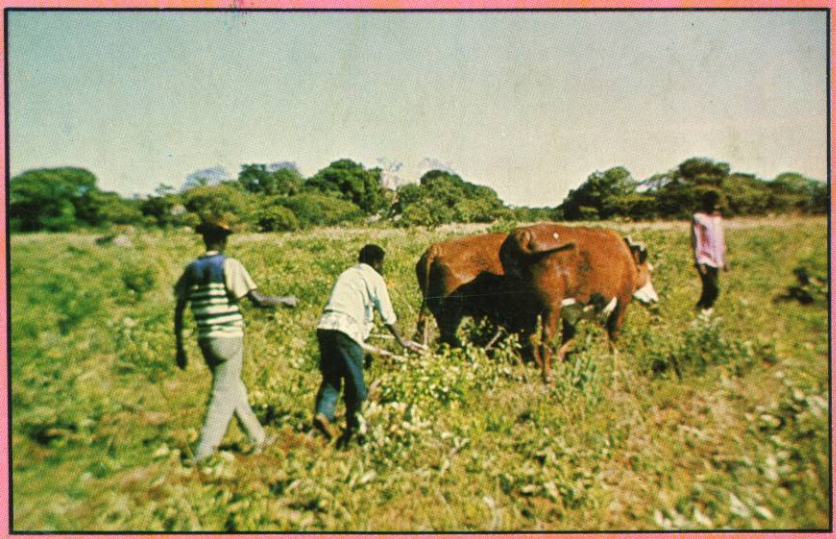
HOUSEHOLD AND NATIONAL FOOD SECURITY IN SOUTHERN AFRICA



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FOREWORD

In 1985 the University of Zimbabwe and Michigan State University initiated a Food Security Research Network for Southern Africa. The objectives of the network are to conduct research that informs policymakers about food security issues and to help strengthen the regional capacity for food policy analyis. The underlying premise of the network is that building excellence in research capacity for national policy analysis comes through experience. In practice, this requires a long-term commitment to analytical capacity building, consistency in funding, and constant interaction between researchers and policymakers.

The network has sponsored four annual conferences for network researchers, policymakers, SADCC officials, and representative of international and donor agencies. The aim of the conference is to share research findings, identify new research themes, and provide an opportunity for policy dialogue between regional researchers, policymakers, and government officials.

The 1988 conference brought together 110 participants who deliberated on 28 papers. In the Official Opening, Vice-Chancellor W.J. Kamba of the Univesity of Zimbbawe highlighted the importance of including health related-issues as a component of food security; and Zimbabwe's Senior Minister of Finance, Economic Planning, and Development B.T.G. Chidzero outlined policy reform priorities for Southern Africa. Subsequent sessions focused on *SADCC's Food Security Programme, the Impact of Market Reform on Food Security, Food Security Policy Options, New Technology to Improve Food Security, Family Food Security Options in Low-Rainfall Areas, Expanding Agricultural Trade in the SADCC Region, Nutrition and Food Security, the Contribution of Small-Scale Rural Enterprises to Employment Generation and Food Security, and the Impact of Irrigation on Food Security.*

A highlight of the 1988 conference was the participation of five nutritionists from Zambia, Zimbabwe, Sweden, and the United States. The presence of the nutritionists stimulated formal and informal discussions on the food access side of the food security equation and drew attention to the need to initiate more research in this area.

A second highlight of the 1988 conference was the attention given to reducing barriers to expanded intraregional trade in the SADCC region. Results presented suggest that there appear to be substantial price and nonprice barriers to expanded trade. Nevertheless, there exist significant opportunities for expanding intraregional trade that can be realized through appropriate government initiatives.

This proceeding contains revised papers prepared under the sponsorship of the University of Zimbabwe/Michigan State University Food Security Research Project in Southern Africa and presented at the University of Zimbabwe's Fourth Annual Conference on Food Security Research in Southern Africa, held at the Holiday Inn, Harare, October 31-November 3, 1988.

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ACKNOWLEDGEMENTS

The Fourth Annual Conference on Food Security Research in Southern Africa provided an opportunity for regional researchers, policymakers, government officials, private sector participants, and donor representatives to share research results and experiences in improving food security in Southern Africa. The studies reported in the proceedings are part of a larger cooperative agreement project on food security in Sub-Saharan Africa that is directed by Michael Weber of Michigan State University's Department of Agricultural Economics. The UZ/MSU Food Security Research Programme is being carried out in conjunction with the Department of Agricultural Economics and Extension, University of Zimbabwe.

Many individuals and institutions have contributed to making the conference a success. We extend our gratitude to the authors of the research papers for their intellectual contributions to the debate on improving food security in Southern Africa; and to the policymakers, private sector participants, government officials, and donor representatives for attending the conference and sharing their insights on the critical issues raised.

The Food Security Research Project has benefitted from the generous support of Sam Muchena and John Dhliwayo, of the Ministry of Lands, Agriculture, and Rural Resettlement (Zimbabwe). In their roles as leaders of SADCC's Food Security Administrative and Technical Unit, they have been particularly helpful in planning the annual conference and identifying relevant research themes that complement SADCC's Food Security Programme.

The Food Security Research Project is financed by the U.S. Agency for International Development, Bureau of Science and Technology; Bureau for Africa; and the Southern Africa Regional Programme; under a *Food Security in Africa* cooperative agreement (DAN-1190-A-00-4092-00) with the Department of Agricultural Economics, Michigan State University and Memorandum of Understanding with the Department of Agricultural Economics and Extension, University of Zimbabwe. We are particularly appreciative of the support we have received from USAID officials, including Allison Herrick, Eric Witt, Joshua Mushuari, Doug Pickett, and Brad Wallach of USAID/Zimbabwe; and our Washington-based project managers, Michael Yates (Science and Technology) and Patricia O'brien (Africa Bureau).

We convey our appreciation to Thembi Sibanda and Murie Hutchison for an excellent job in organizing the Fourth Annual Conference, and to the numerous individuals who helped to make the conference a success: Lovemore Nyabako, Maxwell Chiwashira, Sampson Maguhudze, George Nyamatemba, Ronald Sagwete, Pete Hopkins, and Andrew Barnes.

We are especially indebted to Corinne Smith for her patience, skill, and dedication in word processing the proceedings--and to her husband, Lionel, for his assistance in solving software problems. Their team effort has made this publication possible.

Finally, we thank Chris Wolf and Elizabeth Bartilson for providing software support.

OFFICIAL OPENING

FAMILY HEALTH AND FOOD SECURITY

Professor Walter J. Kamba[1]

INTRODUCTION

It is with great pleasure that I come here this morning to open the University of Zimbabwe *Fourth Annual Conference on Food Security Research in Southern Africa.* I am pleased to report again this year that the conference agenda has been prepared in close cooperation with SADCC member states in cooperation with Zimbabwe's Ministry of Agriculture--the coordinator of SADCC's food security programme.

SADCC member states have a critical role to play in food security planning and research because of the diversity and complexity of the agro-ecologies and the political priorities in our region. This diversity and complexity requires grass roots and national-level participation in food security debates. These national efforts should fulfill national goals as well as contribute to regional cooperation and solidarity.

There is convincing evidence that there are multiple paths to achieving food security. In practice, this means we must move beyond simple slogans such as "food self-sufficiency" and "food self-reliance" and address the overall policy question:

> What is the most cost-effective mix of domestic food production, storage, trade, and/or food aid to meet national and regional food security objectives in both the short- and long-run?

To generate the knowledge base to answer this overarching policy question, each SADCC state must develop its own in-house food security policy analysis capability in government ministries and local universities. This annual conference serves as a mechanism to ensure that national research findings are reviewed by SADCC's food security teams.

Let me comment on the role of tradition that lies behind this annual food security conference. The purpose of this annual conference is to bring together social and technical scientists and SADCC civil servants to generate a climate of debate on research findings, policy approaches, and new research themes that should be pursued.

The fourth conference builds on the tradition of the first three conferences--namely, that "building excellence in national research capacity comes through experience".

In practice, this means pursuing research day-after-day, year-after-year, and reporting the results in an open forum in order that researchers can benefit from the

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[1]Vice-Chancellor, University of Zimbabwe.

comparative experience of policy makers, scholars, and practitioners in other countries.

This exchange creates tension and intensity and helps explain why this conference is regarded as stimulating and productive.

IMPORTANCE OF FAMILY HEALTH

Last year, I spoke on the theme, "building research capacity and cooperation in SADCC universities." This year, I would like to address a related theme--"family health and food security."

In the first eight years of SADCC's action programme, food security has rightfully concentrated on food production, storage, and trade. It is now time, in my judgement, for researchers and policymakers assembled here to launch an ambitious and long-term action research programme on family health and food security. This research is needed, especially in dry areas where the majority of rural families reside.

In calling for an ambitious and long-term research programme on family health and food security, I am repeating the case that plant scientists have made for the last century--namely, that it takes about a decade to develop, test, and release a new maize variety. To address the question, why are 20 to 30 percent of the children in SADCC underweight for age, one cannot expect even the most gifted researchers to answer this question through a conventional three-year research grant from local sources or an international foundation.

Why should researchers pursue in-depth village level research on family food insecurity? The following facts speak for themselves.

- o Hunger and food insecurity in Africa are huge and intractable problems. In the long run--30 to 40 years--raising per capita incomes is a powerful means of solving the hunger and food insecurity problems. But what do we do in the next three, five, and ten years?
- o Africa's poverty is a central cause of malnutrition and family food insecurity. The poverty of Africa is illustrated by a simple statistic: in 1985 the total gross national product (GNP) of the 450 million people in the 45 countries of Sub-Saharan Africa was slightly less than the total GNP of Australia, a nation of some 16 million.
- o Since 70 percent of the people in Africa live in rural areas, it follows that raising the income of rural people across the board is a prerequisite for reducing malnutrition and food insecurity.
- o Family food insecurity is a problem throughout Africa and in the SADCC region. About a quarter of Africa's population--more than 100 million people--do not consume enough food for an active and normal life.
- o Family food insecurity has multiple causes ranging from poverty, drought, disease, and lack of land, resources, and jobs to produce food and/or income to purchase an adequate diet.
- o Family food insecurity problems are especially acute for female-headed households where traditional government services are lagging behind those serving male farmers. We in the SADCC region, as well as in other parts of

Africa, have been slow to grasp the need for research and action programmes to address women and food security.

- o Many rural families are net food buyers. Therefore, simply raising the farm-level price of maize may benefit larger farmers who are net maize sellers while imposing a hardship on many rural families who purchase maize.
- o Since family food insecurity has multiple causes, there is no single action programme that can solve these problems.

Without question, raising farm prices, introducing a new maize variety, setting up a nutrition clinic, or launching a measles vaccination programme will ultimately fail to end hunger because *each* intervention by itself is *limited*! It is obvious that a new research approach is needed to address family health and food security.

NEED FOR A MULTI-DISCIPLINARY APPROACH

Mr. Chairman, I propose that food security researchers from agriculture, geography, economics, and nutrition gathered here this week join forces with medical researchers and lay out an action research programme on family health, nutrition, and family food security.

To help communicate with the public, I propose a simple title--"family health and food security". Nevertheless, behind this title lies the need for equal participation of academic staff from our faculties of medicine, agriculture, and social sciences in the SADCC region. But to tackle the broad and complex topic of family food insecurity, researchers must lay a careful foundation. Because of the complexity of this topic, field research must be preceded by an intensive effort to develop a basic understanding among members of different academic disciplines.

Some hard questions must be resolved in a research programme on family health and food security. These questions and puzzles include the following:

- o Who are the food insecure families? Are they consuming the food - e.g., sorghum and millet--that they produce or are they producing cash crops such as cotton?
- o Where are the food insecure located? Are they in the dry zones? What resources do they lack?
- o Because diarrheal infection and poor diets can cause malnutrition, what are cost-effective ways to improve water, health services, and basic nutrition education?
- o What are new sources of income in rural areas to allow families to find part-time work in slack periods?
- o What institutions need to be changed to allow female-headed farm households to gain access to credit, extension, and other resources?
- o How can resources be mobilized to generate new and permanent employment and income-generating activities within the rural areas?

Many of these puzzles are country-specific and require country-specific action research teams. No single team from SADCC's food security project can expect to unravel these puzzles. But working together, I am confident that researchers in this region can help solve some of these fundamental problems over the coming decade.

Turning to this week's conference, I am pleased to note that nutritionists from Zambia and Zimbabwe are on the programme, but no medical researchers are with us this week? A challenge for the 1989 annual conference is to assemble the full range of applied and theoretical scientists that are necessary for multi-disciplinary research on family health and food security.

I also note that University of Botswana researchers will be reporting on Botswana's successful effort to break the famine cycle during the five-year drought from 1982 to 1987. While the drought was the longest continuous drought in the past 60 years, no one died of hunger or famine during this period.

I am pleased to note that increasing attention is being given to nutrition in the SADCC region. For example, the Third Africa Food and Nutrition Congress held here in Harare in September had its theme "Nutrition and Food Security". It brought together nutritionists, medical researchers and practitioners, agriculturalists, social scientists, and the policymakers. The dialogue has to continue.

AN EVOLVING FOOD SECURITY RESEARCH NETWORK

Last year, I noted that the third annual conference featured researchers from the University of Dar es Salaam, University of Malawi, University of Zambia, and Michigan State. This year I am pleased to report that academic staff from the above universities will be joined by researchers from the Sokoine University in Tanzania and the University of Swaziland.

I am also pleased to note that a follow-up to the third conference included a University of Zambia initiative to invite researchers from Tanzania to share their research findings with policymakers in Zambia.

In summary, I have stressed a simple but fundamental theme. It is time to bring nutritionists, food scientists, and medial researchers into food security research as equal partners with agriculturalists and social scientists.

I am confident that research on family health and food security can supplement and reinforce the excellent studies now under way on national food security policy options in the SADCC region.

It is my sincere hope that your deliberations in this conference will be even more fruitful than the three previous conferences.

It is on that note that I have the pleasure and honour to declare this conference officially open.

ECONOMIC POLICY REFORM AGENDA FOR SOUTHERN AFRICA

Bernard T.G. Chidzero[1]

INTRODUCTION

You have asked me to speak on "the agenda for economic policy reform for Southern Africa". Bearing in mind the importance of the theme of the conference, which is "food security research", I am glad to do so--although the subject I am expected to cover is clearly vast and complex and I can but adumbrate some of the key issues.

I would like, in attempting to determine possible policy reform options open to Southern Africa to facilitate economic growth, including food security and raising the standards of living of our peoples, to outline briefly some of the major constraints to economic growth in the region. These can conveniently be broadly classified into three categories, *viz.* external circumstances, factors of nature, and domestic conditions and policies.

Regarding external circumstances, there can be little doubt in anybody's mind that during the 1980s the global economic environment, which has had a negative impact on developing countries, had been characterised, *inter alia*, by:

- o declining commodity prices and deterioration in terms of trade of developing countries;
- o reduced export earnings and growing balance of payments difficulties;
- o growing protectionism in the developed market economies, including wasteful agricultural subsidies and escalation of tariffs on manufactured exports of developing countries;
- o reduced official development assistance (ODA) flows in real terms, coinciding with reduced export earnings;
- o reverse financial flows from developing to developed countries, and the over-arching debt crisis which threatens the viability of our fragile economies and could undermine the international monetary and financial system itself;
- o high real interest rates and rising or fluctuating exchange rates, including misalignment of macroeconomic policies in developed countries, and aggravation of the debt burden; and
- o erosion of multilateralism and a tendency to resort more and more to unilateral and bilateral actions, in any case preoccupation with domestic issues such as inflation and unemployment in industrialised countries, until relatively recently when multilateralism could be said to be on a revival path.

The list is not exhaustive, but the constraints on developing countries are clear. The question is how can we unite or coordinate our efforts to influence changes in the international environment. And for us in Southern Africa, this situation has

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1. Minister in Parliament and Senior Minister of Finance, Economic Planning, and Development, Zimbabwe.

been further compounded by South Africa's destabilisation activities which have been focussed on the destruction of our infrastructure and other economic targets, leading to immense waste of human and financial resources, the displacement of thousands of our people, human suffering, and untold loss of life.

Natural factors, relating not only to natural resource endowment, including arable land and rainfall but also to natural hazards, have likewise been major constraints. Sparse natural resources have restrained or inhibited development and droughts have taken their tolls, leaving behind trails of death and desertification, wreaking havoc on our fragile economies. There are other hazards--floods, devastating insects, and so on. The challenge is there: how to cope or tame, or control or eradicate such of those hazards as are amenable to human action or to change.

But the major constraints to economic development in Southern Africa are not wholly externally induced, to be eased through international action or assistance; nor mainly attributable to the vagaries of nature, calling for recourse to appeals to the Gods! There can be no avoiding the central issue that unless individual governments formulate and implement policies and programmes that address domestic as well as other constraints on the rapid growth of their economies in the short, medium and the longer term, international assistance or action cannot do the job, nor can mere resort to the Gods. Furthermore, these national approaches have to be supplemented by well-defined and coherent regional initiatives if economies of scale are to be realised and comparative advantages exploited.

On this last point, it should be said that individually our economies are not strong as they are dependent upon outside markets and transport. But taken collectively, for instance, SADCC with a total population of about 70 million is an important economic grouping. At the 1988 SADCC *Annual Consultative Conference* in Arusha, Tanzania, we identified some of the internal constraints to economic growth, including:

- o foreign exchange shortages;
- o shortage of capital, technical and managerial skills;
- o very weak relations among national currencies; and
- o the limited size of national markets.

To these constraints we can also add:

- o the monocultural or near-monocultural nature of many of our economies which gives rise to excessive reliance on a narrow range of export commodities;
- o massive budget deficits;
- o high population growth rates; and
- o little or no direct foreign investment.

As SADCC, we have embarked on a number of regional initiatives which, if successful, would help ease these constraints. For instance, the study on the establishment of Export Prefinancing Revolving Funds is now at an advanced stage. We are also examining the viability and operational modalities of a regional Export Credit Facility and Cross Border Investment. Our cooperating partners, most

notably the Nordic countries, are also currently studying various initiatives to boost interregional and intraregional trade and investment. However, such regional initiatives need the total support and commitment of all participating states if they are to succeed.

At the national level, Southern African states have embarked on various structural adjustment programmes which are aimed at promoting economic growth and stimulating investment. For instance:

- o New or revised investment control regulations have been, or are being introduced--including arrangements for the repatriation of earnings, financial incentives schemes for investors, and exporters, etc.
- o Excessive controls of macroeconomic management are being eased, *e.g.*, many member States are adjusting the exchange rates of their currencies, easing exchange control regulations, implementing or considering to implement varying measures of liberalisation, etc.
- o Excessive price controls, and the resultant distortions to relative prices, are being reviewed or relaxed. For example, Tanzania and Zambia have considerably reduced the number of items on their price control lists and instituted pricing systems more favourable to agricultural production.
- o Prices and incomes policies which redress the imbalance between rural and urban areas are being attended to.
- o Finally, the weights given to export-oriented versus inward-looking growth are being reexamined.

Mr. Chairman, it is important to note that these reform programmes are not being implemented uniformly or at the same pace or with the same intensity--but on the basis of the objective conditions existing in each country. However, structural adjustment programmes, as has been proved not only in this region but also in the rest of the developing countries, can have negative socio-political implications, especially if the adjustment process is externally induced. There is therefore a need to ensure that structural adjustment programmes are supported by increased financial assistance from the developed countries and multilateral agencies so as to cushion the socio-political effects of the adjustment process.

In formulating reform programmes, external technical assistance can be sought from several sources--bilateral, regional, or multilateral. However, this assistance can be effective only if it works within an institutional structure designed to produce operationally relevant policies and programmes--and is also sensitive to the socio-political and economic needs of Southern African states.

There are internally many pressing specific problems which call for urgent action and compete for scarce resources, often affecting the balance between capital and recurrent expenditure as well as allocation of resources to research as against immediate action programmes. Sustained efforts have to be made to overcome employment, to reduce high budget deficits, and to redress the unacceptability high debt service obligations whilst at the same time maintaining necessary recurrent expenditures as well as our external credit-worthiness. There is need to diversify our exports and to realise full capacity utilisation of our productive sectors. While in the

SADCC area our programmes and projects on infrastructural development have so far proved modest successes despite South Africa's destabilisation activities, there is still a great need to continue developing our infrastructure and to underpin investment in production, especially in agriculture as a main engine for economic growth and in the manufacturing sector to effect structural transformation and industrialisation.

Given the colonial history and structure of our economies, on the basis of the objectives stated in national and regional plans and taking as obvious for the moment the critical importance of food and agriculture, attention ought to be paid to investment in the production of capital and intermediate goods for use in the productive sectors to facilitate, in turn, the production of consumer goods to meet basic needs. Emphasis should be put on the utilisation of domestic or regional resources, particularly raw materials as a key element of the strategy. This would reduce the import content of products, creating greater value-added, forging intra-SADCC trade linkages, and making investment opportunities available to all member states according to their indigenous resource endowments.

In nearly all the SADCC member states, most of the major companies--including banking, insurance, and trading--are dominated by foreign interests. This makes it difficult to redirect investment and trading patterns, and to retain profits for re-investment within the region. As a way to redress this situation, over and above purely domestic restructuring efforts, it is necessary to establish genuinely regional companies through regional joint ventures, as well as joint ventures between regional and foreign enterprises. Cross-border investment and such facilities as the proposed *Norsad Fund* could be promotive of such joint ventures--it being understood, of course, that there would be national legislation supportive of these endeavours.

Technological dependence represents another significant constraint in localising production within the region. There is therefore need to deploy more resources to research and development so that technology policy and programmes should be oriented towards:

- o technical skills promotion and manpower development;
- o import-saving innovations;
- o adaptation of technologies to conditions in the region; and
- o designing, developing, and commercialising technologies within the region.

Mr Chairman, let me now turn to the subject which is central to the purpose of your meeting--*i.e.,* agriculture. There is considerable food deficiency in the region and large sums of money to go into food import, while the incidence of food aid flows to the region has not declined. Although one is aware that South Africa's destabilisation activities and direct invasions have seriously affected agricultural production in some of the SADCC member states, the critical point is that serious attention should be paid to agriculture through carefully considered and operationally viable policies.

Agriculture remains the mainstay of the SADCC regional economy, contributing about 34% of the region's GDP, employing about 79% of the total labour force, and contributing about 26% of the total foreign currency earnings. However, per capita

food production in the region has declined to the extent that in 1988 an estimated 1.9 million mt of maize grain equivalent (MGE) will be required in commercial imports and food aid. Such dependence on commercial food imports and food aid, if not redressed urgently, will aggravate balance of payments positions of the importing countries and seriously affect agricultural production in the region insofar as imports--especially if then sold at subsidized prices--easily depress or discourage domestic production.

The need is clearly to formulate policies and programmes to enhance agricultural production, not only commercial but also, and perhaps mainly peasant agriculture and the role of women in agriculture, depending on the circumstances of each country. This would reverse the increasing dependence on food imports, possibly produce surpluses for export and thus enhance export earnings and improve the standards of living of the bulk of the population. This would also provide many of the much needed inputs for the industrial sector and stimulate demand for agriculture's output, as well as strengthen the domestic income and tax base to finance social and infrastructural programmes that would ease the basic constraints on our development.

In this regard, the thrust of the SADCC Food, Agriculture and Natural Resources strategies which are aimed at addressing policy issues in an attempt to improve the policy framework for enhanced agricultural production, is highly commendable and Zimbabwe, both as a major producer of agricultural products and as the country in SADCC charged with the coordinating responsibility in the food sector, has a very major role to play. In the same way, the convening of conferences such as yours, dedicated to food security research in Southern Africa, is most timely and welcome. It is my hope that your efforts are well coordinated with those of such organisations as the Southern African Centre for Co-operation in Agricultural Research (SACCAR) which through the Matopos-based International Centre for Research in the Semi-Arid Tropics (ICRISAT) has already carried out tests on varieties of drought-resistent crops, *e.g.*, sorghum and millet.

It has been suggested elsewhere, and I agree, that once research and technological change in African food production are seen as central, it is necessary to weigh the relative importance of three sets of policy relevant questions. First, what is the nature of the technological problems that science must overcome to boost productivity on a sustained basis, and how adequate are current research and extension processes? Second, what are the roles of other support services and infrastructure, including provision of inputs, output marketing systems, roads, and institutional knowledge? Third, what incentives would influence at least some farmers to produce more, once the technological potentials are available and the necessary inputs and output marketing channels are in place?

However, our coordinated regional approach should not be confined to research into food security alone. It should cover other pressing issues such as transportation, processing, storage, pricing, marketing, and the whole question of agricultural trade, not only within the region but also with the developed market economies. In this regard, at a time when GATT--through the Uruguay Round on Trade Negotiations--is nearing the Midterm Review (December 1988), it is also important to find

common ground and mould and concretise our positions, especially in the area of world agricultural trade. In the Southern African region, it will be politic to work together in identifying areas of mutual interest and be in a position to negotiate jointly as a region in close cooperation with other developing countries in some of the multilateral organisations, such as GATT and the LOME Conventions.

I must, in conclusion, underline the fact that I am only fully aware that I have not even outlined an economic reform agenda for Southern Africa for a variety of reasons including, in particular, the complexity of the subject and the variability of circumstances as well as national predilections and policy stances. But I do hope I have at least outlined some of the key issues and presented a "menu", not of options but of issues and possible measures. I do also hope I have made the general challenge clear.

More reassuredly, I note with satisfaction that your conference will consider most of the issues in detail and we eagerly await the outcome of your deliberation. I therefore wish you success and sincerely hope that you will also enjoy your stay here in Harare.

Thank you.

SADCC'S FOOD SECURITY PROGRAMME

SADCC'S EVOLVING FOOD SECURITY PROGRAMME

K. John M. Dhliwayo[1]

INTRODUCTION

FOOD SECURITY SITUATION IN SADCC

Despite the limitations of available data, it is clear that the food security problem in SADCC and in Africa is generally substantial. Assessments by the World Bank show that the food insecure are not confined to any one group or type of countries.

The Bank's estimates indicated that between 24-50% of the population in five SADCC countries are food insecure[2]. In three countries--Zambia, Mozambique, and Zimbabwe--nearly one-half of the population is estimated to be food insecure. This situation exists, despite the substantial staple grain surpluses produced in Zimbabwe in recent years.

AGRICULTURE AND FOOD SECURITY

Agriculture is important as a vehicle for addressing food security problems for at least two reasons. First, in SADCC agriculture remains the mainstay of the regional economy, contributing about 34% of the region's GDP, employing about 79% of the total labour force, and contributing about 26% of the total foreign currency earnings. Stimulating agricultural growth will therefore be the major instrument for increasing national and household incomes, with which food can be imported and bought domestically.

Second, in most SADCC countries, agriculture is the principal way of ensuring food availability. The largest group of people in SADCC who suffer food insecurity are the rural poor, who have insufficient land and other resources to provide sufficient income or food.

Such people typically live in drought-prone areas, in areas of high population density, and often have female heads of households with inadequate land and capital resources.

Increased food production by such people will often be the only way to increase their food security in the medium term, since alternative employment will not be readily forthcoming and dependence on food aid is unpredictable for more than the short term.

Agriculture can thus contribute to overcoming the food security problem through:

- o growth that distributes its benefits as widely as possible; and

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[1]Sector Coordinator, Food Security Technical and Administrative Unit, SADCC.

[2]Report of the Task Force on Food Security in Africa, World Bank, June 30, 1988.

- o increased food production by the rural poor.

With this background highlighting the fundamental role of agriculture in improving food security, it is not surprising that SADCC has established seven separate interrelated areas for cooperation within its Food Agriculture and Natural Resources programme.

- o Agricultural Research and Training (coordinated by Botswana);
- o Livestock Production and Animal Disease Control (Botswana);
- o Fisheries, Forestry, and Wildlife (Malawi);
- o Soil and Water Conservation and Land Utilization (Lesotho); and
- o Food Security (Zimbabwe).

Within the Food Security Programme, much of the thrust of the regional food security projects is directed at improving the availability side of the food security equation.

FOOD SECURITY PROGRAMME REVIEW

Objectives

The overall objective of the SADCC Food Security Programme is to increase agricultural production so that the region can become self-sufficient in its basic food needs. Within this broad aim, three objectives are to:

- o satisfy the basic food needs of the whole population of the region, and progressively to improve food supplies to the people--irrespective of their specific economic situation or position in society;
- o achieve national and regional self-sufficiency in food supply to the maximum extent possible, in order to reduce the region's dependence on external sources of supply; and
- o eliminate the periodic food crises which affect areas or countries in the region.

Strategy

The original emphasis of the sector's strategy focused on assisting member states to increase food availability through increasing domestic production, reducing post-harvest losses, and expanding grain storage. This thrust is being continued. However, the current strategy also recognizes that increasing food production and efforts toward national self-sufficiency *per se*, will not automatically end hunger and malnutrition. The strategy, therefore, aims to increase household, national, and regional food security by encouraging activities that will enhance the ability of all people to acquire an adequate diet.

The strategy emphasizes the importance of increasing food production in food deficit member states. It also emphasizes the need to give first priority to helping increase food production in these countries; and to support agricultural diversification projects in food surplus countries.

The principal elements of the strategy are to:

- o develop mechanisms for the exchange of information;
- o reinforce national food production capacity;

- o develop intraregional trade in food and other crops;
- o improve food storage, delivery, conservation, and processing;
- o improve seed production and the supply of major food crops in the region;
- o develop cash crops and other agricultural enterprises;
- o establish systems for the prevention of food crises and develop national food security strategies;
- o improve regional food security through effective exploitation of the region's extensive irrigation potential;
- o establish programmes for the control of major crop pests and diseases; and
- o develop skilled manpower.

Implementation

The Food Security Programme is being implemented through 13 interlinked regional projects and a series of other projects which, though national in character, when taken together contribute significantly to the achievements of SADCC's overall food security objectives.

During 1988, the programme at the regional level has concentrated on consolidating progress in the development of the programme's regional projects.

Food Reserve Project

Given the priority accorded in the sector's strategy to establishing systems to prevent food crises and enhance intraregional trade, major emphasis has been given to bringing the Regional Food Reserve Project (FRP) to the stage where it is ready for implementation.

The Council of Ministers reaffirmed its support for the project and approved the *Project Implementation Memorandum* as its meeting in January, 1988. A special working session was held at the 1988 *Annual Consultative Conference* to present the project to cooperating partners. The session was followed by a series of meetings with most of those partners who expressed interest in the project.

Cooperating partners have indicated general support for the concept of the project, and specific support for the management coordination team and for the training component. There is also support for the food aid component. The first grain donation made to the project has been received from Argentina. However, some cooperating partners have raised issues in connection with both the administration and pricing of the food aid component and the contributions by member states to project costs.

After extensive discussions within SADCC, the project has been revised to allow for a rescheduling of the implementation programme to take account of the views of SADCC's partners. Under the revised proposal, SADCC's assertion of full administrative control over the food aid component will be postponed until the database and operational capacity of the reserve's management has been established.

A special meeting of senior SADCC officials in September 1988 recommended implementation of the revised project. Work has started to consolidate funding.

Early Warning System for Food Security

This project is now fully operational, although counterpart staff to the FAO experts still need to be recruited in some posts in some national early warning units. Information is flowing regularly between the national units and the regional unit. Three quarterly *Food Security Bulletins* have been released, with the fourth expected in October, 1988.

A fully operational national unit has been established in Angola with financial assistance provided by the OAU which has also provided funds to meet the balance of local costs of the Regional Early Warning Unit during its three-year establishment phase.

Regional Inventory of Agricultural Resource Base (RIARB)

This project has made significant progress in compiling an agricultural resource data and the designing computerised databases at the national and regional levels. Microcomputers with a range of appropriate software for use in compiling data for the inventory have been distributed to several member states.

A new project associated with the RIARB, for which the support of cooperating partners is sought, is concerned with completing the national soil survey in Zambia. The information to be obtained from the survey will be an essential input for the RIARB.

Regional Information System on Food Security (RIS)

A preliminary version of the Regional Information System on Food Security has been designed and a draft project proposal for implementing the first phase of the project has been prepared for approval by ministers of agriculture and natural resources in October. Cooperating partners are invited to support the implementation of this project.

Post-Production Food Industry Advisory Unit (PFIAU)

This project continues to assist member states to identify, design, and implement projects addressing the reduction of post-production losses in areas such as improved harvesting techniques, handling, storage,processing, and distribution. In addition to the further development of projects in 1987, the PFIAU has assisted with the development of a large-scale project to improve post-production systems in southern Tanzania. A pilot project to develop bunker storage for maize is also being developed in conjunction with the Grain Marketing Board in Zimbabwe.

Funding of the PFIAU and its core activities is available only up until the end of 1988. A tripartite evaluation of the project has recommended its continuation and a proposal for the five-year extension of the project, at an estimated cost of US$3.6 million, is in preparation. Cooperating partners are invited to continue their support for this project.

Improving seed production capacity

One of the projects addressing that element of the strategy which deals with "reinforcement of national production capacity" has been a major study on the

production and supply of seed in the region. The study, which was completed in 1988, has identified 12 projects for improving the seed sector at the regional level and a number of areas for intervention at the national level. Four of the regional projects have been referred to SACCAR[3] because of their implications for the region's agricultural research programme. Detailed project proposals are being developed by the study consultant for the eight other projects. After their approval by SADCC, cooperating partners will be invited to support these new projects.

Strengthening and coordination of migrant pest control

That element of the strategy dealing with establishing programmes for the control of major crop pests and diseases is being addressed by Project 1.0.13--strengthening and coordination of migrant pest control. An agreement with the Federal Republic of Germany on the initiation of a pre-implementation phase to design a long-term project to improve member states' capacity to deal with migrant pests, is expected to be concluded shortly.

Identification of new national projects

Work initiated in 1987 to identify new national projects for inclusion in the Food Security Programme and the review of national projects previously included, is continuing. However, progress has been slow. The Food Security Technical and Administrative Unit (FSTAU) is aware of project proposals in several member states which would lend themselves for inclusion in the Food Security Programme. The Unit, however, lacks the resources to provide assistance to member states to develop the proposals in accordance with the agreed SADCC format in order that they may be submitted for consideration and approval by SADCC. A proposal to expand FSTAU's resources to meet this need is being prepared as part of the proposals for continued funding of the Unit's activities.

SADCC's strategy for food, agriculture, and natural resources recognizes that women occupy a very central position in the production structures of member states, especially in rural peasant agriculture. In some member states, women constitute a majority of the rural labour force because men have left to seek employment in the urban areas or in South Africa. The Food Security Sector recognizes the need to give greater emphasis in the programme to the special need of women in the projects which are developed. Accordingly, negotiations are in progress with the United Nations Development Fund for Women (UNIFEM) for support for the appointment to the FSTAU of a technical adviser to assist in addressing issues specifically relating to women in the development of projects. It is envisaged that this adviser will initially concentrate efforts in projects dealing with the post-production sector.

The review of the management structure and accounting systems of the FSTAU, commissioned by the Government of Zimbabwe in 1987, has been completed; and

[3]SACCAR, Southern Africa Centre for Cooperation in Agricultural Research, is responsible for assisting SADCC countries to strengthen their agricultural research capacity.

the report by the study consultant is now under consideration by government. The consultant has recommended a restructuring of the Unit from its present project team orientation into three sections: technical and economic planning; information; and finance and administration. The consultant has also recommended a significant increase in the allocation of both personnel and financial resources to the Unit. After decision by government on the report's recommendations, detailed proposals for continued funding of the Unit's activities will be prepared and submitted to cooperating partners.

STATUS OF REGIONAL PROJECTS[4]

Project 1.0.1: Technical Assistance Programme for Coordination and Cooperation
The project, funded by USAID, Australia, and Zimbabwe, provides financial and technical support for the processes of cooperation within SADCC on agrarian issues and assists Zimbabwe in planning, coordinating, and implementing the Food Security Programme. It also provides support for the overall coordination of SADCC's programmes in Food, Agriculture, and Natural Resources. A review by the Government of Zimbabwe of the FSTAU's management structure, accounting systems, and resource requirements is at an advanced stage. On its completion, the continued support of SADCC's cooperating partners for this core project will be sought.

Project 1.0.2: Regional Early Warning System for Food Security
The primary objective of this project, which is financed by Denmark, the OAU, and SADCC member states, is to provide advance information on food crop production and food supplies in the region so that member states can take action in the event of impending food shortages or surpluses. A Regional Early Warning Unit (REWU) has been established in Zimbabwe, and national early warning units have been established or strengthened in each member state. The REWU has published three quarterly bulletins on the food situation in the region since December 1987 and a fourth is expected in October 1988. A tripartite review by DANIDA, SADCC, and FAO is due to be conducted in October and November 1988 to review the work carried out so far and assess the need for further assistance.

Project 1.0.3: Regional Information System for Food Security
The project is concerned with establishing a regional information system (RIS) for food security planning. This involves developing national and regional databases on food production, trade in food commodities, and other socioeconomic indicators. During the project's pre-implementation phase, funded by UNDP, the nucleus of the Central Unit has been established, almost all SADCC countries have nominated a National Liaison Officer, and a preliminary design of the RIS has been submitted for

[4]Detailed documentation about each project is available from the Food Security Technical and Administrative Unit, Ministry of Lands, Agricultural and Rural Resettlement, Harare, Zimbabwe.

discussion. Essentially, a distributed information system has been proposed, with strong national modules linked to the Central Unit. The proposal also provides guidelines for database design, software and hardware acquisition, and personnel development--including a training programme to be executed at the national, regional, and extra-regional level. A project document for the implementation phase has been prepared. After its approval by SADCC, the approval of SADCC's cooperating partners will be sought to implement the project.

Project 1.0.4: Regional Inventory of Agriculture Resource Base
This project, which commenced implementation in 1985 with funding from the Republic of Ireland, involves establishing a standardized inventory of the region's agricultural resource base at both the national and regional level which can be used for land-use and other planning purposes. Correlation and standardization of data supplied by member states is being undertaken by the project's Central Unit based in Zimbabwe. Databases for the regional inventory (CARISA) and for the national inventory (NARISA) are being established. When completed, they will help to indicate the potential food production capacity of the region. Soil mapping units of the region have been correlated with the FAO soil legend and the USDA's soil taxonomy and the correlation of land-use patterns in the region is continuing. Two new programmes--SADCC Soil Fertility Analysis Services and SADCC Rangeland Management--and a soil survey project have been compiled and submitted for SADCC consideration. Additional funding of US$50,000 is needed to enable the project to use remote-sensing technology to correlate land use patterns.

Project 1.0.5&9: Regional Food Reserve Project
A pre-feasibility study which commenced in 1983 was reported in 1984. A subsequent feasibility study in 1986 identified alternative management systems for a regional reserve. The selected system was examined at the feasibility level and a *Project Implementation Memorandum* has been approved by the SADCC Council of Ministers.

The project is now in the pre-implementation phase, pending confirmation of funding. Work has started to mobilize funding for the project management, a pre-implementation training study, and for the basic food aid needs. The EEC and other partners have indicated interest in providing financial support for the project management and training programmes, and also for part of the food aid required. However, interested partners have requested modifications in the detailed proposals for project implementation, mainly the food aid component, to comply with their own regulations.

The project document has been revised. On 21 September 1988, officials recommended to ministers that the project, as outlined in the revised document, is ready for implementation. Considerable additional funding will be needed to fulfil the basic project programme; and cooperating partners are invited to support the project.

Project 1.0.6&7: Regional Post Production Food Loss Reduction and Food Processing

This project is concerned with reducing post-production food losses in the region by encouraging the use of more efficient post-production operations and establishing rural facilities for the storage, preservation, processing, distribution, and marketing of food products. Implementation is coordinated by the Post-Production Food Industry Advisory Unit (PFIAU) whose basic strategy is to catalyse action in the post-production systems in member states and conducts workshops and seminars to identify potential areas of intervention. It assists member states to identify, initiate, and monitor projects on system improvement; and assist with obtaining funding support for their implementation. A number of projects to improve post-production systems are being implemented in Angola, Zambia, Lesotho, and Botswana. The PFIAU is funded under a grant from Canada until the end of 1988. A tripartite evaluation mission in 1988 recommended continuation of the project. A proposal for a five-year extension of the project at an estimated cost of US$3.6 million is in preparation and, on its completion, cooperating partners will be invited to support the project.

1.0.8: Regional Food Marketing Infrastructure (study)

This study will (i) provide a basis for proposals to improve the capacity of the existing food marketing and distribution infrastructure in member states; and (ii) identify ways and means to improve the movement of commodities between member states.

The report of the study review, undertaken in 1987 and 1988, is being finalised by the FSTAU. Several areas for improving food marketing infrastructure at the national and regional levels have been identified and specific project proposals developed.

After finalising the proposals and they are approved by SADCC, the support of cooperating partners will be sought for implementing the project. Funding of US$ 30,000 is also being sought to undertake a supplementary study in Angola which the study review could not cover because of logistical problems.

1.0.11: Regional Seed Production and Supply (study)

The objectives of this Danish-funded study are to analyse production, availability, and demand for improved seeds of the major food crops in member states; propose actions to alleviate constraints in the seed sector; and make recommendations on future regional cooperation in the sector. Field work was completed in 1987 and a workshop of SADCC technical experts to discuss the draft study report was held in April 1988. Twelve projects have been identified, four of which have been referred to SACCAR. Detailed project proposals are being developed by the study consultant for inclusion in the final report which is expected to be completed before the end of 1988. After approval of these projects by SADCC, the support of cooperating partners will be sought for project implementation.

1.0.12: Improved Irrigation in the SADCC Region (study)
The objective of this study is to identify appropriate ways by which SADCC can improve regional food security through more effective exploitation of the region's extensive irrigation potential. The study is expected to establish a strategy and programme of activities in the irrigation sector which can be implemented through the SADCC programme of action. Terms of reference for the study have been finalized and negotiations are proceeding with the Australian Government which has indicated its willingness to finance the study.

1.0.13: Strengthening and coordination of migrant pest control
The main objectives of this project are: to improve the capability of member states' ministries of agriculture to protect crops, particularly cereals, from losses caused by migratory pests such as grain-eating birds, African army worm, and locusts; and to develop an integrated regional approach to the control of migrant pests. An appraisal of the project by the Federal Republic of Germany's implementing agency, GTZ, recommended initiation of the project through a short-term pre-implementation phase at an estimated cost of DM1.0 million. Negotiations on the conclusion of an agreement relating to this phase are underway with the FRG.

NATIONAL PROJECTS

The SADCC Food Security Programme also comprise 23 national projects. These national projects with a regional impact reflect a similar concentration of emphasis on improvement to food availability, either through increased production, or improved marketing, storage, and distribution.

While not explicitly directed at improving food security, the production-enhancing objectives of the other sectors of the Food, Agriculture, and Natural Resources programme--particularly the sectors of Agricultural Research and Training, Livestock Production and Animal Disease Control, Fisheries, and Soil and Water Conservation and Land Utilization--are, by contributing to agricultural growth, also contributing to overcoming the food security problem.

However, actions to increase production and incomes in the agricultural sector, although of the highest priority, will not be enough to resolve the food security problem because (i) much of the growth that does occur as a result of initiatives in these sectors will benefit the medium and large producers and urban consumers and (ii) it does little to deal with food insecurity created by natural disaster (droughts, pest outbreaks) or man-made disaster (wars, civil strife).

MEASURES TO REDUCE FOOD INSECURITY

Chronic food insecurity is essentially an income problem and its ultimate solution lies in increasing incomes through broad-based economic development. Thus, there is a need for sound development policies, making necessary structural adjustments to the economy, and getting back on an economic growth path. Very often, what is good for economic growth is also good for food security.

However, it is recognized that reliance on economic growth alone will not be an adequate solution to the problem of food insecurity. There is need to complement economic growth initiatives with direct food security interventions. Economic growth alone may not directly and quickly reduce chronic food insecurity because:

- o Growth takes time and, and in the meantime, problems of food security may be so severe as to demand remedial action.
- o Benefits of economic growth don't always reach disadvantaged groups or less well endowment regions.
- o Some segments of society may not be able to participate in the benefits of growth.

The kinds of government inventions that are needed to enhance food security will include:

- o regular growth-promoting programmes which especially benefit the food insecure;
- o subsidy schemes (for production and consumption); and
- o policy actions aimed at relieving key constraints to achieving food security.

Interventions which can be pursued through explicit food security projects can include:

- o development of planning and implementing capacity for early warning of food problems;
- o specific interventions to help vulnerable rural households to produce food for themselves (*e.g.*, distribution of seed, hand tools, extension);
- o development of agricultural research capacity for drought-resistant crops and improved cultivation techniques;
- o support for food-marketing and storage investments;
- o support for minimum food distribution and storage facilities;
- o specialized extension for women on food crop production;
- o nutrition and supplement programmes; and
- o policy changes--particularly pricing, land tenure, and market liberalization.

This list indicates that the opportunities to develop projects addressing the food insecure population are largely the prerogative of national governments. In recognizing this, SADCC is giving support to food deficit member states for production projects which do not necessarily have any direct impact on any other member state.

The problem in identifying suitable, cost-effective projects remains. It is here that SADCC has a role to play, particularly through exchanging information and sharing experiences.

Notwithstanding the urging by the SADCC Council of Ministers for including more "directly productive projects" in the Food, Agriculture and Natural Resource programme, the Food Security Sector has experienced difficulties in incorporating more of these national production projects that explicitly address the needs of the food insecure into the Food Security Programme.

Part of the difficulty could be due to a shortage of suitably-qualified personnel to develop appropriate project proposals. Through the activities of Project 1, the FSTAU is exploring ways of providing technical assistance to member states to

overcome such constraints. One element of the training programme under the Regional Food Reserve Project will also address this need.

On the other hand, since these types of projects are by their very nature, national in character, member states may feel more comfortable in seeking donor support for them on a bilateral basis, instead of submitting them to SADCC.

IDENTIFYING THE FOOD INSECURE

A fundamental problem remains--the identification of who the food insecure are, where they are located, how severely they are affected, and the causes of their food insecurity.

The Regional Information System and the Regional Early Warning System should go some way toward providing some of the answers. However, there is no single best indicator for measuring whether individuals or groups of people are adequately nourished. Results of any regional research into this fundamental question will be welcomed by the Food Security Programme.

IMPACT OF MARKET REFORM ON FOOD SECURITY

IMPACT OF MARKET LIBERALISATION ON HOUSEHOLD FOOD SECURITY IN TANZANIA

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INTRODUCTION

During the November 1987 *Conference on Food Security Research in Southern Africa*, we presented a paper on the impact of adjustment and stabilization policies in general, and market liberalisation in particular, on food security in Tanzania. Our 1987 paper included: a brief history of agricultural policy since independence in 1961; an analysis of the characteristics of food consumption in rural and urban areas; a detailed examination of the evolution of the intervention regime and its impact on production, consumption, and food security; and an indepth discussion of the impact of recent adjustment policies and market liberalization on food security.

This paper analyses the impact of policy measures since July 1984 on household food security. The paper is divided into four sections. A summary of our 1987 paper and a review of factors affecting food supply in the long- and short-run at the micro level is presented in Appendix I. Section two, a major component of this paper, uses micro-level data to analyse the impact of food market liberalization on consumption growth, mainly through income and price changes. The third section examines some possible policy interventions to reduce food insecurity for those most at risk and presents an *ex ante* analysis of the impact of such policies on the at-risk households.

ACCESSIBILITY TO FOOD

Demand estimates

The main factors affecting household-level demand for a commodity are income, own price, cross-prices, and household size. Other factors like culture, location, religion, sex, and education essentially reflect consumer tastes. Thus, demand estimates differ between countries, regions, rural-urban areas, and across income groups (Kapunda, 1988).

In mainland Tanzania, the food share of household budgets has been estimated at 65%. The budget share is about 70% in rural areas and about 50% in urban centres. Furthermore, the food budget shares are highest in the lowest income group and lowest in the highest income groups. Similar trends are also observed for income or expenditure elasticities. Gross elasticity of demand for food is relatively high (0.87). The magnitude is highest in low expenditure group (0.99) and lowest

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Table 1. Expenditure elasticities of major staples in mainland Tanzania.

Location	Maize	Rice	Beans
Urban	0.55[a]	0.66[b]	0.32[a]
Rural	0.80[a]	1.51[b]	0.75[a]
All[c]	0.64	0.94	0.48

[c]All mainland Tanzania estimates are weighted averages. The weights are budget shares.
Source: [a]Kapunda (1988); [b]Odegaard (1985)

in the upper expenditure group (0.76). It is generally higher in rural areas (0.83) than in urban areas (0.81) (Kapunda, 1988).

In this study, food is a composite commodity made up of maize (flour), rice, and beans. These commodities are chosen because of the availability of good data and:

- o they cover a significant portion of total food (*i.e.*, about 40% of total food expenditure);
- o they present the main nutrition items which are normally available to many consumers, *i.e.*, carbohydrates (maize, flour, and rice) and protein (beans);
- o the percentage of calories from only two staple items (maize and rice) is over 70%; and
- o the contribution to total human energy supply from selected food items is quite substantial, about 40% (Amani *et al.*, 1977).

Total expenditure elasticities for three commodities are shown in Table 1.

Price elasticity of demand for food is estimated at -0.88[2]. These elasticities have been useful in estimating the rate of change in national food consumption. The model by Edel (1969) is employed to obtain the estimates:

$$g_f = n + (1 + n)e_y \; g_y - (1 + n)e_p \; g_p$$

where:

g_f = rate of increase in national food consumption
n = rate of growth of population
e_y = income or total expenditure elasticity of demand for food
g_y = rate of change in per capita income
e_p = price elasticity of demand for food
g_p = rate of growth in relative price of food

[2]Weighted average of maize flour, rice, and beans elasticities. Sources of elasticity estimates are Gerrard (1981) for maize meal (-0.90) and rice (-1.50); and Kapunda (1988) for beans (-0.64).

For the period 1967-68 to 1986-87, the annual increase in national food consumption is estimated to be 5.9%. For the period before liberalization (1970-71 to 1983-84), the annual increase in national food consumption is estimated at 4.2%, while the supply of food (maize, rice, and beans) grew at an average annual trend rate of only 2.6%. However, between 1983-84 and 1986-87 food supply grew at an average annual trend rate of 5.4%, surpassing the annual increase in national consumption of 4.2% as shown in Table 2.

Nevertheless, since liberalization is only four-years old, any conclusion or policy evaluation remains preliminary. The next section further examines the impact of food market liberalization on accessibility to food.

Impact of food market liberalization on access to food

In an economy where food markets function reasonably well and supplies are adequate, both household and individual access to food depends on incomes. Policies that induce increased incomes do in fact also raise accessibility to food and hence food security. The recent liberalization process in Tanzania has helped

Table 2. Production and net importation of maize, paddy, and mixed pulses ('000 mt).

	Maize		Paddy[a]		Mixed Pulses
Year	Production	Net import/ (Export)	Production	Net import/ (Export)	Production
1967-68	551	(8.3)	104	3.8	112
1968-69	638	(43.3)	126	0.0	102
1969-70	488	46.9	132	0.0	122
1970-71	719	(53.4)	171	0.0	108
1971-72	621	92.3	187	(4.2)	na
1972-73	887	78.9	301	(10.2)	178
1973-74	761	183.6	223	23.0	179
1974-75	1,367	317.6	265	63.0	217
1975-76	1,449	106.5	346	20.8	249
1976-77	1,664	41.6	314	5.3	185
1977-78	1,465	34.3	387	48.1	197
1978-79	1,720	(49.0)	262	41.2	218
1979-80	1,726	4.5	291	54.7	310
1980-81	1,839	274.6	200	62.2	272
1981-82	1,654	231.6	320	66.5	297
1982-83	1,651	123.4	350	29.4	282
1983-84	1,939	194.3	356	57.1	281
1984-85	2,067	128.5	425	36.1	406
1985-86	2,127	6.1	496	32.9	354
1986-87	2,359	na	644	na	424

[a]Conversion factor from paddy to rice = 0.6
na = data not available
Source: Market Development Bureau, (various years).

increased rural real incomes and the supply of food. Rural real incomes per capita, measured by agricultural GDP per capita at 1976 constant producer prices, increased at an average rate of 2.4% per annum between 1984 and 1987. Rural incomes per capita, deflated by the national consumer price index, increased at an average rate of 0.33% per annum during the same time period. The comparative average growth rates for the crisis period of 1979-83 were -0.63% and -5.28% per annum, respectively (Table 3). The post-1984 period was thus characterized by positive real income per capita growth for rural producers for the first time since the onset of the crisis in 1979.

The estimated rural expenditure elasticities for maize flour, rice, and beans (0.80, 1.51 and 0.75, respectively - Table 1), combined with income per capita growth data, allowed us to estimate the growth rate of consumption of maize, rice, and beans per capita for the post-1984 period. Assuming that increased consumption comes out of own production, the relevant income measurement is GDP at factor cost (at constant prices), rather than income deflated by the CPI. Estimated consumption per capita average growth rates for the 1984-87 period, resulting from increase in real rural incomes per capita, are 1.95%, 3.68%, and 1.83% for maize flour, rice, and beans, respectively (Table 4).

If one deflates rural incomes by the CPI, the resultant average growth rates of consumption per capita are estimated at 0.26%, 0.5%, and 0.24% for maize flour, rice, and beans, respectively.

Using either measure of real income growth, the estimates show that consumption per capita of the major food staples increased in the rural areas during the post-1984 period. In comparison, consumption per capita of the major staples declined during 1976-83, given the decline in rural income per capita. The estimated rates of decline--using real incomes at factor cost--averaged 0.7%, 1.0%, and 0.6% per annum for maize flour, rice, and beans, respectively. Using CPI deflated incomes,

Table 3. Average annual growth of real agricultural income per capita, Tanzania, 1979 to 1987[3].

Period	Agricultural income (%):	
	At factor costs (1976 prices)	Deflated by CPI
1979-83	-0.63	-5.28
1984-87	2.4	0.33

Source: Computed from *National Accounts* (respective years) and 1987 population census data.

Table 4. Estimated per capita growth rates for major staples, rural Tanzania, 1984 to 1987.

Commodity	Growth rate	Expenditure share of total for the three staple crops
Maize	1.95	60.8
Rice	3.68	15.4
Beans	1.83	23.8

Source: Computed from data in Tables 1 and 3.

the respective rates of decline of consumption per capita were 0.3%, 8%, and 0.3% for maize flour, rice, and beans, respectively[3].

A quick check on the plausibility of the estimates of rural consumption per capita growth, using data on total supplies (local production + imports - exports) inclusive of stocks, indicates that estimates based on real incomes at cost are the most reasonable. As noted earlier, the total supply of the three staples for the period 1983-84 to 1986-87 grew at an average annual trend rate of 5.4%. Given rural population growth rate of 2.6%, the per capita supply growth rate for the period was 2.8%. The weighted average rural consumption growth rate per capita from the estimates for the three staples works out to 2.2% (weights used for composite elasticity are expenditure proportions on each item). The difference between the supply growth rate and the estimated consumption growth rates could be explained by growth in stocks at the level of marketing agencies and producer households.

Food consumption estimates for non-agriculturalists are more difficult to derive because official recorded incomes earned by non-agriculturalists are far below actual earnings, as deduced from their expenditure side. Two recent surveys[4] on food expenditure by Dar es Salaam residents confirm the wide gap between expenditure on food and wage levels. In a survey covering low income areas of Manzese and Buguruni in Dar es Salaam, monthly expenditure on food averaged Tshs. 12,090 for an average household of six persons. The median household spent Tshs. 7,500 per

[3]This analysis does not take into account substitution effects resulting from changes in relative prices for particular items since the year of survey (1976-77). It is nevertheless indicative of a general increased in consumption across the staples.

[4]The first survey was by Aili Mari Tripp, covering 300 households in Manzese and Buguruni over a five-month period as part of a larger study on the informal sector and grassroot dynamics in Tanzania. The second survey was by I.A. Msambichaka and W.E. Maro, covering 225 cases in Manzese and 250 cases in the high income area of Osterbay in Dar es Salaam.

month on food. Official incomes from wages during the survey period (October 1987-January 1988) ranged from Tshs. 1,260 to Tshs. 3,000 per month. The respondents covered the gap between expenditure and official incomes from informal activities, including the sales of food preparation, urban subsistence agriculture, small crafts, and trade in small consumer items. This survey shows a large increase in the participation rate by all household members, including children, in income-generating activities.

In a separate survey of Dar es Salaam, covering a wider spectrum of residential areas, Msambichaka and Maro (1988) confirm the existence of the gap between official incomes and actual expenditures by households on food. In the case of the low income Manzese residential area, based on food budget, Msambichaka and Maro estimate the minimum household food expenditure for a household of six to be Tshs. 7,482. For the high income areas of Msasani/Osterbay, the estimated minimum expenditure on food was Tshs. 12,840 for a household of six persons. Wage incomes in such areas range between Tshs. 5,000 and Tshs. 9,000 after tax.

If one considers only the official incomes by non-agriculturalists, taking minimum wages over time, food equivalence of these wages will differ depending on whether one looks at the trends using official or open market prices. During the post-1984 period, official consumer prices rose at a faster rate to close the gap with open market prices as a matter of policy. The effective prices paid by consumers, however, have been dominated by open market prices. given that more than 80% of requirements for consumption are obtained from the open markets.

In terms of maize flour equivalence, while the minimum wage declined by 14.7% between 1984 and 1987 (from 3.4 kgs per day down to 2.9 kgs per day) at official prices, at open market prices an increase of 90.5% over the same period was recorded (from 1.89 kgs to 3.6 kgs). The weighted average of the two sources (with weights of 0.8 and 0.2 for open market and official sources, respectively) yields an increase of 69.5% between 1984 and 1987. Thus, the minimum wage thus rose faster than the weighted average price of maize flour. In terms of rice equivalence at official prices, the minimum wage declined by 45.5% between 1984 and 1987 (from 2.0 kg to 1.09 kg per day). At open market prices, the minimum wage increased by 28.6% (from 0.77 kg to 0.99 kg per day). The weighted average (with weights of 0.9 and 0.1 for open market and official sources, respectively) reveals on increase of 21.2% over the period.

Policy interventions to guarantee food security for all

The general objective of food security is to guarantee "access by all people at all times to enough food for an active, healthy life" (World Bank, 1986). Attaining this objective entails providing adequate food to all members of society, including those who do not earn adequate income to purchase food or do not produce enough food for their own consumption. For a poor country like Tanzania, this objective may be too ambitious. The feasibility of attaining such an objective, however, depends on the policy instruments used. Direct and general provision of subsidies to reduce food prices is not feasible in the long run because of the financial burden it places

on the government. Moreover, low consumer food prices are likely to be partly financed by low producer prices that will discourage production and sales to the government.

For poor countries, the feasible policy for attaining food security is to increase the productivity and earning power of poor households and the efficiency of food markets. Households should have enough income to purchase adequate amounts of food and this food should be readily available in the markets. Market liberalization that leads to increases in the incomes of the rural population and improves the performance of food markets, generally improves rather than worsens food security in the rural areas. In urban areas, liberalization that improves the functioning of markets would improve food security, particularly in cases where a low food price policy was not effective and most consumers purchased their food in parallel markets at high prices.

An overview of nutritional status in Tanzania

The nutritional status of the Tanzanian population is not accurately known because a nationwide nutritional survey has not been carried out. Lack of nationwide data on nutritional status and how it has evolved over time constrains the analysis of the impact of market liberalization on the food security status of households and individuals. Due to these data limitation, firm conclusions can not be honestly drawn.

In 1980, the Ministry of Agriculture estimated that on the average, a Tanzanian consumes 2,417 calories and 61.7 grams of protein per day. (Table 5). These estimates are consistant with those derived from the 1976-77 household budget survey for the rural areas. (Odegaard, 1985). The majority of the population live in rural areas and depend on agriculture, using mainly human power. The calorie requirement for agricultural work is higher than the minimum requirement. Moreover, the distribution of food consumption is not equal. Hence, there is a significant proportion of the population that does not consume a calorie-adequate diet.

Children--particularly those under five years of age--pregnant women, and lactating mothers are the most vulnerable groups in the population. Unfortunately, there are no accurate estimates of the proportion of clinical malnourished or underweight children. A survey of community studies on nutrition in 1980 indicates that up to 60% of the children had mild to severe malnutrition, characterized by being under 80% of normal weight-for-age (ILO 1982).

Recent protein energy malnutrition surveys conducted by UNICEF indicate that the problem of malnutrition is still serious (Table 6). In the Iringa Region where UNICEF implemented a nutrition education programme supported by modest feeding supplements, the percentage of total underweight children declined from 56.0% in June 1984 to 38.7% in September 1987.

In the Kagera Region where there was no feeding programme, the percentage of total underweight decreased from 49.4% in September 1985 to 39.7% in December 1987. For the Kagera and Iringa Regions we can infer that protein-energy

Table 5. Nutritional analysis of average per capita food intake, Tanzania, 1980.

Item	Grams/ day	Calories/ day	Protein (g/day)	Fats (g/day)
Cereals				
Rice (milled)	33	15	2.3	0.3
Maize	237	766	17.8	2.6
Wheat	16	46	1.3	0.1
Millet & sorghum	124	391	12.3	3.8
Other cereals	7	22	0.7	0.2
Total cereals	417	1340	34.4	7.0
Starches				
Cassava	143	382	2.5	0.1
Bananas	266	164	2.2	0.9
Other starches	70	62	1.1	0.2
Total starches	479	608	5.8	1.2
Other				
Sugar	19	67		
Pulses	51	174	11.3	0.9
Nuts	3	5	0.4	0.8
Vegetables	104	25	1.4	0.2
Fruits	61	24	0.3	0.4
Fats & Oils	8	73	8.2	
Other Food Crops	11	2		
Meat/fish products				
Meat & eggs	31	53	4.4	4.4
Fish	26	27	2.6	0.4
Milk	39	25	1.1	1.0
Total		2,417	61.7	24.5
Plant products		2,312	53.6	18.7
Animal products		105	8.1	5.8

Source: URT

Table 6. Protein-energy malnutrition (weight for age) among under fives in selected regions of Tanzania (%)[a].

Region/ district	Month/year	Total underweight	Severely underweight
Iringa	June 1984	56.0	6.4
	September 1987	38.7	1.7
Ruvuma	May 1987	53.3	7.5
	October 1987	47.7	3.8
	February 1988	50.6	5.8
Kagera	September 1985	49.4	6.5
	December 1987	39.7	4.1
Mtwara District			
	November 1987	50.6	7.0
	March 1988	44.9	5.8
Newala			
District	November 1987	63.9	10.0
	March 1988	60.7	8.5
*Masasi**	November 1987	52.4	7.4
	March 1988	59.8	11.6
Kilimanjaro			
(Hai Dist.)	October 1987	57.7	3.5
	April 1988	32.1	3.4

[a]Percent of children surveyed.
Source: UNICEF (1988).

malnutrition has tended to decrease over the past three-to-four years. In general, however, the percentage of under weightchildren is less than 60%.

Causes of malnutrition and policy interventions

The improvement in national food availability since 1984 has helped reduce the incidence of malnutrition among children in some regions. Nevertheless, the level of the remaining malnourished children is still too high, even in regions that are surplus food producers such as Ruvuma. The high incidence of malnutrition among children is partly the result of feeding habits. In most areas in the country, traditional food for weaning children is gruel made out of water and maize or cassava flour which is deficient in oils and proteins. Moreover, the frequency of feeding is low and, hence, the child does not ingest adequate calories.

Traditional customs favour male adults in the allocation of food, particularly meat. Women usually allocate only a small proportion of the good food to themselves and

their children. Thus, the battle against malnutrition must include a strong programme of nutrition education. Tanzania authorities have taken steps to expand nutrition education, including a *Radio Tanzania* mass education campaign titled *"Chakula ni Uhai"* (Food is Life). The more effective programmes have been those undertaken by UNICEF in rural areas, particularly in the Iringa Region, that included nutrition eduction and modest food supplements. To improve food security, nationwide, programme that emphasize nutrition education and the utilization of nutritious food that is locally available is necessary.

Rural households are generally self-sufficient in staple foods. The poor regions tend to depend more on subsistence production. Generally, the output mix of cereals, legumes, and oilseeds available in most regions contain the necessary nutrients, if eaten in adequate quantities, to reduce the incidence of protein-energy malnutrition. Thus, increasing food production and effective nutrition education can lead to a significant decrease in malnutrition.

Successful market liberalization will lead to more regional specialization according to comparative advantage and an increase in dependence on the market for food purchases over time. It is sometimes argued that production of cash crops may actually worsen the nutrition status of children because men control the cash and will not purchase adequate food for their families. We believe that African men are, in general, responsible parents. With nutrition education, we believe they will provide more food to their children when their real money incomes increase and food is available in local markets.

Seasonal hunger usually increase just before the harvest. Improvement in food storage by rural households will reduce food losses and improve food availability throughout the year. An improvement on the marketing system for staple foods will streamline food availability over geographical areas and time. Successful market liberalization is likely to reduce the incidence of food shortages. Where seasonal hunger is chronic and purchasing power low, the focus of policy should be on increasing food production and rural incomes to enable households to produce or purchase their own food.

In urban areas, most households purchase food from markets. As shown in our 1987 paper (Amani *et al.*, 1987), market liberalization will improve food availability and reduce parallel market prices. The official minimum wage is, however, not adequate to enable a family to purchase adequate food for a healthy and active life. Urban households could not survive and do not live on their official wages and salaries. As discussed earlier, a number of surveys of household expenditures indicate a multiple level of expenditure, compared with official income received. Moreover, in the informal sector where piece rates prevail, effective minimum wages are higher. Increasing the minimum wage is one possible policy instrument that may improve the food security of minimum wage earners. It can be effective if the increase in the mimum wage is not financed by an inflationary budget deficit that could lead to a reduction in real wages. The macroeconomic impact of an overall general wage increase in an economy, characterised by excess personnel in the public sector and a large current budget deficit, cannot be ignored. Overall government

policy should be directed at establishing an institutional setup that is conducive to increasing productive employment and labour productivity that can permit real wages to increase.

Given the level of development of Tanzania and the budget constraint, the government must largely depend on increasing food production and incomes, better functioning of food markets, and nutrition education in order to improve the nutritional status of rural and urban people. Direct interventions in the form of feeding programs should of necessity be limited to those with severe malnutrition. The health centres and dispensaries that are spread throughout the country can also serve as nutritional education centres with modest food supplement programmes.

A common nutrition programme in many countries is the provision of free school lunch, either to all students in public schools or to targeted poor areas. In Tanzania school lunch programmes in non-boarding schools depend on the ability and success of schools to grow their own food. It is not financially feasible for the central government to finance a national school lunch programme. School authorities and local governments should be encouraged to institute school lunch programmes of their own, using food produced in self-reliant projects and parents' financial contribution.

CONCLUSIONS

This paper complements our 1987 paper that discussed in detail the impact of market liberalization on food supply and availability. We have shown that rural incomes have increased since 1984 and, hence, the consumption of maize, rice, and beans has increased. The estimated increase in demand was generally met by an increases in supply.

It was difficult to estimate the change in urban consumption because formal incomes account for only a small proportion of total expenditure of wage and salary earners. More research is needed to estimate the level of real incomes of urban households and their consumption patterns.

Market liberalization since 1984 has increased the food supply and improved the efficiency of markets. The overall increase in food availability generally increased food security in both rural and urban areas. The incidence of protein-energy malnutrition, particularly among children of less than five years, is still high. An increase in food availability is a necessary but not sufficient condition for eliminating malnutrition. Furthermore, nutrition education and a change in feeding traditions are needed to increase households' food availability to eliminate malnutrition.

A nationwide nutrition survey would help to determine the incidence of malnutrition in different regions and to suggest policy interventions to improve household food security. Given budgetary constraints, a national feeding programme or guarantees of cheap food (below cost) to all is not feasible and can not be sustained. In the long run, food security can be improved if households productively earn adequate income and food markets are efficient. Feeding programmes should be limited to those with severe malnutrition.

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Appendix I. Macroeconomic factors affecting food supply in Tanzania, 1984 to 1986.

July 1984:	
Policy measure:	31% devaluation in terms of Tshs.
Problem Addressed:	Overvaluation of currency.
Impacts to date:	Contributed to a major shift of terms of trade in favour of agriculture. i) Implicit taxation on agriculture through overvaluation has been significantly reduced--raising the relative profitability of agriculture as a whole. ii) Explicit taxation on local food producers (measured as the difference between c.i.f. cost of imports at official exchange rate and official farm gate prices of local supplies was wiped out, as farm gate prices rose sharply.
Problems remaining:	i) Unification of exchange rates: official and parallel market rates. ii) Determination of real exchange rate. iii) Prices of imported goods which service the agricultural sector (such as transport equipment, fertilizer and agrochemicals) increased. This has adverse effects on agricultural production and marketing.
July 1984:	
Policy measure:	Raise producer prices of maize by 82% in nominal terms which was equivalent of 31% in real terms over 1983-84 price. For paddy, there was a 50% and 7.8% increase in nominal and real terms, respectively. Real producer price of export increased by only 1.2 percent.
Problem Addressed:	i) To correct for historical production declines and induce overall supplies. ii) Increase the share of purchase into the official channels. The main objective was to reduce food scarcities and provide for sustainable national food security.
Impacts to date:	The gap between official and the effective parallel market prices was reduced; official purchases increased, food crop almost doubled. Export crops did not increase significantly because relative prices favoured food crops.
Problems remaining:	Relative prices of exports not favourable to increase foreign exchange earnings that are required to revamp the economy, including the agricultural sector.
July 1984:	
Policy measure:	Removal of agricultural input subsidies.
Problem Addressed:	i) Reduce government expenditures on subsidies. ii) Only a handful of farmers could get such inputs.
Impacts to date:	Significant increase in food production, especially maize and rice during 1985-86 and 1986-87.
Problems remaining:	Due to increased prices of inputs, their application has declined. This may have negative long-term consequences on agricultural "modernization", especially for export crops.

July 1984:	
Policy measure:	Reduction of internal trade barriers by removing road blocks and allowing private traders to buy and transport up to 500 kgs of food crops per lot. This quality restriction was removed in March 1987.
Problem Addressed:	i) Legalize the *de facto* market system. ii) The official food market system was inefficient, thus affecting both consumers and producers.
Impacts to date:	i) Has improved access to food. ii) Interregional movement of supplies improved. iii) Private trade margins declined as a result of reduced costs which had hitherto been associated with risks from violation of controls. iv) Spatial variation of consumer prices in the open market significantly declined in the case of maize and more or less stabilized in the case of rice, despite cuts in imports.
Problems remaining:	*De jure*, private traders are not recognized; there is still some resistance from some party and government officials. Due to uncertainty there is inadequate investment in storage facilities. ii) Remote and inaccessible major food-producing regions are yet to benefit from this. Few traders buy from such areas.
July 1984:	
Policy measure:	Removal of consumer subsidies, especially on maize.
Problem Addressed:	i) Government budgetary deficit resulting from paying NMC losses. ii) The subsidy was ineffective due to consistent food shortages.
Impacts to date:	Has brought the official ex-store cost and consumer prices closer together. As a result of other policy measures outlined above, consumer prices did not increase substantially.
Problems remaining:	The financial position of National Milling Corporation continue to be precarious.
July 1984:	
Policy measure:	Partial import liberalization by allowing individuals with foreign exchange to import incentive goods and sell them at market-clearing prices.
Problem Addressed:	i) Chronic shortages of basic consumer goods in urban and rural areas. ii) Reverse capital flight which has been going on illegally for many years.
Impacts to date:	Supply of incentives goods increased significantly; time-consuming queues for scarce commodities have disappeared, and the use of permits for acquisition of commodities, hitherto in severe scarcity, is no longer practiced.
Problems remaining:	The exchange rate applicable to official exports was not affected by liberalization measures. Thus, two exchange rate systems were introduced with different exchange rates for imports and exports. Exports continue to be penalized since they had to sell cheap and buy dear from importers.

July 1986:	
Policy measure:	Exchange rate adjustment via crawling peg system.
Problem Addressed:	i) To further correct for overvaluation of the Tshs and remove bias against export crops. ii) To reduce losses of marketing boards and cooperatives that purchase and export agricultural products.
Impacts to date:	The producer price of export crops has risen, thus remove the bias against such crops caused by partial import liberalisation measure outlined above.
Problems remaining:	i) The question at hand is how to allocate the windfall income of the devaluation between producers and marketing institutions. ii) Further increases in prices of imported goods means higher costs of production and marketing.
July 1986:	
Policy measure:	Increase of producer prices by 5% in real terms annually or setting them at a level equivalent to 60-70% of FOB prices, whichever is higher. Increase in producer price of major staples.
Problem Addressed:	Adjustment of producer prices to counter the impact of inflation.
Impacts to date:	The sale price of export crops, has risen and has led to substantial increase in the production of annual export crops, particularly cotton, and to a lesser extent tobacco. ii) Increase in official purchases of major staples, particularly maize and paddy.
Problems remaining:	i) How to reconcile real increases in the producer prices with limiting increases in consumer prices in official channel. ii) Financial problems of cooperatives because of high operating costs. iii) Transportation of these crops is now a major bottleneck.
July 1986:	
Policy measure:	Reduction in price controls.
Problem Addressed:	Rationalize the internal trade in order to unify and parallel markets of both food staple and manufactured goods.
Impacts to date:	Increase in availability of goods in open markets at prices reflecting supply and demand.
Problems remaining:	High prices of goods in parallel markets. Reinstitution of price controls is politically attractive.

THE IMPACT OF MARKET REFORMS ON HOUSEHOLD FOOD SECURITY IN RURAL MALAWI

Ben M. Kaluwa and Benson F. Kandoole[1]

INTRODUCTION

Malawi is a landlocked country with a land area of 94,276 sq. km and a population of 8 million in 1987. Among Sub-Saharan African countries, its population density of 59 persons/km^2 which is only surpassed by Rwanda, Burundi, Nigeria, and Uganda. Nearly 90% of the population is rural based, relying heavily on agriculture. This sector dominates the economy, producing 37% of the GDP and accounting for 90% of the export earnings. In addition to a lack of significant mineral deposits, these factors make Malawi a poor country in which access to arable land, its utilization, and convinient seaports are critical issues for smallholder production, income, and international trade. Moreover, the small tax base which has resulted in low government revenues has seriously constrained efforts to improve either the economic or social indicators of development such as life expectancy (45 years), infant mortality (153 per 1,000 population), nutritional status, primary school enrollment rate (62%), and per capita energy consumption 43 kg of oil equivalent (World Bank, 1988).

For over a decade after independence, the Malawian econony experienced rapid growth. This was largely due to the realistic policies of government which encouraged export-oriented agricultural production, the favourable economic environment which attracted foreign capital and enterprise, the confining of parastatals to a few key sectors, low tariffs, and minimal use of quantitative restrictions on imports (which discouraged uneconomic import substitution), and a policy of wage restraint which helped to keep Malawian goods competitive on the international arena. This relatively healthy economic situation was interrupted in 1979. A combination of drought, deteriorating terms of trade, disruptions of Malawi's external transport routes, a sharp decline in public sector investment and high international interest rates, radically changed the position. Investment fell sharply and estimated GDP growth averaged only 0.1% per year between 1979 and 1983. The current account deficit also widened to almost 24% of GDP during 1979 to 1988 and with declining capital inflows the bulk of this had to be covered by foreign borrowing and by running down reserves. By 1980, the debt service ratio was about 20% (Malawi Government, 1988). The key economic indicators are summarises in Table 1.

The external and internal shocks of this period had serious consequences on both the macroeconomy and on the poor who form a major segiment of the population.

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Table 1. Key economic indicators, Malawi, 1977-1988.

Indicator	Unit	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
GDP growth rate	%	4.3	8.3	3.3	-.4	-5.2	2.7	3.6	4.4	4.3	2.6	-.2	1.2
Trade balance/GDP	%	2.1	-8.6	-8.6	-2.9	2.5	3.9	2.8	12.8	7.2	9.6	7.4	5.7
Current account deficit/GDP	%	7.1	17.8	24.7	22.2	11.4	11.2	12.4	1.3	9.6	6.2	5.1	5.5
Overall trade deficit/GDP	%	-4.8	2.5	8.6	.7	3.3	5.6	9.0	3.4	6.3	.3	-1.2	na
Government revenue/GDP	%	15.7	16.0	18.6	21.6	19.8	19.9	19.6	19.9	20.7	21.9	16.8	15.3
Total expenditure/GDP	%	23.3	24.5	31.0	33.1	35.7	35.5	30.9	30.2	29.5	30.7	27.1	23.6
Recurrent/GDP	%	14.2	14.0	16.8	15.8	18.3	20.9	21.0	20.2	21.4	21.4	19.1	16.7
Development/GDP	%	9.1	10.5	14.2	14.8	17.4	11.2	9.9	10.0	8.1	8.1	6.5	5.7
Overall deficit/GDP	%	7.6	8.5	12.4	11.5	15.9	15.6	11.3	10.3	8.8	8.8	10.3	8.3
Domestic savings/GDP	%	20.1	20.5	12.1	16.5	12.5	15.9	16.0	16.5	10.2	13.2	9.8	8.3
Gross capital formation/GDP	%	22.2	30.7	27.9	23.8	16.0	15.4	14.4	13.1	14.2	15.1	11.3	11.0
GDP per capita	kw	124.4	130.7	131.0	126.4	116.3	116.5	116.2	117.8	119.1	118.2	114.8	113.3
Commodity terms of trade	index	na	na	na	100.0	121.6	123.4	113.2	118.1	100.8	87.8	91.2	88.0
Income terms of trade	index	na	na	na	100.0	96.4	101.7	123.7	93.7	93.7	86.8	93.1	86.0

na indicates data not available
Source: Kandoole (1988)

When it became clear that the changed economic conditions were not transitory, the government in consultation with the World Bank and IMF formulated a programme for dealing with the structural problems. The programme was supported by a series of structural adjustment loans (SALs) from the World Bank. The first SAL was introduced in June 1981 for US$45 million which was followed by another in January 1984 for US$55 million and the third SAL was approved in December 1985. The main objectives of the programme were to reduce the balance of payments deficit; reduce government's fiscal burden; improve the financial performance of public enterprises; reduce energy costs; improve efficiency and resource allocation in agriculture and industry; and ensure transport link to coastal ports. To achieve these objectives, the government implemented the programme using various instruments. Under SAL I, the government increased agricultural prices and some utility tariffs; an investment coordinating committee to oversee all the major investments was established; key planning and budgetory ministries were strengthened; price decontrol measures were undertaken; tax rates were adjusted to mobilize more revenues; efforts were also made to reduce the domestic public debt; and the ability to control external debt was strengthened.

The second phase of the programme continued the adjustment which began under SAL I, but some new areas were introduced. These include reducing subsidies in university education and agriculture; improving the efficiency in the operation of the Agricultural Marketing Board, (ADMARC); and establishing an estate credit facility. SAL III was built on policy reforms and measures initiated under the earlier two programmes. The specific sectoral policies and measures which were addressed by government were as follows. In agriculture, the policy of increased production and export diversification--as well as maintaining the goal of food self-sufficiency through the provision of smallholder producer price incentives and the establishment of a credit facility for the estate subsector--were continued. In addition, the elimination of fertilizer subsidy removal was an issue. In industry, efficiency had to be encouraged and the overall policy environment broadened with a view to enhance

growth through the completion of price decontrol programme and the review of the *Industrial Development Act*. On transport, a feasibility study on the Northern Corridor Transport Project was undertaken with a view of complementing the government's policy of diversifying access routes to the sea. The government also maintained an active exchange rate policy in concert with appropriate fiscal and monetary policies and pursued a flexible foreign exchange allocation system. To achieve the goal of export promotion and diversification, an export promotion policy package and an export credit facility were designed. These measures are summarized in Appendix I.

The adjustment programme has been successful on the macro level. The current account deficit has fallen 24.7% of GDP in 1979 to 5.5% in 1988. The trade balance has also improved due to a reduction in the volume of imports, as a result of the eight devaluations since 1982 and high tariffs which have been introduced during the decade. The volume of exports, except for the decline in 1981 and 1982 because of unfavourable weather conditions, has maintained its 1980 level. The net effect has been that commodity terms of trade have declined by 12.2% and income terms of trade by 13.2% between 1980 and 1986. (Table 1).

The huge deficits in the public sector created a need to mobilise domestic revenue and control public expenditure. On the revenue side, this was attempted through broadening the tax base, especially for the sales taxes; increases in tax rates; elimination of family allowances on personal income; changing from per unit to an *ad varelom* tax base and combining the levy, duty, and surcharge in case of tariffs. When these measures were taken, revenue increased rapidly but receipts and revenue declined from 21.6% of GDP in 1980 to 19.6% in 1983. In response to the economic recovery, revenue went up to 21.4% in 1986 but the estimate for 1987 and the forecast for 1988 show a major drop (Table 1).

One of the conditions of the structural adjustment loan was for the government to reduce expenditure, especially on the development account. This has been done; and total expenditures, after reaching its peak in 1981, have been declining ever since. This decline is primarily due to major cuts in development expenditures which have decreased from 17.4% of GDP in 1981 to 5.7% in 1988; while the change in recurrent expenditure has not been as dramatic (Table 1).

The fiscal problems were further aggrevated by the financial deterioration in the parastatals. The companies have not been able to service their debts; and the government, which guaranteed their foreign debts, has incurred substantial expenses to meet the interest and amortization charges for the statutory bodies. The restructuring of these companies has been rewarding in that some of them are now financially self-sufficient. All these factors led to the decline in the fiscal budget deficit from 15.9% of GDP in 1981 to 8.3% in 1988 (Table 1).

After enjoying favourable rates of economic growth in the 1970s, the economy had some problems in the early 1980s for reasons already cited. GDP at constant prices fell in both 1980 and 1981 before recovering to a 2.7% growth in 1982 and 4.4% in 1984 before the slight decline in 1987. Domestic demand contracted and while consumption took up some of the contraction, investment bore the major portion. Gross fixed capital formation has averaged about 14% in the 1980s

compared to 24% in the 1970s. Savings rates have been lower than before, ranging from 20.5% in 1978 to 11% in 1988. This probably is due to the increases in tax rates (Table 1).

During the 1970s virtually all sectors expanded rapidly. The leading sectors were services and estate agriculture. There was a general decline in 1981 and 1982, but most sectors experienced improvements since 1983 (Table 2). Despite this recovery, the growth has not kept pace with population since real per capita income has been falling during the period. This popular indicator of a country's welfare suggests that the programme has a negative short-run effect on the well being of the society because of the declining per capita income.

THE AGRICULTURAL SECTOR

The agriculture sector comprises two subsectors with distinct characteristics: smallholder agriculture which contributed 78.9% of total agricultural production in 1986 and the estate subsector which produced the balance. The two subsectors differ with respect to all important aspects of agricultural production; namely land tenure, average holding size, crop mix, technology, marketing, and the delivery of economic services. It is useful to understand these distinctions in order to appreciate the reasons for some of the policy responses. Smallholder production is on customary land which amounted to 7.4 million ha in 1985. The power of allocation is vested in the village headman and the right to occupy depends on acceptance in the community. The transfer of land, under this tenure system, is guided by the customary rules of inheritance. The estate agriculture, by contrast, is titled land which is either freehold or leasehold (with leases ranging from 22 to 99 years). In 1985, these categories accounted for 52,016 and 308,413 ha respectively. This represents a fall from 232,557 ha for freehold in 1975 and a rise for the leasehold from 10,189 ha in the same year. The net rise under the two categories shows the rapid expansion of the estate sector which was encouraged by government. For

Table 2. Growth in rural sectoral output (%), Malawi, 1977-1988[a]

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Agriculture	11.2	2.9	3.1	6.5	-8.2	6.4	4.4	5.4	1.1	0.1	1.9	0.8
Small-scale	9.5	3.1	2.6	-8.5	-8.9	2.5	3.7	7.2	1.2	0.4	0.5	-.4
Large-scale	20.6	2.3	5.6	3.3	4.9	22.4	7.1	0.8	0.6	-1.1	7.2	5.0
Manufacturing	2.9	5.3	4.4	0.3	3.6	-0.3	7.1	2.5	0.5	5.3	-0.8	1.9
Electricity & water	5.0	17.8	0.3	5.0	-11.0	-2.1	2.5	5.6	9.4	3.4	1.7	0.5
Construction	10.4	28.0	-7.6	1.9	-17.5	0.6	-8.6	-10.3	32.8	4.6	-26.1	3.6
Transport & communications	-12.3	11.5	15.2	1.6	-7.3	-2.7	-2.5	2.2	4.9	3.7	-4.0	0.6
Financial & professional services	11.8	14.6	16.9	2.8	-7.9	2.3	2.9	1.6	7.2	2.4	-2.9	2.0
Ownership of dwellings	8.4	8.5	7.5	2.9	-1.5	2.8	3.0	2.4	4.6	3.0	0.5	2.6
Government services	4.6	5.0	7.6	8.4	6.3	5.5	4.9	10.3	3.2	8.5	4.1	-.3
Private, social, community services	-2.3	3.5	4.5	3.6	5.2	1.3	6.8	3.6	3.8	2.0	3.0	3.5
GDP (factor cost)	4.3	8.3	3.3	-0.4	-5.2	2.7	3.6	4.4	4.3	2.6	-.2	1.2

[a]Year end, 31st March.

Source: Kandoole (1988).

example, the number of leases for tobacco were increased from 111 in 1967 to 1,190 in 1986.

The implication of the expansion of the estate sector, relative to the smallholder sector, is that it has been associated with a decline in the land available under the customary land tenure system from 8.8 million ha in 1964 to 7.4 million ha in 1985. Although the government has acquired some of the freehold land, a small part of it has been allocated to smallholders and the balance to forest reserves or national parks (1.1 million ha) and statutory bodies such as ADMARC. The Southern Region has been the worst affected since it suffered the worst alienation of land during the colonial period where, due to accessibility and good climatic conditions, a number of European acquired large tracks of land early in the century. This trend in land acquisition is also being experienced in the Central Region where there has been a rapid rise in leases for tobacco estates, thereby increasing the pressure for land.

The estate sector is oriented towards the major export crops (flue-cured and burley tobacco, tea, and sugar). This sector accounts for two-thirds of all exports. Smallholders meet the country's food requirements of maize, beans, groundnuts, root crops, and rice. They also produce the bulk of cotton and sun- and fire-cured tobacco varieties which are for both the domestic industry and for export. Technologically, the dualism between the estates and the smallholders is also evident. There is much higher level of mechanisation in the estate sector, as the small holder sector is constrained by holding size and access to capital. For example, in the 1984-85 growing season, only 7% of smallholders used work oxen for land preparation and 70% of them were concentrated in only two of the eight Agricultural Development Divisions (Karonga and Mzuzu). Despite this labour intensity, smallholder agriculture could still be productive if high levels of appropriate seasonal inputs were used. But here again, usage is very low. For example, only about 22% of the farm operators apply fertilizer. Lack of credit is only one of the factors to blame for this as in 1984-85 only 42% of those using fertilizer obtained it through credit.

Estate farmers make their own marketing arrangements. Since they produce the export crops, they are therefore in a position to benefit from the eight currency devaluations instituted under the structural adjustment programme. Smallholders, on the other hand, market their crops through ADMARC which has the discretion of determining the difference between its earnings from the crop sales and its payouts to farmers. For example, for the two varieties of tobacco, Northern Division Dark Fired and Southern Division Dark Fired, farmers recieved the highest shares of the auction floor prices in the 1984-85; 68 and 87%, respectively. Before and after that year, the shares were much lower. For example, in 1981-82 they were 15 and 17%, respectively, while in 1986-87 they were 19 and 30%. These high margins ADMARC realized from the marketing of smallholder tobacco have enabled it to finance its operations in the loss-making marketing activities such as its dealings in maize. For the food crops, however, the smallholder farmers can exercise some discretion about the marketing channel they use. Private traders and district and local parallel markets often offer higher prices than ADMARC, particularly for high-valued crops like beans, peas, and rice. But for farmers located in remote areas

in which private traders are unwilling to operate, ADMARC may be the only liable choice.

The only form of direct economic service that government has provided the estate sector has been the policy which has actively supported commercial bank loans to the sector, particularly for tobacco farming. For the smallholder, government has supplied or supported economic services by providing free seed, subsidized seed and fertilizer, and some credit at concessional rates of interest. ADMARC has provided free tobacco and cotton seed to maintain product quality.

THE CHARACTERISTICS OF THE VULNERABLE GROUPS

The foregoing discussion described the customary land tenure system and has also given an indication of the pressure for land brought about by population increases and by the alienation of land for estate expansion. It is not surprising that government has alredy identified the land constraint as the major determinant of poverty with its associated socioeconomic indicators--early food stock depletion child malnutrition, and low levels of income (Malawi Government, 1988).

The government classifies the smallholders according to holding size as follows. Those with less than 0.7 ha, 35% of the smallholders, who are unable to satify their subsistence requirements and are dependent on off-farm income; a further 40% with holding sizes between 0.7 ha and 1.5 ha who are able to satisfy subsistence requirements and have modest marketable surpluses; and the remaining 25% who have larger holdings and grow cash crops in addition to the food crops. However, our own calculations show that the percentage of households who are unable to satisfy their subsistence requirements from own production is much higher (55.3%). Table 3 indicates that the most vulnerable group (holding size of less than 1 ha) account for 55% of all households, but own just over a quarter of the total cultivated area; while the large farmers, who own over 3 ha and account for 4.2% of households, controls 15% of the cultivated land. The mean holding sizes range from 0.31 ha to 4.00 ha and the mean family size increases with the size of the landholding. The positive correlation between holding size and family size may be attributed to the fact that the most vulnerable households have food insecurity with its associated poverty and hunger and, hence, are unable to protect their children from malnutrition and diseases.

Despite the small average family size, households with a small land base tend to have more surplus labour than the larger households because of the land constraint. Therefore, these households must depend to a large extent on off-farm activities. If this group is to remain on their holdings, it is clear that off-farm income must be generated in rural areas. In fact, the amount of hired labour increases with the size of holding, implying that the unused labour balances are hired by the bigger farmers, usually on a seasonal basis.

The landholding distribution pattern is associated with four other important factors; namely, the gender of the household head, regional setting, cropping

Table 3. Distribution of smallholder farm size and related indicators, Malawi, 1984-85.

Holding size category	Basic data: % of all holdings	Basic data: Cum (%)	Basic data: Total cult. area (%)	Basic data: Mean holding size (ha)	Basic data: Mean H/H size	Labour: HH[a] labour capacity (mandays) Hired	Labour: HH[a] labour capacity (mandays) Total	Labour: Off-farm[b]	Labour: Unused labour (% of total)	Gross HH income (kw)	Extension participation rate: Operators (%)	Extension participation rate: Average participation per operators (days)	Fertilizer use (kg/HH)	Calorie balance (%)
< 0.50	23.0	23	6.2	0.3	3.6	8	389	106	58	91	13	2.7	6	-66
0.50-0.99	32.3	55	20.9	0.7	4.4	12	492	105	53	165	18	3.1	12	-28
1.00-1.49	19.9	75	21.3	1.2	4.9	20	589	99	47	263	28	4.6	33	12
1.50-1.99	10.9	86	16.3	1.7	5.1	25	618	105	32	343	41	5.1	59	55
2.00-2.49	6.3	92	12.2	2.2	5.7	42	754	100	32	460	39	4.8	87	95
2.50-2.99	3.5	96	8.3	2.7	6.1	58	821	97	24	549	52	5.5	114	120
>3.00	4.2	100	14.8	4.0	6.4	94	915	93	0	805	47	5.9	146	232

[a] Family labour is positively correlated with mean household size which rises with holding size category.
[b] Mainly a result of agricultural labour balance computed as total available mandays less total required mandays.
Source: Ministry of Agriculture (1984-85).

patterns, income levels and their sources, and food balances from own production. Information from a 1981-82 survey indicates that 47% of male-headed households have holdings of less than 1 ha, compared to 69% of the female-headed households. Regionally, the distribution of those with holding sizes of less than 1 ha reflects the relative population pressure in the three regions of the country. For example, in 1984-85 growing season, this subgroup represented as much as 65% of smallholder farmers in the Southern Region, 44% in the Central Region, and only 12% in the Northern Region. The respective population densities of the three regions, according to the 1987 population census, are 125, 88, and 34 persons/km^2, respectively. Clearly, the incidence of land constraint or near landless is most critical in the Southern Region and to a lesser extent in the Central Region.

As implied in the above categorization of household economic characteristics by holding size, there are bound to be differences in cropping patterns determined by the extent of the land constraint. The most prominent feature of these differences relate to the relative importance attached to various food and cash crops. The proportion of land area devoted to the maize crop is over 60% for the bottom two categories, falling to 43% for the largest holding-size category (Table 4). The same pattern is observed for the other important food crops, such as root crops and pulses. When it comes to cash crops (cotton and tobacco), the pattern is reversed with higher percentages accounted for by the larger holdings. The same trend applies to hybrid maize varieties and groundnuts, which are also regarded as cash crops. These patterns are explained mainly by the fact that since households with small holdings are risk averse, they tend to emphasize measures that contribute to their food security. Apart from this, they also have access to fewer resources, including land, to devote to cash crops. This implies that it is unlikely that the land constrained are going to be a good target for that crop diversification. Also, not only is the range of relative prices relevant to them as producers, but furthermore it is

Table 4. Percentage cropping pattern by holding size category, Malawi, 1984-85.

Holding size category (hectares)	Maize				Rice	Millet	Sorghum	Roots	G/nuts	Pulses	Sugar	Cotton	Coffee /tea	Tobacco[b]
	Local	Gom-posite	Hy-brid	(Total)[a]										
< 0.50	61.6	1.2	0.6	(81.5)	2.4	2.3	2.9	10.5	4.3	10.6	0.7	2.3	0.1	0.3
0.50-0.99	61.3	0.8	1.3	(83.7)	1.8	3.6	4.1	2.1	4.9	11.0	0.3	2.4	0.2	1.1
1.00-1.49	59.7	1.7	3.4	(82.3)	1.4	3.5	3.4	5.2	8.1	8.3	0.1	3.0	0.1	2.3
1.50-1.99	56.8	0.6	5.3	(74.7)	1.1	2.8	3.3	5.3	8.0	8.7	0.3	4.0	na	3.7
2.00-2.49	51.8	2.5	8.4	(77.3)	1.7	3.3	3.0	3.8	8.9	9.2	0.2	2.4	na	4.1
2.50-2.99	46.6	2.1	10.3	(69.8)	1.0	3.4	2.8	5.1	9.8	9.6	0.3	3.8	na	5.2
> 3.00	43.5	3.0	15.5	(70.6)	0.8	3.8	1.1	3.7	11.8	7.7	na	3.9	na	5.2
Total	52.2	1.6	5.1	(77.9)	1.4	3.3	3.1	5.5	8.0	9.2	0.2	3.2	0.1	3.1

[a] Includes groundnuts, pulses, roots, and other on mixed stands.
[b] The most important variety is dark-fired which accounts for 2.5 of the 3.1%, followed by sun-aired accounting for 0.5, and oriental/other accounting for the remaining 0.1%.
na indicates data not avaliable
Source: Ministry of Agriculture (1984-85).

unlikely they are going to be very responsive to changes.

When it comes to average household income, the major source for all groupings is agriculture. But the near landless rely more on other sources than the other farmers. This shows the importance of holding size in alleviating poverty. It also shows how important the off-farm activities are to the very poor with little land and more surplus labour which the larger farmers and the estates could easily exploit. But, with appropriate policies, off-farm activities could be used as a means of improving the living standards of the very poor. Those with larger landholdings rely heavily on agriculture as the main source of income, with emphasis on cash crops such as hybrid maize, groundnuts, cotton and tobacco. Low mean holding size, low income, inadequate use of inputs such as fertilizer, and surplus labour make the land-constrained and near-landless smallholder food insecure. As Table 3 shows, the farmers with less than 1.0 ha cannot satisfy their subsistence requirements from their own food production.

THE EFFECTS OF MARKET REFORMS ON SMALLHOLDER FARMER

The previous section identified land-constrained or near-landless smallholder farmers as the most valnerable groups; and that female-headed household and those in the Southern Region have high percentages of households within the at-risk group. The vulnerable groups are also associated with low income levels; high concentration of production in food crops; high labour surpluses; little access to capital, credit, and extension services; and high levels of food deficiencies. The first section discussed market reforms implemented in Malawi since the early 1980s; including price incentives, fertilizer subsidy removal, enhancement of the role of private traders, and

a review of the country's land tenure system. This section analyses the affects of some of these reforms on smallholder farmers.

Relative prices

Because of the stagnation in smallholder production, increasing food insecurity, and the need to diversify exports, the government increased the prices of agricultural produce in 1981-82 as an incentive for smallholders to produce more. For maize, the increase was about 68%. Table 5 shows that with that increase in the price, production did not change but the proportion of maize sold to ADMARC increased from 11 to 20% in one year. Between 1976-77 and 1986-87, maize production declined by 9% despite the 14.4% increase in the price of maize. The decline in per capita output, while sales to ADMARC have been rising, implies that the output left for home consumption has been falling. The falling production of maize is a result of a change in the relative producer price structure which was in favour of other crops and against maize.

The declining relative price of maize before 1987-88 has reduced margins from the crop, which is also the most fertilizer intensive and therefore was the most affected by fertilizer subsidy reductions. This induced farmers to allocate land to other crops such as groundnuts, which compete for land with maize. In the five years before 1986-87, the hectarage planted to maize had been fluctuating while groundnuts increased from 143,000 ha to 203,700 ha over the same period in response to increasing prices, relative to maize (Table 6). Because smallholders tend

Table 5. Smallholder maize production and sales to ADMARC, Malawi, 1976-77 to 1987-88.

Crop year	Output (mt)	ADMARC purchases ('000 mt)	Sales as % of output	Index of per capita output	Producer price (Kw/mt)
1976-77	1.32	89.9	6.8	100.0	50
1977-78	1.43	120.6	8.4	104.7	50
1978-79	1.39	82.2	5.9	99.0	50
1979-80	1.20	91.9	7.7	82.5	66
1980-81	1.24	136.6	11.0	82.6	66
1981-82	1.24	246.1	19.8	80.5	111
1982-83	1.37	244.9	17.9	85.8	111
1983-84	1.40	296.6	21.2	84.9	122
1984-85	1.36	272.7	20.0	79.7	122
1985-86	1.30	111.3	8.6	73.8	122
1986-87	1.20	60.0	5.0	66.4	122
1987-88	1.42	110.0	7.0	76.2	166

Source: ADMARC (various years).

Table 6. Smallholder groundnuts production and sales to ADMARC, Malawi, 1981-82 to 1987-88.

Croping year	Output ('000 mt)	ADMARC purchases ('000 mt)	Percent sold to ADMARC	Producer price (t/kg)
1981-82	na	19.49	na	33.84
1982-83	50.99	10.68	21	51.85
1983-84	50.72	10.22	20	59.46
1984-85	59.48	9.98	20	69.28
1985-86	82.81	17.51	21	73.76
1986-87	87.91	51.34	58	73.76
1987-88	70.67	42.87	61	73.76

na indicates data not available.
Source: Ministry of Agriculture

to be risk averse, the majority are unlikely to have benefitted directly from the official relative producer prices that favoured cash crops. However, there are a number of other ways in which they could have benefitted.

First, apart from keeping ADMARC's purchasing costs low, the stagnation of maize producer prices had also arisen from a desire to keep maize consumer prices low for deficit producers and other low-income consumers.

Second, both maize surplus and deficit households using ADMARC are subsidized by cash crop-growing households, particularly those growing tobacco. This is because ADMARC's trading in the bulky crops such as maize incurs high costs and subsequent losses, which are at least partly offset by the rather high proportion of auction floor tobacco prices that it retains (Table 7).

The land-constrained households favour the local maize variety for its qualities, which include little dependence on fertilizers--unlike the hybrid varieties which tend to be grown as a cash crops by those with larger holdings.

There are other indications that the past gains of the food deficit households are likely to be reversed, due to policy changes associated with the market reforms and national food security considerations. The 1987-88 maize producer prices increases are only the beginning of a trend to ensure enough maize production for sufficient current consumption and for replenishing the strategic reserve stocks, which have been near zero for several years. For those relying on purchases from ADMARC (because of accessibility of ADMARC markets and lower prices), higher producer prices will be matched by higher consumer prices.

Table 7. Smallholder tobacco production and its prices, Malawi, 1981-82 to 1987-88.

Crop year	Output ('000 mt)	Producer price (t/kg)	Auction price (t/kg)	Producer price % share
1981-82	6.52	52.08	343.69	15.15
1982-83	7.62	75.64	287.54	26.31
1983-84	15.50	83.74	215.37	38.88
1984-85	16.18	102.03	150.73	67.69
1985-86	13.18	101.52	224.87	45.15
1986-87	11.87	105.52	344.67	29.45
1987-88	7.68	109.64	344.67	29.45

Source: Ministry of Agriculture

Institutional changes

Net operating losses by ADMARC have amounted to Kw 31 million between 1980-81 and 1986-87. The resulting pressure on the central government deficit has led to measures to institute structural changes, including the licencing of private traders to share the burden. But there are two reasons why these measures are unlikely to benefit the target group of smallholders.

First, the target group has little to sell--either to ADMARC or to the private traders. Second, private traders are highly sensitive to costs and are unlikely to penetrate into the remote areas or deal in bulky low-value produce. For example, figures compiled by Quinten and Sterkenburg (1975) on major markets throughout the country indicate that private traders who have always operated in the country, even before the marketing liberalisation, had completely ignored the Northern Region and remote districts in other regions. This means that any attempt to withdraw ADMARC's operations from remote areas to reduce the persistent losses will not only adversely affect agricultural production, but will also affect the access to basic needs by food deficit households in deficit areas.

Exchange rate devaluations

The effect of the series of exchange rate devaluation on agriculture has been to reduce the negative effects of the deteriorating external terms of trade which is currently the general experience for African countries. For example, for smallholder tobacco producers the average price to growers has been rising steadily from 1981 to 1985 for the major variety grown (Northern Division Dark Fired), despite ADMARC's marketing intervention. Prices for flue-cured and burley tobacco grown on the estates also trended upwards. These developments had two effects on the target groups.

First, pressure has been increasing on customary land from the expansion of estates with government encouragement for balance of payments considerations. The pressure of such expansion in an already land-constrained country has resulted in the reallocation of land among different land ownership arrangements. Land under the customary land tenure system declined from 7.6 million ha in 1974 to 7.4 million ha in 1985 (National Statistical Office, 1987).

Second, rising producer prices for export crops has resulted in an increase in hectarage under these crops. For tobacco, total area went up from 66,900 ha in 1982, to 101,800 ha in 1985. Much of this increase was in the smallholder sector where the hectarage under the fire-cured varieties doubled from 22,700 ha to 45,900 ha. (National Statistical Office, 1987).

Paid employment in private sector agriculture went up from 135,000 in 1982 to 165,000 in 1985. Much of the increase (17,000) was in tobacco growing and the rest accounted for by tea growing and other. Much of the labour provided by rural-rural migrants rather than urban-rural migrants, which is an uncommon phenomenon. Apart from formal employment, there is also evidence that the smallholder sector itself absorbs a considerable amount of its own surplus labour, but much of this occurs during peak labour demand periods (Chipeta, 1983). The arrangements range from reciprocal labour to formal employment, particularly by those with larger holdings who tend to be the cash crop growers.

Nonagricultural price liberalisation

With the liberalisation of prices in the manufacturing sector, these prices have responded to the escalating costs of imports due to devaluations. This has resulted in declines in both real incomes and real consumption. For those in the target group who take up paid employment in the agricultural sector, the decline in real wages may have contributed to the expansion of employment there (Table 8).

Table 8. Real wages in private sector agriculture, Malawi, 1979 to 1985.

	1979	1980	1981	1982	1983	1984	1985
Aver. annual earn. (nominal)	144	163	199	229	214	236	265
GDP deflator (1980=100)	85.0	100.0	116.3	127.2	141.8	161.4	172.8
Real earnings to employers[a]	171	163	171	180	151	146	153
CPI (food costs)	80.1	100.0	109.8	114.6	132.3	153.1	167.1
Real earning to employees[b]	181	163	181	200	162	154	1599

[a]Average annual earnings deflated by the GDP deflation

[b]Average annual earnings deflated by the consumer price index. The food costs index was used on the assumption that low income wage earners spend a high proportion of their incomes on food.

Source: National Statistical Office (various years) and IMF (1986).

Both the real wages faced by employers and employees declined in the two years after 1982. In 1985 both real wages rose, but not high enough to match those of pre-1982. Thus, employers were still better off while the employees were still worse off, compared to the pre-1982 period. Although the latter include some of those who had sought paid employment to escape from the food constraints associated with small land holdings, the inflationary tendencies (partly due to rising crop prices) has, to some extent, ensured the persistence of the problem. The extent to which their real earnings fail to cover their food requirements is not known and is an area that needs further investigation.

Other effects

As part of the structural adjustment programe, government has sought to reduce, if not completely eliminate, the central government deficit. But it appears that the Malawi government, with support from foreign donors, is committed to both expanding agricultural services (including credit and physical infrastructure) and safeguarding human capital (Malawi Government, 1988). However, central government has reduced personnel in health and education, and agriculture from the record levels of 1981--16,332 and 31,819 in 1981 to 15,626 and 11,861 in 1985, respectively) (NSO, 1987).

POLICY IMPLICATIONS

The severely land-constrained smallholders are associated with low income levels, high dependence on food crop production, high labour surpluses, disadvantaged access to credit and extension services, and food deficiency. As producers, these characteristics have restricted the participation of the vulnerable subgroup in the market reform measures by restricting their ability to respond fully to changes in relative prices. As consumers, particularly to supplement their food requirements, the marketing structure (especially the role of ADMARC as a residual trader in food crops with lower producer and consumer prices) has benefited them. But this has been greatly facilitated by ADMARC's implicit taxes on those with larger holdings and who are the main cash crop growers, plus increasing subventions by the central government. However, these policies will have fundamental negative effects on the welfare of the target groups.

While the liberalised exchange rate policy has contributed to the expansion of paid employment opportunities in the rural areas, given the land constraint these effects can only be sustained through intensive cultivation on existing estates and a greater effort to induce export crop diversification to spread the impact of adverse external terms of trade. Also, the expansion of paid employment--notwithstanding other measures that have been part of the market reforms, *e.g.*, general liberalisation of prices--have led to reductions in real wages to the paid workers.

With these effects, the government faces hard choices in identifying policy measures that will be sympathetic to the sizeable group of deprived persons and, at the same time, be consistent with the general thrust of market liberalisation, particularly reducing the size of the government sector. Three areas stand out for

consideration, assuming that the chosen direction in the economic system is irreversible. These are in land reform, agricultural marketing structure, and economic support services.

In land reform, the government has already taken the initiative by recommending a freeze on the expansion of the estates sector in densely-populated areas (Malawi Government, 1988). But given rising population pressure in those areas, this measure is inadequate. Urgent steps should be made to facilitate resettlement, particularly in those areas of the Northern Region and Central Region which are presently less densely populated. A start could be made by resettling those unemployed but who have ventured away from their home districts in search of agricultural wage employment. A complementary measure would be to ensure stability of tenure and provide land for subsistence agriculture as necessary conditions for paid agricultural employment.

The government should be more assertive in not only promoting private traders in the remote areas, but also by providing strong incentives and technical assistance. The base of international/interregional trade could usefully be decentralised to allow traders in remote areas near bordering countries to exercise greater discretion about the direction of their operations.

Economic support services, which the government intends to strengthen, might usefully diversify from the current agricultural extension services which tend to concentrate on cash crops and the farmers with larger landholdings. Livestock development, especially for small ruminants for densely populated areas, could receive more attention as cash-generating activities. Apart from this, business/craft extension should also be tried, with the better-off farmers as a target group of potential investors and entrepreneurs. Lastly, concerted effort should be directed towards faster diversification in smallholder crops.

CONCLUSION

The present study has identified the land constraint as being at the root of much of the deprivation that exists among Malawi's smallholder farmers, but the problem is being compounded by the effects of market reform, especially price liberalisation (including agricultural and nonagricultural prices). Although the choices for reforms sympathetic to the target group seem to be limited, given the measures already being implemented, further worthwhile steps could still be taken. These include more serious consideration of resettlement schemes, support for private traders to operate in rural remote areas, and a more comprehensive approach to rural extension to include nontraditional areas such as livestock development, business/craft development, and crop diversification.

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Appendix 1. Summary of reform programmes, Malawi, 1981-1988.

Smallholder Agricultural Sector

Policy measure: a) Price incentives.
Problem addressed:
- o Stagnation of production and worsening of food security situation.
- o Increase export diversity.

Programme: SAL I-III
Comments: Annual large producer price increases started in 1981, followed by improvements in ADMARC's purchases.

Policy measure: b) Elimination of fertilizer subsidy
Problem addressed:
- o Insufficient fertilizer usage.
- o Reduce budgetary deficit.

Programme: SAL II-III
Comments: Four-year subsidy phase out programme 1985-86 to 1988-89.

Policy measure: c) Expansion of credit and extension services.
Problem addressed:
- o Inadequate Credit and low adoption rates of high yielding crop varieties.

Policy measure: d) Enhance the role of private traders.
Problem addressed: Financial and operational inefficiency of ADMARC.
Programme: SAL I-III
Comments: ADMARC's restructuring and divestiture started in 1982. Private traders involvement in marketing enhanced by the 1987 Act.

Policy measure: e) Review land tenure system.
Problem addressed: Inequitable and inefficient land allocation.
Programme: SAL IV
Comments: Estate expantion in densely-populated areas to be frozen.

Estate Agricultural Sector

Policy measure: Estate credit facility, training, and extension.
Problem addressed: Supply constraints and lack of diversity.
Programme: SAL II-III
Comments: AGRIBANK yet to be implemented.

Industrial Sector

Policy measure: a) Price decontrol.
Problem addressed: Stagnation and inefficient resource allocation.
Programme: SAL I-III

Policy measure: b) Liberalize licensing.
Problem addressed: Monopolistic pricing lengthy and complicated licensing process and criteria.
Programme: SAL III
Comments: Industiral Development (Amendment) Act (1988) removed protection.

Policy measure: c) Credit guarantee scheme.
Problem addressed: Banks lending only to large-scale enterprises.

External Trade Sector

Policy measure: a) Export Incentives.
Problem addressed: Export diversity and balance of payments.
Programme: SAL I-III
Comments: Export Incentives Act (1988). Expanded credit facilities, technical assistance, and simplified licensing and regulations.

Policy measure: b) Maintenance of an active exchange rate policy.
Problem addressed: Deteriorating terms of trade.
Programme: SAL III
Comments: A string of devaluations

April	1982 15%
September	1983 12%
January	1984 3%
April	1985 15%
January	1986 9.5%
August	1986 10%
February	1987 20%
January	1988 15%

Policy measure: c) Northern Corridor Transport project.
Problem addressed: Diversification of access routes to sea ports.
Programme: SAL III

Fiscal Sector

Policy measure: a) Tax and tariff reform.
Problem addressed: Narrow tax base, inefficient and complicated system, inadequate incentives to producers, uneven protection.
Programme: SAL I-III
Comments: Shift tax burden from producers to consumers.

Policy measure: b) Reduce subsidies on education, health, housing, and agricultural services.
Problem addressed: Budgetary deficits.
Programme: SAL III
Comments: Loan scheme for the university, fertilizer subsidy removal programme, house ownership scheme, raised departmental charges and fees.

Monetary Sector

Policy measure: Flexible interest rates. Reduce domestic public borrowing.
Problem addressed: Negative real bank rates, and savings. Crowding out of private sector borrowing requirements.
Comments: Interest rates raised substantially, but bank liquidity crises occurred early in 1988. Rates revised downwards.

Parastatals Sector

Policy measures: Restructure parastatal sector and tariff/price flexibility.
Problem addressed: Poor financial performances and inefficiencies.
Programme: SAL III
Comments: Divestiture and asset exchange. Setting up of Department of Statutory Bodies.

AGRICULTURAL POLICY AND ITS IMPACT ON FOOD SECURITY: THE ZAMBIAN CASE

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INTRODUCTION

The agricultural policy objectives of the Zambian Government, as stated in the *Third National Development Plan* are: to achieve a satisfactory level of food self-sufficiency; increase export crop production to broaden the export base of the economy; and, to promote the economic development of the rural areas. Through the various national development plans initiated since independence in 1964, the government placed increasing emphasis on agriculture in an effort to "minimize the inherited imbalance between the urban and rural sectors and reduce the countries dependence on copper exports" (Zambia Government 1979, p. 139).

Government has used several major policy instruments to achieve the above mentioned policy objectives. This paper analyzes the impact of four of these policy instruments on food security over the past five years, namely: price controls, crop marketing policies and practices, consumer and producer subsidies, and foreign exchange controls.

HISTORICAL SETTING

In the first decade after independence, Zambia's copper-based economy was very strong. When copper prices started to fall in the mid-1970s, Zambia's economy deteriorated rapidly. Zambia's external debt rose with no hope of ever improving the situation by relying on traditional copper earnings. Hence, government decided to embark on the *New Economic Recovery Programme*, with the support of the World Bank, the International Monetary Fund, and a number of the major bilateral donors.

To qualify for assistance from these donors, Zambia agreed to carry out major economic reforms. In the agricultural sector, this included the liberalization of agricultural marketing, withdrawal of food subsidies, and devaluation of the currency. This paper analyzes these changes and the effects they have had on the food security situation in the country.

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PRICE POLICIES AND SUBSIDIES

The Zambian government has used price regulation as a major instrument to control not only food prices, but also prices of manufactured goods. Government has regulated food prices since independence in order to make food available to the majority of the people in the country. This measure has created the need for many other regulations.

Input price controls

In Zambia, retail input prices have reflected government's desire to stimulate food production without unduly increasing the costs of food to urban consumers. Input prices, especially for fertilizer, have been controlled and subsidized (Table 1). These subsidies have encouraged farmers to use fertilizers, especially for maize production. Nitrogenous fertilizer use increased by 25% from 1972 to 1983. Total fertilizer consumption increased by 58% from 1976 to 1983 (Ginder, 1983). Since 1986, the fertilizer subsidy has been reduced drastically, resulting in the nominal price of fertilizers more than doubling.

The increased use of fertilizer on maize resulted from more small-scale farmers shifting away from other crops. Through both research and extension, the

Table 1. Fertilizer subsidy to farmers and price of fertilizers, Zambia, 1972-87.

Year	Fertilzer subsidy (Kwacha/mt)	Price of compound D (Kwacha/50 kg)	Price of urea (Kwacha/50 kg)
1972	na	2.75	2.80
1973	na	3.50	3.55
1974	na	4.00	0.05
1975	na	4.00	0.05
1976	158	6.55	0.75
1977	106	6.55	0.75
1978	153	6.55	0.75
1979	91	8.55	0.75
1980	210	11.60	1.65
1981	230	9.60	0.65
1982	227	11.75	0.95
1983	166	14.95	4.95
1984	na	24.10	4.10
1985	na	26.75	6.75
1986	na	80.00	3.00
1987	na	80.00	3.00

na indicates data not available
Source: NFNC and IFPRI (1985)

government promoted hybrid maize. Although hybrid maize requires more fertilizer than local varieties, it is more difficult to store. As a result, family food insecurity may have increased.

Input price control has had several effects on Zambian agriculture. First, it has had the positive effect of helping to increase maize production, except during drought periods. Small-scale semi-commercial farmers increased their share of marketed maize from about 20% at independence to about 60% in recent years. The fertilizer subsidy, together with other policy measures, has encouraged farmers to produce more maize in almost every part of the country.

The second effect of input price controls has been that the input subsidy mostly benefited the large-scale commercial farmers. Therefore, the subsidy was misdirected.

Third, the subsidy bill for inputs increased to the point that the government had to rethink its whole policy. The government also faced the lack of foreign exchange. Following its decision to discontinue food subsidies, a decision encouraged and in the main inspired by most of the large donors, fertilizer subsidies were substantially reduced, resulting in higher fertilizer prices as shown in Table 1. However, the removal of the subsidies and the consequent sharp rise in fertilizer costs do not appear to have reduced agricultural productivity. In fact, production of maize in particular has increased rather than decreased.

Because of the government promotion of maize, more and more farmers throughout the country began to adopt maize as their cash and food crop, changing the regional pattern of production. Provinces like the Eastern and Northern Provinces were/are becoming much more important as maize producing areas than ever before. Clearly, factors in addition to input price controls influenced this development.

Output price controls

The government has tried to control producer prices of food crops for several reasons. First, uncontrolled producer prices would result in higher consumer prices and defeat the government's policy of providing inexpensive food. If consumer subsidies were to be provided in such a case, the explicit subsidy levels would be far larger than if the state controlled the price and marketed the staple commodity, maize.

Second, government has controlled the output price to prevent a few commercial farmers, or a strong trading community, from gaining control of the potentially profitable maize market. Thus, government has controlled the price to encourage smallholder maize production.

Third, to encourage commercial farmers to shift from maize to export crops, government has increased the producer prices of many agricultural commodities (Table 2).

Furthermore, government has introduced what are considered attractive official prices for millet, sorghum, and cassava in an effort to develop rural markets in these crops. From 1980 to 1988 the nominal producer price of maize increased by more than 500%. Other crop prices increased within approximately the same range.

Table 2. Agricultural producer prices (Kwacha/90kg bag), Zambia, 1979 to 1988.

Year	Maize	Sorghum	Millet	Wheat	Soyabean
1979	9.20	6.00	6.00	20.00	25.00
1980	11.70	6.00	6.00	20.00	32.00
1981	13.50	9.00	6.00	26.00	36.30
1982	16.00	9.00	6.00	32.00	42.00
1983	18.30	16.00	29.00	35.75	45.30
1984	24.50	18.65	29.50	42.50	52.50
1985	28.32	26.90	38.10	45.20	60.90
1986	55.00	52.75	56.25	84.40	112.10
1987	78.00	74.00	74.00	111.00	148.00
1988	80.00	76.00	60.00	190.00	217.50

Wheat prices were also increased to promote import substitution.

The price of maize remains controlled to the present, whereas for other crops the government prices are floor prices. For example, the floor price for soyabeans was K217 per bag, but last season farmers could get as much as K240 per bag from private and parastatal buyers. Soyabeans are rapidly becoming an important cash crop for many small-scale farmers in preference to maize. This may pose a problem of food security for this category of farmers.

The current pricing system is intended to promote both cash and food crops throughout the whole country. Farmers are left with a difficult choice on growing cash crops and purchasing food on the market, or growing food crops and selling the surplus. The response appears to be the same throughout the country--farmers are opting to grow cash crops. Maize is also becoming more as a cash crop, particularly for small-scale farmers. While maize is still sold through the cooperative movement and the National Agricultural Marketing Board (NAMBOARD), other crops and livestock are freely traded in the open market.

Increased agricultural production seems to be directly related to rather large increases in producer prices. However, in the final analysis, an increase in producer prices, or even decontrol of producer prices, does not automatically lead to an increase in agricultural production.

Pan-territorial and pan-seasonal pricing

The uniform pricing system has contributed to the low productivity of the agricultural sector, particularly among traditional farm households. For example, farmers in regions which do not have a comparative advantage in maize growing have continued to grow maize with little success.

Much of the increase in maize production has been through an increase in the area planted. Labour and other resources have shifted from traditional crops such as sorghum, millet, and cassava which are less vulnerable to weather variability. Pan-seasonal pricing has induced farmers to sell more maize to the official marketing

channels and store less on the farm, as shown by a recent study in the Eastern Province (IFPRI and NFNC, 1985).

With less maize being stored on-farms and with distant places producing more for the urban market, government's cost of handling maize has increased. For example, in the 1988 budget speech it was disclosed that it cost the government K49 to handle a 90 kg bag of maize before it reached the millers. A major outcome of this policy has been that the farmers who depended on sorghum, cassava, millet, and local maize varieties for food switched to hybrid maize as a cash crop--making them more vulnerable to transitory food insecurity. High reliance on cash incomes for food have been linked to lower nutritional levels among households following this practice (IFPRI and NFNC, 1985).

The maize pricing system has also increased the government's cost to provide inexpensive food to all the people with access to subsidized maize (mealie meal). Consumers, especially in urban areas, have been purchasing maize meal at less than half the real value of the processed commodity (IAS and ERG, 1988). The government has borne the difference, thus contributing to a the budget deficit.

Consumer pricing and subsidies

For crops such as rice, sorghum, millet, and cassava, rural market prices reflect both regional and seasonal differences *vis-a-vis* their major production sites (NFNC and IFPRI, 1985). The markets for these crops are rudimentary and involve very small quantities. There is also no subsidy offered on processed products made from these crops. However, for maize the rural market is almost nonexistent. There is little rural storage for off-season sales or for own consumption. Especially in areas where subsidized maize meal is readily available, farmers sell their crop as soon as the marketing season opens and start purchasing maize flour from the market.

In normal rainfall years, there has been an increase in the production of maize throughout the country. The marketed figures are approaching the production figures because producers retain little maize for consumption, as noted above. This also has resulted in increased demand for the industrially-milled maize products, which is not surprising considering the large subsidy offered on the final product.

The *Analysis of the 1988 Budget of Zambia* (IAS and ERG, 1988) estimated that the total subsidy on maize (handling, storage, and milling represented K155.55 per annum per person. A subsidy of K79.23 per 90 kg bag of maize or K77.79 per month per average family was offered to the consumers. For an urban family the subsidy was between K100 and K113 per month. The report added that subsidies on consumer products do not generally help the rural population which either produces its own food or has little access to the subsidized and often scarce commodity. Also, because the food subsidies are generally aimed at the urban population, they further encourage rural-to-urban migration.

In the past two years, Zambia has actually experienced a drastic increase in demand for subsidized mealie meal in rural areas throughout the country. This problem was more prominent during the late 1987 and early 1988 when severe shortages of mealie meal were experienced throughout the country. Although the mealie meal problem was worsened by the draught, the changed crop production

patterns have been equally important. Traditional cassava, millet, and sorghum-eating areas have shifted to consuming more maize meal and have reduced their production of other food crops.

In December 1986 mealie meal prices were doubled, but as a result of rioting in the Copperbelt, the government rescinded the price increase. The maize flour subsidy has absorbed a considerable portion of its revenues. In 1986 18.8 % of the government expenditures were spent on the subsidies (Table 3). In the 1988 budget the amount earmarked for subsidies equalled 42% of the total deficit. Maize subsidies alone (handling and milling) are expected to reach K948.3 million in 1988. Although the maize subsidy is designed to help the rural and urban poor, it also benefits net-food buyers and high income earners. Therefore, the government is now trying to reduce the maize subsidiy by targeting it to the needy.

The maize subsidy has significantly contributed to the deficit, which in turn has fueled inflation--making manufactured goods and inputs extremely expensive. The terms of trade between the rural and the urban areas have weighed heavily against the former. Inflation has also seriously affected the low income, relative to the high income, group.

Consumer price statistics indicate that a basket of goods that could be purchased for K100.00 in 1975 would cost low-income consumers K788.40 and high income consumers K787.20 in 1986 (CSO, 1987). For food items (reported together with beverages and tobacco), the 1987 price index was 807.7 for the low-income group and 815.5 for the high-income group. Since the low-income group spends over 70% of their income on food, despite the high maize meal subsidy, increase in the price of the staple food (mealie meal) would therefore threaten the food security of the low income group. This is why the government is very cautious about removing the maize subsidy.

Current reports indicate that the incidence of malnutrition is increasing and that it is greater in rural areas (IFPRI and NFNC, 1985). This is mainly because food

Table 3. The cost of maize subsidies, Zambia, 1982 to 1987.

Year	GRZ own revenues	Subsidies	
	Million Kwacha	Million Kwacha	Percent
1982	841.0	154.0	18.3
1983	1,016.1	82.2	8.1
1984	1,092.1	90.5	8.3
1985	1,546.7	188.4	12.2
1986	3,035.6	569.9	18.8
1987	4,279.8	676.0	15.8

Source: Ministry of Finance (various years).

availability, especially during the drought, is extremely low due to extensive food sales through the official marketing channels. The combined impact of price and subsidy policy instruments is to induce smallholders to shift their resources away from traditional food crops to cash crop production, including maize. Maize is increasingly grown as a cash crop and the income obtained from it is used to purchase industrially-milled mealie meal. Thus, the demand for industrial-milled mealie meal has increased not only in urban areas, but also in rural areas. In addition, population growth increases the demand for maize throughout the whole country.

As a consequence of the pricing policies noted above, both net food buyers and net food sellers benefit from the subsidized staple food item, mealie meal.

INSTITUTIONAL ARRANGEMENTS AND THEIR EFFECTIVENESS

To achieve the goal of providing inexpensive food to the people through subsidies, it was necessary to create new institutions for this purpose. Since government did not consider small grains to be an important food crop until the 1980s, no institution was charged with the responsibility to purchase these crops.

NAMBOARD

The most important and well-known Zambian marketing board is the National Agricultural Marketing Board (NAMBOARD). Since the government sought to control both input and output prices, it was necessary to arrest private traders who would not observe fixed prices.

Through NAMBOARD, the government provided subsidized inputs to farmers, purchased maize at controlled prices, and sold to private millers who could then sell their products at the controlled prices. For example, before May 1987 NAMBOARD purchased a 90 kg bag of maize at K55.00 and sold it at K35.00 to millers. The difference of K20 was absorbed by the government as an explicit subsidy.[3]

The milling industry

As a result of the food riots in December of 1986, the government declared the milling industry a strategic industry. Events preceding the riots are important to understand the incident. To reduce the subsidy bill and still provide assistance to the most needy citizens, the government decided to subsidize only roller meal, the type of mealie meal believed to be consumed by the majority of the low income earners. (The other type, breakfast meal, was not to be subsidized). Further, just before the

[3]Government control of maize marketing is not a post-independence phenomenon; rather, it goes back to the 1940s when the then colonial government decided to provide inexpensive food to the miners.

proposed decontrol of the price of breakfast meal, the government intended to transfer the point of the roller meal subsidy from NAMBOARD to the millers in order to further reduce the subsidy bill.

During the transition in the locus and method of subsidy, shortages of mealie meal occurred. The shortages developed because the mechanism for millers to recover the subsidy had not been worked out beforehand, and millers feared they would not be able to recover the costs for producing and selling subsidized roller meal. Consequently, most of the millers produced the price-decontrolled breakfast meal, which was being sold at K78 per 50 kg bag compared to roller meal which remained at K28.70 per 50 kg bag.

To urban low income earners with monthly wages below K300 per month (CSO 1987), the cost of the breakfast meal alone would have taken over 90% of their salary, since roller meal was not available[4]. Thus, the volatile urban population was left with very little to do but to protest. Govenment blamed the millers, mainly private firms for the shortages, and subsequently took over the industry.

Taking over the milling industry enabled government to more easily channel the staple food subsidy to the low-income group. Currently, cooperative unions, district councils, and parastatals run the maize meal industry. A few small private mill owners still operate in rural areas, but licenses are required if they are to purchase any maize from government stocks. Most of the small millers have problems in obtaining these licenses and therefore function as service millers to people who bring their own maize for milling.

The subsidy is paid to the millers when they provide receipts of their sales to retailers or consumers. The change on the point of subsidy appears to be operating well, but it has not reduced the subsidy bill. As previously noted, it cost as much as K49 per 90 kg bag for handling, even before the maize was milled. Additional costs were incurred for milling, distribution, storage, and retail.

During late 1987 (November and December) and early 1988 (January, February, and March), Zambians faced a serious shortage of both breakfast and roller meal. The main cause of the shortage is yet to be determined. The milling industry insisted that their production was normal and that there was adequate capacity to satisfy the national demand. Also, the government maintained that there was no maize shortage as additional supplies had been imported from Zimbabwe and Kenya.

Several reasons have been proposed to explain the problem that besieged the whole country. One view argued that demand among the rural food producers drastically increased because the price differentials between producer and consumer products make it rational for farmers to sell their maize and purchase subsidized maize meal. Furthermore, it does not pay to store maize on the farm, especially since hybrid maize does not store well under present on-farm storage technology. Whatever the reasons for the maize meal shortages in 1987 and early 1988, the fact remains that Zambia is highly susceptible to transitory food insecurity.

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[4]Even among the low-income group, a large percentage actually consumed breakfast meal, not roller meal.

Unfortunately, food producers are contributing to the size of this group under threat. Institutions charged with the responsibility to ensure food security to the nation cannot do their work under unfavorable conditions and without the necessary inputs.

On the other hand, institutions charged with handling nonfood crops and beef have performed relatively well. The tobacco industry increased its exports. The beef industry has also increased its exports through the parastatal (CSBZ) and private initiatives. Throughout the country, prices of meat and meat products have increased to well over 300% from 1982 to 1987 due to the deregulation of the prices.

The operations of NAMBOARD and cooperatives have contributed to the food insecurity of food producers. The fact that the maize marketing period lasts for only a short period (May to June/July) forces farmers to sell their maize as soon as the marketing season begins. In 1988, government provided an incentive for farmers who sold their dry maize in April--an additional K25 per 90 kg bag above the producer price of K80 per bag to assist farmers to cover the cost of drying. By providing this incentive, the government hoped to then acquire maize stocks for milling, as they had almost run out. It is hoped that in the future when the stocks are high, the government can provide a similar incentive for people to store maize on farm and receive a higher price later. Longer on-farm retentions would reduce national grain losses and make maize available for households needs.

Impact on the private sector

The creation of government market institutions was partially designed to prevent private traders from taking part in the marketing of essential crops. For example, the government did not want a small group of traders to dominate the market in such essential food products as maize for fear of exploiting the farmers. The result is that there is little private trading in rural areas, except for small quantities of traditional crops. Government retail shops such as the Zambia Consumer and Buying Corporation (ZCBC), Mwaiseni, and National Import and Export Corporation (NIEC) stores distribute mealie meal in rural areas.

Private participation is present in the processing sector to a small extent. Hammer-mill owners in Zambia do not have their own stocks of maize, but operate only as service millers. Small grains are milled at the household level. The Small Industries Development Organization, (SIDO), is hoping to introduce dehullers in rural areas to encourage greater utilization of small grains and, hence, assist in achieving food security.

The current arrangements in the maize market are such that operating a mill in a rural area on a private basis is unprofitable, unless the miller can claim subsidies from the government. The presence of mealie meal in state shops in most of the rural areas (the coverage may be low), the lack of spare parts, and the pricing conditions have discouraged small-processing businesses. Large maize-milling operations have been prohibited in Zambia since December 1986. Only cooperative unions, district councils, and parastatal companies are allowed in the industry. As a result, employment opportunities in the rural areas from this sector have been depressed. Depending on mealie meal from large mills has also required rural people to travel long distances and has sometimes caused maize meal shortages.

This is in addition to the costs incurred in moving maize from production areas to the mills and maize meal back to the consumers.

Marketing policy options

The motive for government (both the colonial government and the GRZ) to intervene in the marketing of maize, the main staple food of urban Zambia, can easily be appreciated. Nevertheless, the problems and bottlenecks in the whole agricultural sector caused by this intervention need to be addressed. First, the intervention has been at a very high cost to government because of the heavy subsidies it has been forced to make. In 1986 the subsidy level rose to 69% of the total budget allocated to the Ministry of Agriculture and Water Development.

Obviously this state of affairs has grave consequences for food production as it brings to a standstill most of the other essential agricultural services that are vital to increasing food production. In any case, the Zambian government does not have the money to sink into the bottomless pit of subsidies. When it is be forced to stop the subsidies because it does not have the funds, then other social and indeed political problems will arise.

On the other hand, to suddenly abandon the subsidies is equally suicidal. As has been pointed out earlier, a majority of the people spend as much as 70% of their incomes on the maize flour which is heavily subsidized. Without the subsidy, the commodity would be completely out of their reach.

Another aspect of having official boards solely in charge of marketing the main staple is the question of the ability of those boards to effectively carry out their mandate. In the first place, neither NAMBOARD nor the provincial cooperative unions have adequate transport to haul the produce to safety before the onset of the rains. Consequently, substantial amounts of the badly needed crop goes to waste.

In the second place, these official agencies do not generally have sufficient money to pay farmers for their produce. This results in late payments, which in turn discourages farmers from growing the staple. Instead, they grow other cash crops whose marketing is more efficiently managed, such as cotton. Cotton growers receive all the necessary inputs, including extension advice, on time and are paid for their produce soon after they deliver it to the marketing board.

It is the strong opinion of the authors of this paper that all the fuss, and more importantly, the large crop losses that occur during the harvest and marketing season could be avoided if maize storage was further decentralized. More all-weather rural depots could be constructed, which would store the produce until it is required elsewhere in the country later in the year. In addition, farmers would keep more of their maize and store it on-farm if there were incentives, such as being able to sell it at a higher price later in the year when there was an increased demand.

MONETARY AND FISCAL POLICIES AND FOOD SECURITY

Monetary and fiscal policies have a bearing on the food security situation in so far as they affect the whole economy. Zambia has experienced changes in monetary and

fiscal policies since the mid-1970s, the turning point when world market trends were no longer favorable to Zambia. Prior to this period, even though the agricultural sector could not provide the needed cheap food for the urban population, food imports were easily financed through copper revenues. The mineral revenues also supported a relatively good purchasing power for the Kwacha. After 1973-74 when copper prices fell and oil bills increased drastically, Zambia found itself without foreign exchange to easily import food and other goods and services. Clark and Keen (1988) reported that the terms of trade index (which measures trends in export prices compared with trends in import prices) fell from 100 in the early 1970s to just 24 in 1982. This meant that Zambia had to export more than four times as much in order to import the same value of goods.

Zambia has introduced several monetary and fiscal policies to ensure that food which can easily be grown locally is not imported.

Introduction of the foreign exchange auction

After having had a fixed exchange rate throughout the 1970s and early 1980s, the government realized that the Kwacha was overvalued. Agriculture is one sector that employed imported capital-intensive production methods in the midst of abundant labour. The commercial farmers who could get foreign exchange from the Bank of Zambia (the Central Bank allocates the scarce foreign exchange) imported machinery and irrigation equipment, particularly to produce wheat and soyabean. The demand for wheat products has increased in the urban areas, despite the fact that Zambia cannot produce even one-third of its wheat requirements. The increased wheat demand has been due to both the exchange rate and foreign food aid which made wheat products cheap.

In October 1985 the Government, with the help and urging of the IMF devalued the Kwacha to the US dollar exchange rate through the use of a foreign exchange auctioning system. The foreign exchange auction was to be supported by other market liberalization measures such as reducing the budget deficit, decontrolling interest rates, liberalizing imports, and reducing the money supply. By April 1987, the Kwacha declined in value from K2.23 to US$1.00 in October 1985 to K21.01 to US$1.00.

Impact of the auction

The major effect on these policies increased the cost of imported goods, which pulled up the prices of all other commodities. Inflation started running around 60%. Workers sought higher wages in order to restore their purchasing power. Firms that were not successful in bidding for foreign exchange, but were highly dependent on imported materials for their production, started laying off workers. Therefore, unemployment was not arrested by the auctioning system.

Agriculture was affected in several ways by the auction. Some commercial farmers started utilizing more labour-intensive production technologies. Use of oxen power increased significantly as the prices of imported machinery, fuel, and spares increased. The effect on rural employment is not clearly known as the period of auction was too short. Inflation obviously changed the terms of trade between rural

and urban areas. Prices of agricultural products such as maize were still being controlled, but urban manufactured goods were not.

The agricultural sector did not benefit much from the auctioning system which was ended on the 1st of May 1987, with the currency fixed at K8.00 to the US$1.00. Exports of a few crops and livestock products did increase. Generally, however, most of the agricultural producers were outbid and could not adjust quickly enough to employ more local resources. This occurred despite the fact that agriculture was given a separate window. Since interest rates were also decontrolled, farmers found it extremely difficult to borrow money from the banks. Small-scale farmers, who only needed money to purchase inputs within the country, were badly affected by interest rates which increased as much as 30% on a seasonal loan. Agriculture, and consequently food security for the rural people, was negatively affected by the auctioning system. However, the government has tried to cushion the effects of inflation on the urban poor by continuing to subsidise maize flour. The money supply was never contained and grew by as much as 93% between 1986 and 1987 (Budget speech, 1988). The increased money supply and the continued government budget deficits affected the food security situation of the people by fueling inflation.

CONCLUSION

With the decline of the mining industry, Zambia is currently placing increased emphasis on the agricultural sector, particularly on maize production. Indeed, food security in Zambia is almost synonymous with maize self-sufficiency. Therefore, it is not surprising that key agricultural policies that government has recently initiated are related to maize production and marketing. By and large, Zambia has shown that she is capable of producing sufficient maize, given good rains[5]. What she now needs to do is to consolidate this capacity, as well as review her marketing and storage capacities. The various irrigation schemes, both small- and large-scale, need to be expanded in order to supplement rainfed agriculture, especially in bad years.

Like the rest of the economy, there is also a need to diversify the agricultural sector. In recent years, government has encouraged farmers to grow crops other than maize. This is particularly true of the export crops for which the farmers, mainly commercial farmers are given good incentives.

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[5]With a current demand for marketed maize of 8.5 million bags, the country produced enough to meet domestic requirements in 1976, 1977, 1981, 1986, and 1988. The excess demand is met either by commercial imports or aid. Zambia has been importing and receiving food aid in the form of maize for a long time, ranging from a high of 288,000 mt in 1980 to a low of 68,000 mt in 1982 (MAWD and Mills Associates, Ltd., 1986). This year the country has imported maize from Zimbabwe and Kenya to make up the shortfall, with about 162,500 mt projected to be imported from Zimbabwe (Times of Zambia, April 14, 1988). Part of this consignment (62,500 mt) is from the World Food Programme as food assistance.

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FOOD SECURITY POLICY OPTIONS

GRAIN RETENTIONS AND CONSUMPTION BEHAVIOUR AMONG RURAL ZIMBABWE HOUSEHOLDS

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INTRODUCTION

Most observers of contemporary Sub-Saharan Africa agree that food policy analysis is often formulated on an inadequate base of knowledge about a country's food situation. For instance, Mellor, Delgado, and Blackie (1987) comment on the dependence of useful policy prescription on "accurate factual information which is largely missing from Africa". Current debates in Zimbabwe highlight large knowledge gaps concerning existing patterns of production, consumption, marketing, and storage; and farmer and consumer response elasticities to price and income.

Government programmes concerned with family food security require an understanding of

- who is most vulnerable to inadequate food intake,
- strategies used by households to secure access to food,
- how do the poor change food consumption patterns when circumstances change,
- to what extent is on-farm food production shortfall the problem,
- the role of other farm and nonfarm activities in household food security, and
- programme interventions that will raise food intake.

To address these issues requires data on food consumption patterns, household level food availability, and nutritional status of individuals within the household. Since the primary variable to improve household nutritional status is access to food resources, this paper looks primarily at data relating to household food availability and consumption. Basic food grains supply the bulk of calories of most rural households, so the analysis focuses on food grains. For Zimbabwe these are, in order of importance, maize, sorghum, bulrush millet (*mhunga*), and finger millet (*rapoko*).

This study uses cross-sectional data to look at grain consumption behaviour among rural households in Zimbabwe. While the sample--in terms of the universe of communal areas--is inevitably narrow, the study provides an opportunity to investigate grain consumption behaviour among a broad spectrum of communal producers. The three locations studied incorporate farm households in both grain surplus and deficit areas:

- Hurungwe communal land is a grain-surplus area in Mashonaland West, 260 km northwest of Harare. Maize occupies over 90% of the area under grain crops in this region and accounts for 70% of the cultivated area. Mean

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landholding size is around 4.2 hectares. Sample households were selected on the basis of a stratified random sample to incorporate households with good, moderate, and poor access to market.

- o Bushu communal land, also a grain-surplus area in most seasons, is located in Mashonaland Central 110 km northeast of Harare. Land holdings are on average smallest in Bushu (1.8 ha) due to high population pressure on available arable land. Maize accounts for 95% of the area under grain crops which occupy some 65% of the total cultivated area. Sample households in this area face relatively uniform environmental conditions and differ little in their access to market.
- o Binga District is a grain-deficit region located in a marginal rainfall area Southeast of Lake Kariba in Matabeleland North. Grain crops account for almost 100% of the cultivated area with bulrush millet and sorghum the two most important ones. Average landholding size is relatively large (7.2 ha) due to the low quality of the soils and to the fact that polygamous and extended households are a common feature of the people in this area of Zimbabwe.

The data used were generated by a grain transaction survey administered in the areas between April 1986 and May 1987. The 1986 harvest represents a slightly below average season. Farmers reported that in general, grain production was similar or slightly below the previous season. The survey instrument was administered to each household monthly. Information collected includes grain flows, grain consumption, income and expenditure, and related variables such as household composition and resource endowments for a total sample of 128 households[2]. The present analysis evaluates data for the 12-month period from June 1986 to May 1987 in the case of Hurungwe and Bushu, and April 1986 to March 1987 for the Binga sample which has a shorter growing season and an earlier harvest than the other survey areas.

The paper is structured according to the following sequence of analytical questions:

- o What conceptual models and principles of theory can we use to organise the analysis?
- o What are the specific variables of interest and how are they measured?
- o What are the sample characteristics with respect to the variables to be included in the analysis?
- o What is the likely impact on food consumption of changes in the key parameters?

[2] Only households for which there was a complete data set for the full 12-month period are included in the analysis. Nine households are excluded from the Binga sample because dissident activity disrupted data-collection in one location. Fourteen households are excluded from the Hurungwe sample because of incomplete or conflicting data.

FRAMEWORK OF ANALYSIS

Peasants as both producers and consumers

In rural Zimbabwe as in many LDCs, farm households are both producers and consumers and are semi-commercialised. They meet a significant proportion of their food consumption requirements from own production, but also trade produce and buy some of their requirements. They purchase some production inputs, but also provide some (notably labour and draft power) themselves. This dual character of the peasant household raises complex questions for researchers searching for a framework of analysis. The conventional approach to the peasant economy has been to abstract independent producers and consumers from the complex of peasant society--ignoring that the peasant 'runs a household and not a business concern' (Wolf, 1966). More recently, building on the earlier theoretical analysis of peasant households behaviour by Chayanov and Nakajiama, a number of household economic models have incorporated both production and consumption. (Barnum and Squire, 1979; Singh, Squire, and Strauss, 1987).

The basic household model consists of four elements: a utility function, a production function, an income constraint, and a time constraint. Agricultural household modelling assumes that markets exists for all goods and that households are price takers which enables the production and consumption side to be estimated separately. According to this line of reasoning, the amount of say maize to produce can be determined independently of the amount of maize consumed since the family can always buy and sell maize at a fixed price. The only constraint on consumption arises from total household income. The production and consumption components are therefore linked through the income constraint. The model uses the full income concept which incorporates the effects of income earned on the production side of the model and the value of the household's time endowment. As explained by Singh *et al.* (1987) "production decisions determine profits which are a component of household income which in turn influences consumption". This one-way relationship between production and consumption is referred to as the profit effect. The key conceptual issues raised by the farm household model are the need to explicitly take into account the dual nature of the farm household as both family and enterprise, consumer and producer, and the desirability of including the value of home consumption in a measure of household income, thereby allowing for the profit effect which does not occur in traditional demand theory.

Peasant consumers are rational

Peasant consumers are rational. Some of the plausible assumptions about what constitutes rational behaviour are embodied in standard consumer theory. These include the notion that consumers choose the combination of goods (food, nonfood, leisure, etc.) that maximises their satisfaction. Second, that there exists a decreasing rate of commodity substitution and, third, that consumer choice is constrained by income and the price of commodities. Therefore, according to consumer theory the main demand shifters are household income, prices, and tastes.

Food Consumption behaviour

Economic theory together with empirical investigation provides an important set of expectations concerning the relationship between food consumption and the key demand shifters--income and price.

The relationship between demand and average income is a demand curve plotted in price-quantity space. The response of the demand for food to changes in average income is measured by income elasticity of demand. The majority of income elasticities for food are positive, but less than unity--indicating that an increase in income is associated with a less than proportionate increase in the demand for the product in question. This relationship is known as Engels' Law. It implies that the proportion of income spent on food staples declines as income rises. It may not, however, be an accurate guide to the behaviour of low income households who may actually have an income elasticity of demand for food of one or greater. As a partial equilibrium concept, demand curves incorporate both substitution and income effects of price changes as a move along the demand curve, but assume that average income has not changed. Partial equilibrium demand curves are problematic where a significant proportion of consumers are also producers and the good (maize) accounts for a large proportion of real expenditures.

Income elasticity coefficients estimated for a population over a range of average incomes show that income elasticity is likely to vary with different income levels. Generally, the trend is expected to indicate declining elasticity with income.

Bennet's Law states that as incomes go up, the proportion of basic staples in the diet tends to decline as staples are substituted by higher quality or convenient carbohydrates such as wheat products or rice and as a wider variety of food sources are incorporated in the diet, such as meat protein, vegetables, and fats.

Bennet's and Engel's Law combined suggest that income elasticity of demand for food is likely to be larger for low income consumers than upper income consumers and that this pattern will be sharper for staples like maize.

Empirical studies suggest that for most food products, the quantity demanded of a good falls when the price increases and that a proportionate change in price is associated with a less than proportionate change in the quantity demanded. Price elasticities, like income elasticities, vary with equilibrium prices.

The theoretical perspective on food consumption is conveniently summarised by the Slutsky equation which decomposes the demand relationship into its substitution and income components. If the price of a food increases, this is likely to lead to substitution of the food in question by cheaper commodities. However, a price increase also means that real incomes decline and this is likely to lead to further substitution of a cheaper commodity. According to Timmer (1986), the income component alone of the Slutsky equation normally leads to observed negative price elasticities since in low income societies the budget share devoted to basic food commodities is likely to be large and the income elasticity significantly greater than zero. Since the pure substitution effect is always negative, the traditional approach of consumer demand analysis would predict unambiguous decrease in consumption of maize following an increase in its price.

This theoretical perspective does not allow for the profit effect previously noted. When the price of maize increases, farm profit increases. This means more household income, which will increase the demand for maize. In an integrated household model, the demand for maize comprises two forces pulling in opposite directions. On the one hand, an increase in price is likely to reduce demand as a result of traditional substitution and income effect of consumption theory. On the other hand, the profit associated with the same increase in price will tend to increase demand. As noted by Singh *et al.* (1987), "the ultimate effect is therefore a matter for empirical investigation. The profit effect could outweigh the other effects and reverse the traditional conclusion".

IDENTIFICATION AND MEASUREMENT OF VARIABLES

This study examines grain retentions and grain consumption patterns in selected survey areas to try and understand what determines effective demand for different grain crops and how basic economic forces and government policy affect consumption patterns of different groups in the population. Therefore, variables of interest are household grain consumption and it's major explanatory variables--income, prices, and household characteristics. The definition, source of data, and measurement of these variables is outlined below.

Grain consumption data

Grain utilisation data are based on a monthly enumeration of survey households. The monthly data are aggregated to provide seasonal and annual estimates of household grain use. The use of grain by farm households can take a variety of forms. Grain is used on the farm for both home consumption, feeding livestock (particularly chickens and pigs), and beer brewing. It may also be used for labour payment and exchange. Surplus grain is sold either locally or to the parastatal marketing agency. In examining the effective demand for grain, it is important that food and nonfood uses are clearly distinguished since these components are likely to be determined by different factors. While from a planning perspective, one is interested in understanding the factors which determine the total on-farm retentions and utilisation of grain, this paper focuses primarily on grain used for human consumption.

The relative importance of different staples varies between regions in Zimbabwe. The different ways in which each grain is processed before preparing it for consumption influences the level of accuracy with which it is possible to assess grain consumption by the monthly recall method used in this study. Households in areas where maize is the major staple, as is the case in Hurungwe and Bushu, are well served by local mills. The majority of households take maize grain for milling before preparing it for consumption. The volume of maize consumed by a household in any given month, measured in terms of the standard units on which local milling charges are based, is therefore known by the household with a high degree of accuracy. In contrast, in communal areas where sorghum and millets are the dominant staples,

there are very few mills due to the absence of appropriate technology for small grain dehulling. Food processing is largely done by hand on a daily basis, using a pestle and mortar. As this is the situation among rural households in the Binga area, quantitative estimates of grain production and utilisation are therefore more difficult to establish and need to be treated with some caution.

It should be noted that in the analysis, transactions involving commercially-milled maize meal are converted to a maize-grain equivalent for comparative purposes.

Income

Household income is probably the single most important variable affecting food consumption. In rural areas of Zimbabwe, a substantial part of household income consists of the food grown on the farm. Households also often receive payment in-kind for tasks undertaken, rather than cash wages. Therefore, in defining household income, it is necessary to take into account the net value of farm production consumed on the farm and the value of income received in-kind, in addition to cash income earned from the sale of own production or employment. Income can be formally defined as follows:

$$Y = \sum_{i=1}^{n} p_i Q_i - \sum_{j=1}^{m} p_j V_j + E$$

where Q = Output, for i=1, ...N
V_j = Variable Inputs, for j=1, ...M
p_i = Price of Q
p_j = Price of V
E = exogenous income (in cash and in kind).

All farm output (grains, vegetables, oilseeds, and livestock products etc.) that is domestically produced, whether utilised on the farm or marketed, should be valued. However, due to limitations on the length of the questionnaire used to collect data for this study, information concerning on-farm utilisation of production was not collected for livestock or crops other than grains. Consequently, the value of farm production is based on grain output and income received from any other farm production that was marketed. Although grain crops make up a large proportion of the home produced foodstuffs of rural families, it is recognised that for food security purposes, this measure is limited.

For the purpose of valuing grain output, total grain production is subdivided into various components, based on method of utilisation as follows:

$$Q^{prod} = Q^{hcons} + Q^{sales} + Q^{sbeer} + Q^{other} + Q_{t+1}^{stock} - Q_t^{stock}$$

where Q^{hcons} = quantity of grain used for human consumption.
Q^{sales} = quantity of grain sold.
Q^{sbeer} = quantity of grain used to brew beer for sale.

Q^{other} = quantity of grain used for other on-farm consumption and processing (excluding brewing of beer for sale) plus grain used in nonmonetary transactions.
Q_{t+1}^{stock} = quantity of grain in storage at the end of the season.
Q_t^{stock} = quantity of grain in storage at the beginning of the season.

In terms of the income model described in the preceding paragraph, each of the above components of grain production can be regarded as distinct outputs.

The valuation of subsistence and other output that doesn't enter the market is problematic. One might argue that the relevant price to associate with, say, maize utilised on the farm is the opportunity cost of this maize (*i.e.*, the price maize could be sold at in the market). In a world characterised by perfectly competitive markets, the opportunity cost would be equal to the buying price and there would be no problem in using the opportunity cost to value consumption. However, because of transport and other frictional costs and because of the Zimbabwe Government's key role in setting guaranteed prices for output and fixed prices for the sale of maize meal, the price that a farmer can get for her maize is often different than the price she would have to pay to buy maize. Therefore, one could argue that subsistence should be valued at the farmgate buying price. This is particularly true in areas such as Binga where quite a few households are deficit producers and have to purchase additional grain for subsistence. This study values all maize consumed as human food at its buying price--whereas maize used in any other on-farm use, stored, or exchanged is valued at its selling price.

The value of grain sales is equal to cash receipts, less direct marketing costs such as transport. Grain used in brewing beer for sale is valued on the basis of actual income received from beer sales, less the cost of any purchased ingredients.

In calculating the cost of variable inputs used in the production process, only those costs paid for directly in cash or kind are taken into account. The contribution of unpaid family resources, such as labour and draft power, is not deducted from income. Details of production costs were established from a farm management survey and from details of repayment of Agricultural Finance Corporation (AFC) loans out of crop receipts.

Nonfarm income includes all income earned or received from other sources by household members resident on the farm, including remittances from family or relatives working in urban areas, or in any other wage employment.

It is appropriate to comment on the level of accuracy that can be attached to cash income data used in this study, since income is a sensitive and difficult variable to monitor. Estimates of annual and seasonal income are based on aggregated monthly recall data. This, therefore, avoids the problem of trying to draw far-reaching conclusions based on income data collected from a single visit survey which relies on farmers' ingenuity and willingness to recall and divulge their income for the previous year. Generally, the enumerators involved in carrying out this survey established good rapport with the households and believed that they were being provided with accurate income data. This was particularly true in the Binga area where farmers have few cash income sources. However, some errors are likely to have occurred

in monitoring the income of families in Bushu and Hurungwe operating business concerns, since even they themselves found it difficult to estimate net profits.

Prices

The buying price used to value grain used on the farm for human consumption was calculated on the basis of the cost of its maize-meal equivalent, since this is generally the food which producers use to make up family consumption requirements. The selling price of grain varies between households and is calculated as a weighted average of the net price farmers received for grain they sold during the survey period. This enabled both variations in households' access to market and quality of grain marketed to be taken into account. If farmers didn't market any grain during the survey period, the opportunity cost of grain they used on the farm for purposes other than human food is estimated as a weighted average of the net sale price received by other survey farmers in their village who had marketed grain.

Household characteristics

A number of household characteristics could be explanatory variables affecting the pattern of grain consumption. These include household size and composition, productive assets, source of income, and socioeconomic characteristics such as whether the household is headed by a female or a male. Most of these variables do not present any measurement problems. However, in order to net out the effect that household composition may have on consumption, a weighting system based on the standard calorie requirements is used to calculate the size of a household, in terms of adult equivalents (AE). A weighting scheme is not ideal because it doesn't allow for economies of size in food preparation, but it represents a reasonable way to standardise household size. The coefficients used to calculate adult equivalents are given in Appendix 1.

DATA CHARACTERISTICS

Socioeconomic characteristics of the survey areas

Table 1 presents characteristics of the sample households, grouped by survey area. There is considerable variation within and between areas in access to land--a determining factor in a farm household's ability to meet its food needs and participate in the market. Households in Binga have relatively larger holdings, but this reflects the low quality of the soils in this area and the fact that polygamous and extended households are a common feature of people in this part of the country. Land holdings are smallest in Bushu where there is considerable population pressure on available cultivable land.

Average cattle ownership is highest in Hurungwe and lowest in Bushu. Sheep and goat ownership is highest among Binga households where they act as an important cash reserve to be drawn on during drought. Over one-quarter of sample households own no cattle and this proportion is highest in Bushu where population pressure on land is greatest.

Table 1. Socioeconomic profile of households in three survey areas, Zimbabwe, 1985.

	Hurungwe		Bushu		Binga	
Field area (ha)	4.2	(3.0)	1.8	(1.2)	7.19	(4.41)
Garden area (ha)	0.1	(0.08)	0.12	(0.11)	0.13	(0.4)
Average number of:						
cattle	7.8	(9.6)	3.9	(6.2)	4.6	(4.6)
donkeys	0.2	(0.8)	0.0		0.5	(2.1)
sheep and goats	7.6	(9.4)	1.8	(3.1)	28.7	(38.9)
pigs	2.1	(3.8)	0.4	(1.9)	0.2	(0.7)
Households with no cattle (%)	28.0		33.0		26.0	
Female-headed households (%)	5.0		4.0		0.0	
Household head absent year (%)	10.0		36.0		10.0	
Average number of:						
adult males	1.0	(0.6)	0.7	(0.9)	1.3	(0.7)
adult females	1.5	(0.9)	1.2	(0.8)	3.7	(2.5)
unmarried post-school children	0.8	(0.9)	0.8	(1.2)	0.3	(0.8)
school age children	2.8	(2.3)	2.1	(1.5)	4.6	(3.5)
pre-school children	1.3	(1.3)	1.4	(1.6)	3.0	(2.2)
Total number of:						
household members present	7.4	(4.2)	6.3	(3.7)	12.9	(7.1)
household members present in AE	5.4	(3.0)	4.5	(2.6)	9.0	(4.9)

[a] Standard deviation in parenthesis.
[b] Includes only those households with complete 12 months of grain transactions data for period June 1986 to May 1987.
[c] Households with household head absent 4-12 months per year.
[d] Average number present
[e] 17-24 years of age.
Source: Data from author's baseline surveys, 1985.

The number of female-headed households is relatively small, but since over one-third of household heads are absent for most of year in Bushu, these households are effectively managed by women.

The composition of survey households is similar in Hurungwe and Bushu, except the number of absent male members is higher in the latter area. These households support 6-7 persons on average. Households are larger in Binga due to the fact that many men are polygamists and because it is quite common for married sons and their wives to continue residing at the father's homestead.

Household income sources

Economic theory suggests that income is a key demand shifter, with respect to food consumption. Household income has been calculated using the approach outlined previously and is summarised for the three survey areas in Table 2. Except in the case of grain crops, it was not possible, due to lack of data, to incorporate in the estimation of income the value of other farm outputs consumed as food. To the extent that other home-produced items--such as livestock products, vegetables, and oilseeds are important--this leads to an underestimation of household income.

Table 2. Annual household income in the three survey areas, Zimbabwe, 1986-1987.

Survey areas	Type of income (%)				
	Grain consumption:		Net farm income	Nonfarm income	Full income
	Human	Other			
Hurungwe (June 1986-May 1981)					
Mean (household)	303	53	684	973	2013
Standard deviation (household)	(167)	(50)	(1435)	(1622)	(2921)
Mean AE[a]	96	14	110	218	438
Standard deviation AE	(30)	(15)	(201)	(250)	(339)
Percentage (household)	15	3	34	48	100
Bushu (June 1986-May 1987)					
Mean (household)	228	22	350	908	1508
Standard deviation (household)	(90)	(37)	(590)	(611)	(898)
Mean (adult equivalent)	58	6	101	313	478
Standard deviation (adult equivalent)	(21)	(9)	(193)	(406)	(547)
Percentage (household)	15	2	23	60	100
Binga (April 1986 - March 1987)					
Mean (household)	595	42	358	165	1159
Standard deviation (household)	(355)	(52)	(323)	(241)	(723)
Mean AE	68	5	47	21	141
Standard deviation AE	(20)	(5)	(45)	(29)	(57)
Percentage (household)	50	4	31	14	100

Source: Data from author's monthly income surveys, 1986-1987.
[a]Adult equivalent

Average household income (Z$2,013 per annum) is highest for Hurungwe, but Bushu households have a higher level of income per adult equivalent. At Z$1,159 per household, or Z$141 per AE, average income in Binga is considerably less than in either of the other two survey areas. Some 52% of income for Binga housholds is derived from the value of grains consumed or utilised on the farm, whereas the share of these items in the income of households in the other two survey areas is only 18%. Net farm income, derived predominantly from the sale of small livestock and beer, accounts for two-thirds of cash income received by Binga households. For both Bushu and Hurungwe housholds, nonfarm income accounts for the largest share of cash income received. This is particularly striking among Bushu households for whom nonfarm income is Z$313 per AE per annum and nearly twice the value of grain production and marketed output.

Farm household grain transactions

Farm household grain transactions involve both inflows and outflows. Sources of grain include own production, purchases, nonmonetary transactions, and carryover stocks. Purchases may be in the form of grain or commercially milled maize meal.

Nonmonetary transactions include exchange of services, such as labour and draft power and commodities such as meat for grain. Uses of grain also take a variety of forms. There is an on-farm demand for grain for both human consumption and feeding livestock (mainly chickens and pigs) and beer brewing. Households also use grain for exchange. Surplus grain are either sold locally or to the parastatal marketing agency, the Grain Marketing Board (GMB).

A summary of household grain transactions in the three survey areas over a 12-month period is provided in Tables 3-5. There is considerable variation between survey areas in the availability and composition of grain supplies. Average level of grain supply and disposal among Hurungwe households in the 1986 season was just over 9 mt per household or 1,715 kg/AE. In aggregate terms, households in Hurungwe were self-sufficient in grain and had a significant marketable surplus. Average level of transactions per household was fairly similar among sample households in Bushu and Binga, but the AE figures show that total grain transactions in Binga were only 339 kg/AE compared to 580 kg/AE in Bushu. Therefore, grain supplies in Binga are significantly lower than in either of the other two study areas.

Maize is clearly the dominant grain in both Hurungwe and Bushu with the other grains generally accounting for less than 6% of transactions. In these areas the production of other grains is limited and they are mainly used for brewing beer. Bulrush millet is the dominant staple of survey households from the Binga area and accounts for around two-thirds of all grain transactions. The balance is derived from a combination of sorghum, maize, and purchased maize meal. All of these grains are used for food purposes, in addition to other on-farm uses.

The seasonal pattern of grain flows is largely as expected. Activity is greatest during the postharvest period and, with the exception of Hurungwe households, purchases are concentrated in the preharvest period when on-farm stocks are falling. The high percentage of monetary and nonmonetary transactions occurring between June and September for Hurungwe households is largely accounted for by grain received in payment for beef that had been disposed of before harvest and by purchases of maize intended for resale to the GMB.

Strategies used by farmers to secure access to food

Since meeting food requirements generally takes priority over other production goals in the survey areas (Table 6), own production is generally the dominant source of grain for most households; except in a drought season or if the household has limited production resources.

The extent to which sample households were able to secure access to food requirements through carry over stocks and own production is illustrated in Table 7. In all the survey areas, the average supply of grain is greater than that consumed by the family as food. Supplies were also, on average, large enough to meet other on-farm consumption requirements. Binga households were borderline subsistence, whereas in Hurungwe and Bushu 59% and 84%, respectively, of available supplies was marketed. However, these aggregate figures mask wide variations in the grain situation of individual households within the survey areas.

Table 3. Summary of farm household grain transactions, Hurungwe Communal Land, Zimbabwe, June 1986-May 1987[a].

Transaction type	All grains			Share	Share by grain (%)[c]:					Share by season (%):		
	Total	Mean per[b]:										
	(mt)	H/H (kg)	AE (kg)	%	Mz	Sg	Bm	Fm	Mm	Jun-Sep	Oct-Jan	Feb-Mar
Source												
On-farm stocks (1.6.86)	0.9	24	4.4	0.2	48	9.0	0	43.0	0	100	0.0	0
Harvest 1986 season	341.3	8,751	1,620.0	94.5	98	neg	0	2.0	0	100	0.0	0
Monetary transactions	2.1	54	10.0	0.6	94	0.0	0	6.0	0	95	5.0	0
Non-monetary trans.	15.0	385	71.0	4.1	98	1.0	0	neg	0	99	0.0	1
Used from 1987 harvest	2.2	55	10.0	0.6	100	0.0	0	0.0	0	0	0.0	100
Subtotal	361.5	9,267	1,715.0	100.0	98	0.2	0	1.8	0	99	0.0	1
Use												
Own consumption	46.2	1,185	219.0	12.8	98	0.0	0	2.0	0	35	32.0	34
Monetary trans.	287.8	7,379	1,366.0	79.6	99	neg	0	1.0	0	93	2.0	5
Other on-farm consumption and processing	14.2	363	67.0	3.9	95	2.0	0	3.0	0	44	19.0	37
Non-monetary trans.	8.5	218	40.0	2.4	97	2.0	0	1.0	0	95	4.0	1
Ending stocks (31.5.87)	4.8	122	23.0	1.3	79	3.0	0	18.0	0	0	0.0	100
Subtotal	361.5	9,267	1,715.0	100.0	98	0.2	0	1.8	0	83	6.3	10.7

[a]Hurungwe sample (number of valid observations = 39). [b]Ratio of means. [c]Mz = Maize, Sg = sorghum, Bm = bulrush millet, Fm = finger millet, Mm = maize meal.
Source: Data from author's monthly food grain survey, Hurungwe Communal Land, 1986-87.

Table 4. Summary of farm household grain transactions, Bushu Communal Land, Zimbabwe June 1986-May 1987[a].

Transaction type	All grains			Share	Share by grain (%)[c]:					Share by season (%):		
	Total	Mean per[b]:										
	(mt)	H/H (kg)	AE (kg)	%	Mz	Sg	Bm	Fm	Mm	Jun-Sep	Oct-Jan	Feb-Mar
Source												
On-farm stocks (1.6.86)	5.4	79	18	3.0	97	1.0	0	2	0.0	100	0	0
Harvest 1986 season	161.4	2,337	518	89.4	99	1.0	0	neg	0.0	100	0	0
Monetary transactions	8.1	102	23	4.5	66	0.5	0	12	21.5	18	32	50
Nonmonetary trans.	4.5	51	12	2.5	69	0.0	0	6	25.0	36	16	48
Used from 1987 harvest	1.2	17	4	0.6	100	0.0	0	0	0.0	0	0	100
Subtotal	180.6	2,617	580	100.0	94	2.0	0	1	3.0	94	2	4
Use												
Own consumption	60.7	880	198	33.6	93	1.0	0	1	5.0	31	32	37
Monetary trans.	97.6	1,414	318	54.0	100	neg	0	0	0.0	96	2	2
Other on-farm consumption and processing	8.3	120	27	4.6	80	0.0	0	20	0.0	45	31	24
Non-monetary trans.	7.2	104	24	4.0	100	0.0	0	neg	0.0	22	58	20
Ending stocks (31.5.87)	6.8	99	22	3.8	98	2.0	0	4	0.0	0	0	100
Subtotal	180.6	2,617	580	100.0	94	2.0	0	1	3.0	62	15	23

[a]Hurungwe sample (number of valid observations = 39). [b]Ratio of means. [c]Mz = Maize, Sg = sorghum, Bm = bulrush millet, Fm = finger millet, Mm = maize meal.
Source: Data from author's monthly food grain survey , Bushu Communal Land, 1986-87.

Table 5. Summary of farm household grain transactions, Binga District, Zimbabwe April 1986-March 1987[a].

Transaction type	All grains			Share	Share by grain (%):					Share by season (%):		
	Total	Mean per[b]:										
	(mt)	H/H (kg)	AE (kg)	%	Mz	Sg	Bm	Fm	Mm	Jun-Sep	Oct-Jan	Feb-Mar
Source												
On-farm stocks (1.6.86)	5.7	300	33		5	11	84	0	0	100.0	0.0	0.0
Harvest 1986 season	46.2	2,431	270		13	27	70	0	0	100.0	0.0	0.0
Monetary transactions	3.0	158	18		0	2	11	0	87	8.0	36.0	56.0
Nonmonetary trans.	2.2	113	13		68	13	12	0	7	11.0	10.0	79.0
Used from 1987 harvest	0.9	38	5		0	0	100	0	0	0.0	0.0	100.0
Subtotal	58.0	3,050	339		13	17	66	0	4	90.0	2.0	8.0
Use												
Own consumption	42.7	2,243	249		14	19	61	0	6	33.5	33.8	32.7
Monetary trans.	2.7	143	16		40	4	56	0	0	11.0	78.0	11.0
Other on-farm consumption and processing	2.6	137	15		1	20	73	0	6	39.0	33.0	28.0
Non-monetary trans.	2.5	132	15		7	22	62	0	9	11.0	63.0	26.0
Ending stocks (31.5.87)	7.5	395	44		5	7	88	0	0	0.0	0.0	100.0
Subtotal	58.0	3,050	339		13	17	65	0	5	27.0	32.0	41.0

[a]Binga sample (number of valid observations = 19). [b]Ratio of means.
Source: Data from author's monthly food grain survey, Manjolo Communal Land, 1986-87.

Table 6. Household production goals for maize, sorghum, bulrush millet, and finger millet in the three survey areas, Zimbabwe, 1985.

Production goal (%)	Hurungwe				Binga				Bushu			
	Mz	Sg	Bm	Fm	Mz	Sg	Bm	Fm	Mz	Sg	Bm	Fm
Surplus: sell and store[a]	46.2	7.7	0.0	12.8	31.3	37.5	31.3	0.0	82.4	0.0	0.0	1.5
Surplus: sell[b]	41.0	3.8	0.0	3.8	0.0	0.0	6.3	0.0	5.9	4.4	0.0	5.9
Surplus: store[c]	6.4	1.3	0.0	7.7	6.3	62.5	62.5	0.0	2.9	0.0	0.0	1.5
Meet needs[d]	6.4	9.0	0.0	16.7	62.5	0.0	0.0	0.0	8.9	2.9	0.0	2.9
Less than needs[e]	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Little/no grain: buy[f]	0.0	28.2	0.0	24.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
None[g]	0.0	48.7	100.0	34.6	0.0	0.0	0.0	100.0	0.0	92.6	100.0	88.2

[a]More grain than the household needs so that you can sell some and store extra in case of a bad season.
[b]More grain than the household needs so that you can sell some.
[c]More grain that the household needs so that you can store extra in case of a bad season.
[d]Just enough grain for the household needs.
[e]Less than the household needs.
[f]Little or no grain and buy all the grain the household needs.
[g]Do not grow or use this grain.
Source: Data from author's baseline surveys, 1985.

Table 7. Grain available from on-farm stocks and 1986 harvest in three survey areas, Zimbabwe, 1986-87[a].

Survey area	Mean kg per:		On-farm supply as % of:			Sales as % of on-farm supply
	Household	AE[a]	Human consumption	All on-farm consumption	All grain used	
Hurungwe	8,775	1,624	740	567	95	84
Bushu	2,416	536	271	242	92	59
Binga	2,731	288	122	115	80	2

[a]Adult equivalent.
[b]Data are for the following 12 month periods: Hurungwe, June 1986-May 1987; Bushu, June 1986-May 1987; Binga, April 1986-March 1987.
Source: Data from author's monthly food grain surveys, 1986-87.

The proportion of households whose available supplies of grain did not meet effective demand for grain for home consumption is as follows. Among Binga households, some 37% of families were only in a position to meet between 63% and 94% of food needs out of own supplies. A further 11% were able to meet between 100-115% of their needs and, therefore, had limited grain available for other on-farm uses or exchange. The situation was somewhat better in Bushu, where some 19% families were unable to meet their food requirements from available grain supplies. Although aggregate supplies in Hurungwe were over seven times the total quantity of grain consumed as food, a small percentage of households (10%) were not self-sufficient in grain--although generally the shortfall for these households was quite modest. Around 20% of the Hurungwe households had grain supplies that were more than 20 times the quantity that these households consumed as food. This reflects the marked inequality in the distribution of maize production among households in this area.

Among Binga households, on-farm stocks were sufficient to meet requirements through to December, but thereafter the percentage of households with no grain in storage rises (Table 8). Households stock bulrush millet longer than either sorghum or maize stocks. The majority of households in Hurungwe and Bushu had on-farm stocks through to February 1986. Thereafter, the percentage of households with maize in storage declined and households used the current crop for home consumption.

Households secure additional grain through a number of sources (Table 9). Although on average the quantity of additional grain supplies is highest for Hurungwe households, most of these inflows are related to commodity exchange and purchases of maize for resale and were not made by food insecure households. This is not the case in either of the other survey areas, where the acquisition of grains was generally associated with food deficit households acquiring grain for home consumption. The few exceptions to this were purchases of finger millet by Bushu households for beer brewing.

Table 8. Household grain storage among households in three survey areas, Zimbabwe, 1986-87.

Month April 1986 to May 1987	Households with stocks (%):					
	Hurungwe	Bushu	Binga	Binga		
	Any grain	Any grain	Any grain	Maize	Sorghum	Bm[a]
April	na	na	100	55	80	100
May	na	na	100	62	90	100
June	11	100	100	62	90	100
July	99	98	100	74	90	100
August	100	100	100	65	90	100
September	100	98	100	50	90	100
October	100	98	100	50	90	100
November	100	98	100	30	50	100
December	100	98	89	10	30	85
January	100	96	74	10	15	70
February	100	94	84	30	10	70
March	95	78	95	65	55	95
April	86	84	100	65	80	100
May	57	71	100	65	75	100

[a] Bulrush millet. Na = no data collected.
Source:Data from author's monthly food grain surveys, 1986-87.

For food purposes, Bushu households depended mainly on purchases of maize grain from local farmers, although some people received grain in exchange for labour or as a gift. Binga households depended mainly on purchased maize meal since there was little surplus grain in the local market. For Binga households, drought relief accounted for 29% of total grain consumed coming from outside the household. However, a point of concern is that all of this drought relief was in the form of maize which is normally the least important grain in the local diet. Given that Zimbabwe has considerable stocks of both sorghum and bulrush millet, it is surprising that these grains were not used for drought relief.

The primary and secondary sources of income most likely to be used to purchase additional grain by Bushu households are remittances from family members working away from home and casual employment; and for Binga households, the sale of livestock and beer brewing (Table 10).

Grain retentions and grain utilisation

A detailed breakdown of retentions and utilisation of grain by households is given in Table 11. Grain that was sold on the local market is included because, although this represents part of the marketed surplus, it also comprises part of the stock of grain that households retain and withold from the formal market. All figures are expressed in AE terms to enable comparisons to be made between survey areas.

Table 9. Pattern of acquisition of food grains in three survey areas, Zimbabwe, 1986-87[a].

	Hurungwe	Bushu	Binga
Total food grains acquired (kg)	17,121	10,557	5, 149
Average per sample household (kg)	439	153	271
Average per adult equivalent (kg)	81	36	30

Source of Acquired grain	Share	Share by grain (%)					Share by season (%)		
	%	Mz	Sg	Bm	Fm	Mm	Jun-Sep	Oct-Jan	Feb-May
Hurungwe									
Purchase	12	98	2	0	0	0	99	0	1
Labour payment	3	65	15	0	17	3	97	3	0
Gift	1	100	0	0	0	0	0	0	100
Exchange[b]	84	100	0	0	0	0	100	0	0
Bushu									
Purchase	64	66	1	0	12	21	18	32	50
Labour payment	15	85	0	0	11	4	47	32	21
Gift	19	56	0	0	2	42	34	6	59
Exchange[b]	2	64	0	0	34	0	55	45	0
Binga[a]									
Purchase	58	0	2	11	0	87	8	36	56
Labour payment	4	5	24	57	0	14	45	55	0
Gift	8	4	28	68	0	0	39	13	48
Exchange[b]	1	0	0	0	0	100	0	0	100
Drought relief	29	100	0	0	0	0	0	0	100

[a]12 month period for Binga sample is divided into the following seasons: April 1986-July 1986, August 1986-November 1986, and December 1986-March 1987. [b]Commodity exchange.
Source: Data from author's monthly food grain surveys, 1986-87.

Table 10. Primary and secondary sources of income for purchase of additional grain for households in Bushu and Binga survey areas, Zimbabwe, 1986-87.

Primary income source (% households)		Source	Secondary income source (% households)	
Bushu	Binga		Bushu	Binga
56	7	Remittances	2	0
16	0	Casual employment	23	7
11	0	Handicrafts	16	0
5	50	Small stock sales	23	29
5	36	Cattle sales	2	0
0	7	Beer brewing	2	57
7	0	Crop sales	0	0
0	0	Gold sales	14	0
0	0	Loans	12	0
0	0	Other	6	7

Source: Data from author's supplementary surveys, 1986-87.

Table 11. Annual on-farm grain utilisation (kgs per adult equivalent[a]) in three survey areas, Zimbabwe 1986-87.

	Hurungwe (June-May)					Bushu (June-May)					Binga (April-March)				
	Mz	Sg	Fm	Mm	Total	Mz	Sg	Fm	Mm	Total	Mz	Sg	Fm	Mm	Total
Human consumption	244	1	2	0	25	210	1	0	3	216	36	47	154	14	251
Standard deviation	115	2	5	0	115	80	4	3	21	78	21	23	75	20	77
Percentage	98	0	2	0	100	93	1	1	5	100	14	19	61	6	100
Livestock feed	76	0	0	0	76	15	0	0	0	13	0	0	1	0	1
Standard deviation	88	0	0	0	88	41	0	0	0	41	0	0	4	0	4
Percentage	100	0	0	0	100	100	0	0	0	100	0	0	100	0	100
Brewing beer	7	3	4	0	15	11	0	7	0	18	0	5	15	1	21
Standard deviation	13	17	8	0	27	18	0	12	0	30	1	7	9	2	8
Percentage	50	23	27	0	100	59	0	41	0	100	1	24	69	6	100
Local sales & exchange	53	1	9	0	63	41	0	0	0	41	7	5	0	12	24
Standard deviation	65	3	31	0	75	59	1	0	0	59	18	10	1	29	46
Percentage	84	2	14	0	100	99	1	0	0	100	29	20	1	50	100
Carry-over stocks	20	1	6	0	26	27	0	1	0	28	3	1	50	0	55
Standard deviation	33	3	22	0	41	45	1	5	0	47	8	4	57	0	60
Percentage	76	3	21	0	100	97	1	2	0	100	5	7	88	0	100
Total utilisation	399	6	21	0	427	303	1	9	5	318	46	58	220	16	339
Standard deviation	230	19	55	0	249	161	6	15	21	168	34	30	130	20	133
Percentage	93	2	5	0	100	95	neg	3	2	100	13	17	65	5	100

[a] Mean of ratios, data rounded to nearest whole number.
Source: Data from author's monthly food grain surveys, 1986-1987.

Total retentions were highest for Hurungwe households and lowest for Bushu households. It could be hypothesised that the high level of retentions in Hurungwe is due to the generally higher level of grain production in this area. However, if there was a simple correlation between these two variables, one would expect retentions in Bushu to be higher than those in Binga--which is not supported by the data. The lower level of retentions in Bushu appears related to less grain consumed as food. This is probably related to differences in families' ability to utilise alternative staples, either due to the availabilty of cash to purchase other foods, or to better access to retail outlets where they can be obtained. Bushu is in a more favourable position than Binga with regard to both of these factors, due to its better accessibility and the relativeley large number of households in this area where the head engages in wage employment locally or elsewhere.

Notable differences between survey areas in the utilisation of grains for nonfood consumption purposes are the higher levels of grain used by Hurungwe farmers for livestock feed, local sales, and exchange. The utilisation of grain for other purposes by households in Binga was probably dampened by the fact that more than one-third of these households were production deficient in the 1986-1987 season. Nevertheless, Binga farmers had the highest level of grain use for beer brewing.

Carry-over stocks represent between 1.3 to 1.5 months of food requirements for Hurungwe and Bushu and about 2.5 months supply for Binga housholds. However, the high standard deviations on mean stocks in all three survey areas indicate that carry-over stocks vary considerably among households. Generally, households in both Hurungwe and Bushu carry forward minimal levels of maize stocks to the next season. They often use maize that is in the granary, when the new crop is harvested, as livestock feed. If supplies are available, Binga households will try and store extra bulrush millet or sorghum in case of a bad season (Table 6).

EMPIRICAL ANALYSIS OF CONSUMER GRAIN DEMAND

This section analyses the major explanatory variables affecting rural grain demand. The analysis is exploratory and its purpose is to indicate statistical patterns in the data, rather than to provide a complete consumption analysis with refined parameters. The results provide a basis to extend the complexity of the analysis to estimating the type of agricultural household model discussed previously.

The most important explanatory variables that are explored are household income, household size and composition, assets (in particular size of land holding and cattle ownership), source of income (*e.g.*, farm versus off-farm income, cash versus self-provisioning), and socioeconomic variables such as whether the household head is absent from the household in wage employment elsewhere. Economic theory suggest that relative prices are also an important explanatory factor affecting the pattern of food consumption, but cross-sectional data used in this study does not lend itself very well to the analysis of price variables. Due to government producer and consumer price controls, households do not face very different prices for the same commodity. However, farmers do face some variation in producer prices in the sense that transport costs from household to marketing depots vary according to the

distance from depot. Because of this, transport cost from household to depot can be used as a proxy for price differences in Hurungwe and Bushu. This is not possible for the Binga data, since there are no grain depots in this district.

Consumer grain demand has been disaggregated into grain demand for food and demand of grain for other purposes (including on-farm processing, livestock feed, and nonmonetray exchange, but excluding sales). This was done in expectation that different factors might account for different types of grain use. For instance, the quantity of grain fed to pigs is more likely associated with the level of livestock ownership than with household composition; whereas the reverse is true for grain consumed as food.

In examining the pattern of grain demand among sample households in Binga, all grain crops are included. Only maize is examined for Bushu and Hurungwe households since grain in these areas consists overwhelmingly of maize, and sorghum and millets are largely used in beer brewing.

Multivariate analysis

The combination of factors influencing the food consumption demand for grain are likely to differ from those that influence household grain demand for other purposes. Therefore, these two aspects of demand are best treated separately. Only the demand for food is considered here. Multiple regression equations, explaining grain consumption on the basis of selected variables, are shown in Tables 12 and 13. Total grain consumption and grain consumption per AE are the respective dependent variables. In general, the adjusted R^2 is quite high in all regressions, except the Hurungwe regressions on household consumption of maize per AE.

Determinants of household consumption

Table 12 which shows the results of regressing household consumption on selected variables, indicates that both houshold size and household compostition are highly significant explanatory variables. The parameter on total production is also statistically significant for the Binga and Hurungwe regressions. The best specification of the income variable differed slightly between regressions. The production parameter was sufficient to explain variations in total consumption of Binga households and no income variable was specified. This is consistent with the fact that production represents a sizeable component of household income for Binga farmers. The level of cash income was the most significant income variable for the Hurungwe regression; whereas both full income and the share of imputed value of home consumption and utilsation of maize in full income were positively correlated with consumption in the Bushu regression. The positive coefficient on the transport cost variable, a proxy for the selling price of maize, is consistent with economic theory and implies that lower prices are associated with higher consumption, but the correlation is not statistically significant.

The multiple regression results explaining household grain consumption per adult equivalent (Table 13) suggests the following main points:

Table 12. Multiple regression equations explaining grain consumption on the basis of selected variables, Zimbabwe[a].

	Const	HHPR	ADULT	CHILD	PROD	SHCON-INC	CASHINC	FULLINC	TCST	F	R^2	SE
Hurungwe	308.40 (2.4)[b]	100.80 (6.2)	-	-	-	-	0.06 (2.5)	-	-	33.3	0.64	388.20
Bushu	299.90 (7.74)	80.12 (15.7)	-	-	0.017 (2.47)	-	-	-	-	133.1	0.80	151.46
	-23.60 (-.168)	69.38	-	-	-	790.60 (3.46)	-	0.098 (3.60)	62.40 (1.03)	74.8	0.82	144.81
Binga	58.50 (0.30)	-	171.50 (3.50)	-	0.48 (6.30)	-	-	-	-	94.2	0.91	401.13
	452.80 (2.20)	-	-	-	0.69 (10.18)	-	-	-	-	103.6	0.85	552.60

[a] HHPR = number of household members; SHCONINC = % share of imputed value of own consumption; ADULT = number of adults present; CASHINC = cash income; CHILD = number of children present; FULLINC = full income; PROD = grain production; TCST = transport cost to depot per bag maize.
[b] T statistics are in paranthesis for the independent variables.

Table 13. Multiple regression equations explaining grain consumption per adult equivalent on the basis selected variables, Zimbabwe[a].

	Const	FLDAE	HHPR	ADEQ	TCST	FULINCAE	FULINC AE^2	SHCONINC	SHOTHINC	F	R^2	SE
Hurungwe	178.40 (2.6)[b]	3.10 (0.43)	-	-15.5 (-2.3)	-	0.19 (2.84)	-	214.6 (1.7)	-	5.70 -	0.34 -	94.8 -
	89.60 (1.9)	- -	- -	- -	14.70 (0.53)	0.57 (4.0)	-0.0003 (-3.1680)	- -	- -	6.8 -	0.32 -	96.1 -
Bushu	155.7 (8.7)	22.86 (4.0)	- -	-9.9 (-4.5)	- -	0.092 (8.141)	- -	159.60 (3.27)	- -	53.67 -	0.76 -	38.8 -
Binga	-381.5 (-3.2)	- -	2.6 (1.4)	54.7 (1.4)	- -	1.75 (6.80)	- -	519.1 (6.1)	78.90 (1.12)	11.25 -	0.74 -	39.0 -

[a] FLDAE = field area per adult equivalent; FULINCAE = full income per adult equivalent; HHPR = number of household members; FULUNCAE^2 = full income per AE squared; ADEQ = household size in adult equivalent; SHCONINC = % share of imputed value of own consumption; TCST = transport cost to depot per bag maize; SHOTHINC = % share of nonfarm income in full income
T statistics are in paranthesis for the independent variables.

- o Household income is statistically significant in all the areas.
- o Household size, expressed in terms of AE, is significant for both Bushu and Hurungwe regressions. The negative parameter attached to this variable implies that each additional household member, *ceteris paribus*, reduces maize consumption/AE by between 9-15 kg/pa.
- o The farm size variable is positive, but only significant for the Bushu regression and likely reflects the shortage of land experienced in this area.
- o The income source variable indicates that greater reliance on consumption of own production improves household consumption, although the effect is not statistically significant for the Hurungwe regression.
- o The proxy variable for price is not statistically significant.

Income elasticity of demand for maize

A number of alternative funtional forms are used to estimate the effect of income on household consumption of grain. The estimated equations are presented in Tables 14 and 15. For all three survey areas, the dependent variable is consumption/AE. The independent variable was household income/AE. The R^2 is quite low for the Hurungwe and Binga regressions, but reasonable for the Bushu regressions, ranging between 0.48 and 0.60. Small sample size in Hurungwe and Binga probably account for the low explanatory power of these regressions. Overall, the quadratic demand function had the higher explanatory power. The implied income elasticities for maize by income class are calculated for the Bushu data and shown in Table 16. They are positive but less than 1.0, implying that the quantity of maize consumed rises with income but less than proportionately. Although economic theory suggest that income elasticities of demand, particularly for a staple, are likely to be larger for low income consumers than upper income consumers, this pattern is not reflected in the data. Rather, income elasticity of demand appears to rise as income increases and then decline at higher income levels. A possible interpretaion of this result is that after a household reaches a certain consumption level, additional income may be allocated to essential purchased foods or other important items such as school fees, rather than to additional maize consumption. Only after some of these essentials are provided will the household use more of any additional income to increase their consumption of maize. Alternatively, the difficulty lies in the specification of the model. This is a matter for further empirical investigation.

SUMMARY AND CONCLUSIONS

The typical rural household is an important consumer of grains and mean annual utilisation/AE ranged between 318 kg and 427 kg in the three areas studied. Generally, food consumption accounted for the bulk of grain utilsation, but households commonly used grain for purposes other than food, particularly grain surplus households in Hurungwe. Own production accounted for the bulk of household requirements but quite a high proportion of households in Binga were production deficient in the 1986-1987 season.

There exist interregional differences in the importance of different grains. In Hurungwe and Bushu areas, grain consists overwhelmingly of maize. Maize is also grown in Binga, but millet and sorghum are of greater importance.

At the household level, grain demands were strongly influenced by the size and composition of the household. Income seems to influence consumption, but the derived elasticities were quite low.

The above findings are consistent with theoretical expectations concerning the relationship between food consumption and key demand shifters, although the absence of any substantial price variation for grains made it difficult to examine price effects and could have biased the income coefficients. Nevertheless, the empirical analysis is complimentary to the descripitive material and provides a basis for further consideration of these issues in the context of an agricultural household model.

Table 14. Maize consumption per adult equivalent relative to household income level, Zimbabwe.

Variables	Constant	I	I^2	F	Adjusted R^2	SE
Hurungwe						
Linear[a]	185.4	0.15	-	8.29	0.16	106.5
	(6.9)	(2.9)				
Quadratic[b]	107.1	0.57	-0.00033	10.29	0.33	95.1
	(3.1)	(4.1)	(-0.3.19)			
Semi-log[c]	-157.7	164.3		15.22	0.28	99.1
	(-1.5)	(3.9)				
Double log[d]	1.6	0.29	-	25.00	0.39	0.14
	(10.9)	(5.0)				
Bushu						
Linear[a]	162.7	0.11	-	90.45	0.57	51.7
	(19.4)	(9.5)				
Quadratic[b]	142.1	0.18	-0.00003	70.61	0.60	50.27
	(11.4)	(5.3)	(-2.20)			
Semi-log[c]	-212.3	168.96	-	70.61	0.51	55.34
	(-4.1)	(8.4)				
Double log[d]	1.6	0.30	-	62.47	0.48	0.10
	(16.2)	(7.9)				

[a]Linear C = a + bI; [b]Quadratic C = a + bI + CI^2; [c]Semi-log C = log a + b log I; Double log log C = log a + b log I; where C = Maize consumption per adult equivalent in kg per annum, I = full income. T statistics are in parentheses for the independent variables.

Table 15. Grain consumption per adult equivalent relative to household income for Binga survey area, Zimbabwe.

Variables	Constant	I	I^2	F	R^2	SE
Hurungwe						
Linear[a]	153.2	0.70	-	6.50	0.23	67.0
	(3.7)	(2.5)				
Quadratic[b]	-3.8	2.85	-.0063	5.60	0.33	62.70
	(-.04)	(2.5)	(-1.9)			
Semi-log[c]	-306.0	263.6	-	8.93	0.30	63.80
	(1.6)	(2.99)				
Double log[d]	1.38	0.47	-	9.30	0.31	0.11
	(4.24)	(3.05)				

[a]Linear G = a + bI; [b]Quadratic G = a + bI + cI^2; [c]Semi-log G = a + b log I; [d]Double log G = log a + b log I; where G = home consumption of all grains per adult equivalent in kg per annum, and I = full income per adult equivalent. T statistics are in parenthesis for the independent variables.

Table 16. Calculations of income elasticity for maize by income class, Bushu survey area, Zimbabwe.

Income class	Mean annual full income (Z$ per AE)	Income elasticity for maize[a]
Bottom quartile	133	0.14
Second quartile	313	0.26
Third quartile	518	0.34
Fourth quartile	1,168	0.44
Highest 10%	1,758	0.42

[a]Calculated from the following Engel function:
$C = 142.1 + 0.181 - 0.000025(I)^2$; where C = maize consumtpion per adult equivalent in kg per annum, I = full income per adult equivalent in Z$ per annum.
$\text{Elasticity} = (0.18 - 0.00005(I)) \frac{I}{C}$

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Appendix 1. Adult equivalent units

The World Health Organisation has set the daily calorie allowance of a moderately active male at 3,000 calories (Kcals). The consumption of people of other ages and sex can be expressed as a percentage of this standard. Such scales are called adult-equivalent scales. The categories and calorie value used to devise adult equivalent units are as follow:

	Kcal allowance	AE unit
Male over 17 years	3,000	1.0
Female over 17 years	2,200	0.73
Male 6-16 years	2,318	0.77
Female 6-16 years	1,972	0.66
Pre-school child under 6 years	1,415	0.47

Source: WHO (1985).

PAN-TERRITORIAL AND PAN-SEASONAL PRICING FOR MAIZE IN ZIMBABWE

Kay Muir and Tobias Takavarasha[1]

INTRODUCTION

Agricultural prices are seldom left to the market mechanism, regardless of the political system or level of development. This intervention in the price which would be established by unfettered supply and demand is motivated by more than existing market imperfections. The biological nature of the agricultural production process is a major factor in government intervention. Actual and planned supply are rarely the same; there are significant lags between the planning of production and the eventual supply of the commodity. Prices are unstable both within and between seasons and may involve cycles which move away from, rather than towards equilibrium--even under conditions of perfect competition. The situation is aggravated by the fact that because most agricultural commodities are necessities, they have a relatively inelastic demand. This means that fluctuations in supply will result in more than proportionate fluctuations in price. Much of the intervention is thus aimed at stabilising domestic supplies and prices. Food security, income redistribution, and reallocation of resources are other major objectives.

Government intervention in agricultural pricing can essentially be categorised either as consumer or producer oriented. In the former, the objective is to keep food prices down, and in this way agriculture is 'taxed' and resources are transferred to other sectors--which has happened in many developing countries. In the latter, prices are raised to increase farm incomes. This broadly is the position in the European Community, where a battery of supports keeps agricultural producer prices well above their market levels. These distortions have a major impact on world prices, which in turn affect price determination in developing countries.

The national development objectives of the Zimbabwe government are laid out in a number of policy documents. "The central objectives are to foster rapid economic growth, full employment, dynamic efficiency in resource allocation, and an equitable distribution of the ensuing benefits" (Zimbabwe, 1981, p.1). Government is in the process of complying with the provision in the *Transitional National Development Plan* to undertake a comprehensive examination and review of agricultural pricing with a view to developing a pricing policy which effectively and equitably promotes growth, development of the communal areas, food self-sufficiency, regional security, and efficient land use and development. Conflicts are inherent in some of these objectives and it is the role of the policy analyst to determine the trade-offs.

Zimbabwe has very high bridging costs to and from international markets and regional markets for maize are limited. Maize is the staple food and the most

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widely-grown crop. The extreme variability of maize yields and the very high differential between export and import parity mean that free market conditions would result in unacceptably high market risks for producers and unacceptable price fluctuations for consumers. Any government intervention to reduce these fluctuations will have associated costs. National buffer stocks, imports, and artificially-determined prices incur trade-offs between conflicting objectives. In order to ensure rational policy decisions, it is essential that the impacts of a particular policy are measured against each major objective.

A REVIEW OF PRICE SETTING POLICY SETTING IN ZIMBABWE

Historical background

Direct government intervention in agricultural marketing was initiated in 1931 in response to the world depression which seriously undermined the financial viability of the maize industry which relied on exports. The Maize Control Board was established to stabilize the industry and relied on local consumers to subsidise producers. The era also saw the commencement of racial discrimination in marketing. Maize from communal lands was only allowed access to the lower-priced export markets (Muir-Leresche, 1984).

Producer prices were fixed according to a basic price agreed between government and the National Farmers Union, with annual adjustments made on the basis of changes in a production cost index. This cost-plus pricing system, together with the introduction of high-yielding maize varieties during the 1950s, culminated in overproduction by the end of that decade with surpluses being sold at a loss. As a result, the pricing agreement was dispensed with in 1962. Since then, maize prices have been adjusted annually by government in consultation with the relevant marketing boards and producer representatives.

By 1970 government prescribed producer prices for maize, groundnuts, sorghum, cotton, wheat, soybeans, coffee, beef, and milk. Sunflowers and millets became controlled crops in 1983 and 1984, respectively. The degree of monopsony control varies. Whilst there is legislated monopsony control on all cotton, the Grain Marketing Board (GMB) has monopsony control between communal areas and in all designated areas outside them (Zone A). In Zone B, the communal areas (and low-output commercial areas), free trade is permited within the boundaries of each area, but the commodities may not cross zone boundaries. This was established to encourage communal areas to be self-sufficient, but to retain control of all exchanges with the formal sector and urban areas and has effectively limited exchanges between surplus and deficit communal areas, unless they have contiguous boundaries.

The government allocation to agriculture includes financing to cover agricultural marketing board deficits. In many instances, these deficits are the result of low selling prices and are effectively consumer subsidies rather than agricultural supports. However, some of the subsidies do result from various direct and indirect producer price supports and it is to a clearer analysis of these policy interventions that this

paper is directed. The annual marketing board subsidies given in Table 1 are a significant proportion of the total budget allocated to agriculture. In 1982-83 agriculture was allocated 5% of total government expenditure of which subsidies (predominantly for consumers and a few large-scale producers) accounted for over half of this vote--leaving only 2.35% to finance all extension, research, marketing, animal health, tsetse control, and administration of large-scale, small-scale, and communal agriculture (Muir-Leresche, 1984).

Price levels have been established around a number of key objectives which include achieving self-sufficiency and maximising foreign exchange earnings where favorable export markets exist. In the 1970s, cotton and groundnuts were taxed relative to opportunity costs; wheat and soybeans were subsidised. This reflected self-sufficiency objectives, the bias of the large-farm lobby, and cost of production pricing.

Price setting for controlled agricultural commodities in the 1980s has been more complicated than in previous decades. The levels of inflation, distorted exchange rate, and declining terms of trade have made the setting of the 'correct' price levels more difficult. Fluctuations in output due to drought and the financial consequences of these swings in production have further complicated the process of setting price levels (Takavarasha, 1987). Nonetheless, in recent years producer subsidies on wheat and soyabeans and taxes on groundnuts and cotton have been reduced, indicating a move towards greater efficiency; although maize price setting continues to vary in a relatively explosive cycle (Muir and Blackie, 1988).

Current price setting

The formal procedure for setting the price levels of major state-controlled agricultural commodities begin with meetings between producer representatives and the Agricultural Marketing Authority (AMA). Budgeted trading accounts and cost

Table 1. Parastatal food marketing boards' annual deficits (Z$ million), Zimbabwe.

Year	CSC[a]	DMB[b]	GMB[c]	Total	Maize[d]
1981	46.3	18.4	30.7	95.4	20.4
1982	45.3	35.6	58.4	139.3	43.6
1983	45.8	38.6	28.0	112.4	17.0
1984	24.3	46.3	31.5	102.1	42.6
1985	27.7	55.6	52.1	135.4	46.3
Totals	189.4	194.5	200.7	584.6	169.9

[a]Cold Storage Commission, predominantly beef.
[b]Diary Marketing Board.
[c]Grain Marketing Board; all food crops including maize, wheat, sorghum, munga, rapoko, groundnuts, soyabeans, sunflowers, and coffee.
[d]Maize is included in the GMB total, but is also shown separately because it is the staple food and most widely-produced commodity.
[e]Harvest year refers to the 1981-82 marketing year.
Source: Respective marketing boards' annual reports (various years).

of production schedules are submitted to the ministry. After a series of meetings with marketing and producer representatives, the ministry decides on prices to recommend to cabinet. No specific formula or technique is used to set price levels and several interrelated factors are considered. Each factor is weighted according to the type of commodity being considered so that commodities largely produced for export are more closely related to border prices. On the other hand, when determining costs of production for maize, wheat, and soybeans, strategic stockpiles and internal selling prices are usually more important than opportunity costs. The macroeconomic impact of the recommended producer prices are considered by an inter-ministerial working party before cabinet makes a final decision.[2]

Producer prices are fixed during harvest in April for all commodities (wheat being a winter crop is set preplanting). The rationale for postharvest pricing was to allow prices to vary with rainfall, but this has not been the practice (Chavanduka, 1983; and Muir, 1984). The prices are pan-seasonal and apply from April to the following March for the entire country. They are pan-territorial prices, effective at all designated receiving depots.

IMPACTS OF CURRENT PRICE SETTING

Cost of production approach

In practice, the most influential basis for producer prices has been costs of production, in particular those of the commercial farmers. Farm lobbies have been important and price negotiations have concentrated on establishing which data sets accurately reflect costs. Since independence, however, increasing recognition has been given to opportunity costs.

Economic efficiency is seriously affected whenever prices are established on a cost-plus basis. The signals which are sent to the industry are to maximise yields, regardless of costs. These same signals affect the entire agricultural service industry and in particular, the research divisions. Little or no effort is made to find cost-reducing technologies. Where input prices are also distorted in favour of capital-intensive systems, the effects on economic efficiency (growth) are particularly serious. Little attention is given to the most economically efficient farmers or technologies in accordance with Zimbabwe's comparative advantage. All the emphasis is on maximising yield or, at best, on technical efficiency. There still remains considerable confusion between absolute advantage (environment and skills) and comparative advantage which includes demand and price.

To the extent that farmers are able to control producer prices, they will lobby for, and favour a cost of production price system. From a national perspective, however, it is essential to find an independent basis for judging prices. Yield increases are important, but yield increases at any cost are not necessarily desirable. To the

[2]See Wright and Takavarasha (forthcoming) and Herbst (1988) for details of the price setting process in Zimbabwe.

extent that a national economy can support inefficient producers[3], farmers can continue to rely on a cost of production pricing mechanism. However, when the national economy cannot sustain the support system, attention has to be directed to reducing costs of production rather than relying on increased prices and transport subsidies.

International markets for most agricultural products are seriously distorted by heavy support for the farm communities in most developed countries, especially the EEC. This in turn has not only reduced world prices, but has distorted research priorities to favour yield-maximising over cost-reducing technologies. In order to sustain agriculture in developing countries, it may be necessary to subsidise production relative to the distorted world prices. But with the very limited resources available, it is essential that any implicit or explicit subsidy is targeted to those commodities which will help to maximise growth with equity. These supports should avoid sending signals which favour economically inefficient commodities and technologies. The current policies appear to have negative consequences for both growth and equity, given that officially marketed beef and dairy products are produced be a few large-scale farmers and consumed by employed urban households.

Pan-seasonal pricing

The term pan-seasonal pricing is used here to refer to the practice of offering the same price to farmers throughout the season. This section seeks to examine the major issues which must be considered in testing the hypothesis that raising the GMB purchase price at intervals after the harvest period would reduce trading losses by encouraging on-farm storage.

Seasonal production creates the need for a marketing system that can store the product from a short harvest period to the much longer consumption period. Over 90% of the GMB maize intake is normally received in five months, June to October, while sales are evenly distributed throughout the year. The exact timing of maize deliveries will vary from year-to-year depending on seasonal rainfall patterns, conditions at harvest, and availability of transport. An additional factor influencing the timing of sales is the need for ready cash by peasant farmers (Stanning, 1987).

Climatic variations cause agricultural production to follow certain distinct seasonal patterns. Hot, wet conditions are necessary at the planting stage; moisture is essential for pollination; while harvesting is best done under dry, sunny conditions. Seasonality in agricultural production places high premiums on the timely performance of critical tasks such as ploughing, planting, cultivation, and harvesting. Significant labour bottlenecks usually occur if certain tasks must be performed very quickly at specific times to ensure maximum yields (*e.g.*, weeding). Marketing agencies must similarly plan their operations in such a way that produce can be handled and transported before the next rains set in.

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[3] This refers to producers who cannot compete on world markets without subsidies and does not mean that the farmers are technically inefficient, given available resources.

Maize stocks perform a dual purpose: they provide a working stock for annual requirements and a reserve for periods of deficit. The rainfall pattern in Zimbabwe is capricious and highly seasonal, occuring mainly between November and March. Agricultural potential is distributed according to average rainfall variations and temperature differences, as depicted by the country's five natural regions. Total rainfall and its distribution during the season are the overriding limiting factors for agricultural production (Table 2).

Taking a three-year average (1985-1987), 83% of all maize marketed and 95% of maize marketed by the commercial farming sector came from Natural Region (NR) II. Although only 8% of the communal lands are in NR II, they contributed 67% of marketed maize in the period, rising to 85% in 1987 which was a drought year. The contribution to maize marketing by communal and small-scale farmers fell between 1985 and 1987, but the contribution from those farmers in NR II rose steadily (Table 3).

Zimbabwe has experienced extreme variability of rainfall in the years following independence. Rainfall was higher than normal throughout most of the country during the 1980-81 and 1984-85 cropping seasons, which produced bumper harvests and losses on exports. A widespread successive drought occurred for three seasons between 1981-82 and 1983-84 causing severe food shortages, especially in calender year 1984. There was drought again in 1986-87. Yield variability has been estimated by the GMB for both communal and commercial production (Table 4).

The above analysis, notwithstanding the limitations of using aggregated data over a brief period, has served to highlight the susceptibility of maize production to seasonal variations in yields, especially in the communal sector. Seasonability is further aggravated by the unreliability of NR III, IV and V as sources of regular marketable maize surpluses.

The relationship between seasonality and food security

Wide fluctuations in production and marketing have simply added to the government's difficulty in stabilising domestic food prices, controlling storage costs, and has resulted in stock management problems. Fluctuations in GMB intakes, sales, and reserve stocks are shown in Table 5.

The proponents of on-farm storage have shown that decentralised storage is cheaper than centralised storage under certain circumstances. Given the circumstances in Zimbabwe, however, it would appear that the economies of size of centralised storage may outweigh the benfits of on-farm storage, particularly in view of the fact that all home consumption is already stored in the communal areas and it is only the marketed surplus for deficit and urban areas and for export which is centrally stored.

The impact of pan-seasonal prices on delivery patterns

Grain marketing tends to vary considerably more than production, especially in the communal sector where a significant share of food production is consumed directly by the farm household. In drought years, net marketings and deliveries to the GMB decline proportionately more than production.

Table 2. Distribution of agricultural land by natural region, Zimbabwe.

Natural Region	Average annual rainfall (mm)	Large-scale commercial (%)	Small-scale commercial (%)	Communal farmers (%)	Resettlement farmers (%)
I	> 1000	3	0	1	2
II	750-1000	30	18	8	20
III	650-1000	16	38	17	37
IV	450-650	23	37	45	38
V	< 450	28	7	29	3
		100	100	100	100

Table 3. Marketing surplus of maize by natural region and by farming sector, Zimbabwe, 1985 to 1987.

Contribution of NR II to:	1985	1986	1987
Total sales (%)	80	86	91
Commercial sector sales (%)	95	95	95
Communal sector sales (%)	61	72	85

Table 4. Yield variability in maize production, Zimbabwe, 1980-88

	Commercial area (mt/ha)	Commercial area (mt/ha)
Mean	4.60	0.90
Standard deviation	1.06	0.45
High	5.97	1.71
Low	2.58	0.29

The persistent instability in production means that to achieve maize self-sufficiency objectives, the country has relied heavily on large reserve stocks being held by the GMB. The main rationale for self-sufficiency includes a consumer preference for white maize which is usually only available from South Africa. In addition, the high bridging costs and foreign currency constraints make imports undesirable. Large centralised storage facilities are necessary in order to maintain the required strategic reserve of some 1 million mt (or 1 year's consumption). Keeping such large stocks is expensive (Buccola and Sukume, 1988), but is considered the price of national food self-sufficiency.

Table 5. Maize stocks purchases and sales ('000 t), Zimbabwe 1980-81 to 1986-87.

Marketing year	Opening stock	Local purchases	Local sales	Exports (imports)	Shrinkage	Closing stock
1980-81	64.8	814.8	716.1	2.9[a]	2.7	157.9
1981-82	157.9	2,013.8	664.9	305.1	1.1	1,200.7
1982-83	1,200.7	1,391.3	1,046.2	492.0	18.6	1,035.1
1983-84	1,035.1	616.9	1,273.2	252.3	3.8	122.7
1984-85	123.0	942.0	860.0	(269.0)	12.0	462.0
1985-86	462.0	1,828.0	560.0	285.0	13.0	1,432.0
1986-87	1,432.0	1,594.4	713.3	494.5	12.3	1,806.3

[a]In the 1980-81 marketing year, 86.3 mt were exported and 83.4 mt were imported.
Source: Grain Marketing Board, (1988).

Similarly, in good years the percentage increase in marketing is usually substantially larger than the percentage increase in production (Stanning, 1987). Stanning's study noted that small farmers have multiple objectives in producing grain, but concluded that meeting food requirements takes priority over other production goals.

> Grain retentions are dictated by farmers' consumption and sales habits. In general, storing grain for household receives priority. In addition, most farmers regard it as important to have in store more than they consume during the year in case of a bad harvest and also to retain some grain for nonfood purposes such as labour payment, exchange, and beer brewing (Stanning, 1987, p.38).

This study showed that in surplus areas, most maize was sold in a single sale two to three months after harvest and that only 10% of the population exhausted home grain supplies before the next harvest. Local purchases and labour exchanges made up most of the deficit. Although GMB has pan-seasonal prices, local prices do vary but "farmer behaviour in Urungwe and Bushu implies that the costs of storage (losses due to insects and rodents, outlays on buildings), outweights the benefits of storage" (*ibid*, p.52).

Although the exact timing of maize sales varies from year-to-year depending on seasonal rainfall patterns, conditions at harvest, and availability of transport; the need for ready cash is a major factor affecting timing. For many small farmers, crop sales are the main source of cash and, therefore, timing of sales is closely related to cash needs. The decisions are unlikely to be affected by incentives offered to encourage storage for sales later in the year. Large-scale farmers would be in a better position to take advantage of price variations, but this would have a major impact on traditional short-term financing.

Introducing price variations to encourage on-farm storage will thus have a very limited impact since peasant farmers do not rely on central government to store their maize for home consumption--a significant proportion of national production is already stored for one season on farms (only 30% of total estimated production in

the small farm sector was marketed in 1985, some 45% of total GMB intake). Early sale of that proportion which is marketed is likely to continue, even with fairly considerable price incentives for on-farm storage.

Intraseasonal price variations will, therefore, only affect the large-scale sector. If it were in the national interest to stagger deliveries to the GMB, this sector would respond--provided the incentives were sufficient to cover cost of storage facilities, interest on investment, spoilage risk, and the interest on extended financing of variable inputs. Transport currently staggers deliveries to some extent, but all maize is usually delivered by August; whereas the peasant sector, which has poorer access to transport, continues to deliver much later. The potential moisture spoilage effect from large deliveries after the rains have commenced needs to be considered before any incentives are offered for deliveries after October. In years when buffer stocks are low, price incentives have been offered for early delivery in April and May. These incentives have effectively been available to the large-scale sector only because of the throughput necessary to warrant investment in artificial drying facilities.

The administrative costs of estimating the necessary variations to elicit desired response are high in countries where reliable forecasting models and data do not exist. Thus, it would only be worthwhile if the social costs of pan-seasonal prices are likely to be considerable. This is unlikely, given that they affect intra rather than interseasonal storage and given the existing storage infrastructure in Zimbabwe. In most years the GMB prefers to take delivery of the grain as soon as possible after harvest so that it can plan effectively and negotiate export or import contracts as appropriate.

Pan-territorial pricing

Pan-territorial pricing refers to the uniform depot price paid throughout Zimbabwe. Farmers bear the cost of transport to depots, but the marketing parastatals bear all transport costs ex depot to zone centres. Millers, processors, and food aid organisations bear costs of transport from zone centres. There is a uniform selling price ex zone centre and the retail price of maize meal is controlled throughout the country with an insignificant margin allowed for transport. This results in shortages in rural areas during deficit years (Child, Muir, and Blackie, 1985) and loss-leader or conditional sales when maize is available. This paper, however, concentrates on pan-territorial producer prices and does not consider the impacts of uniform selling prices.

Uniform depot prices mean that farmers in the more remote surplus regions are being subsidised by farmers in deficit regions and by farmers closer to markets. Pan-territorial prices are defended on the basis that they increase returns to the more isolated areas and thus increase equity. In addition, they are easier to administer and appear, superficially, to be more equitable since all farmers are paid the same price. The fact that incomes are equal to price times yield appears to be ignored.

Economists agree that uniform prices have a negative impact on economic efficiency and thus growth[4]. Uniform prices are usually supported on equity grounds. The thesis of this paper is that pan-territorial prices have a negative impact on both growth and equity. Uniform prices infer an implicit transport subsidy which distorts resource allocation by encouraging the production of low-value, high-bulk commodities in remote regions. This increases demand on an already over-burdened transport sector. Deficit regions receive a producer price very much lower than those which would obtain under a free-market system (see Figure 1), thus reducing incomes in these areas and increasing the transport burden. To the extent that the poor are maize producers living in deficit areas, there is a negative impact on equity.[5]

Theoretical impacts on growth

Uniform prices ignore transport costs, thus distorting comparative advantage and resulting in the misallocation of resources. The extent to which resources are misallocated depends on the development level of the transport infrastructure and the distance from markets. Producers close to market have an absolute advantage in the production of all commodities (assuming similar agronomic conditions), but producers further from the market have a comparative advantage in the low-bulk, high-value commodities. This is because the transport cost is a smaller proportion of the value to weight ratio (*e.g.*, transport costs are 6% of sorghum price and only 1.5% of groundnut price).

If producer prices ignore transport costs, then they are encouraging remote regions to grow high-bulk, low-value commodities while producers close to the market are discouraged by the implicit tax. Producers in deficit areas would produce more if prices were higher, but with a uniform price they do not receive the necessary incentive which means that greater imports to the area are necessary. These distortions place an excessive burden on the transport system; increasing the demand for transport and thus foreign currency. Where the foreign exchange component of transport is estimated at some 70%, the distortion is even greater if opportunity cost pricing is used. It is not possible to estimate the actual impact on the transport sector since it is difficult to estimate the reduction in production in remote surplus areas and the increase in deficit regions or in areas close to the market, without reasonably accurate price elasticities of supply.

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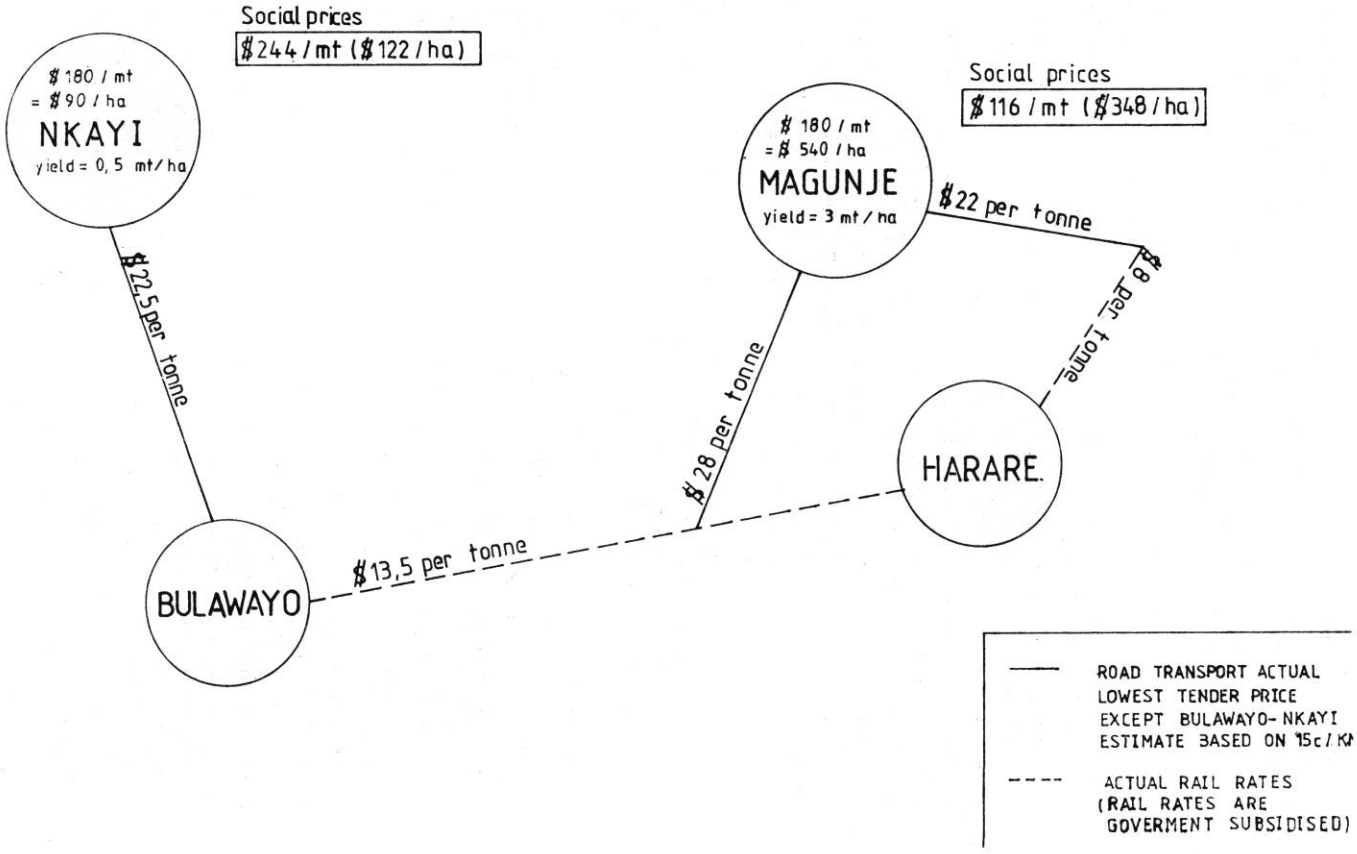
[4] Agronomists usually prefer to see higher prices in agronomically suitable zones in the interests of higher national average yields. This would only be economically rational if there was no demand for that commodity in deficit areas.

[5] Where the poor are involved in purchasing maize, those in surplus areas are negatively affected by uniform prices. Theoretically, net maize purchasers in deficit areas benefit from uniform prices which keep producer prices low. In fact, in deficit areas local sales are made well above the government established price (e.g., In Chivu in 1988, maize was selling for three times the GMB purchase price). To some extent, this informal trading offsets the distortions within those areas of the uniform price policy.

FIGURE 1

EXAMPLE OF PAN-TERRITORIAL PRICE DISTORTIONS



The production of higher-value crops is reduced, thus reducing agricultural output, GNP, and growth. In many instances, these higher value crops play an important role in saving or earning foreign currency, thus furthering the negative impact of uniform prices on the supply of foreign currency. The most important constraint to growth in Zimbabwe is access to foreign currency.

Theoretical impacts on equity

Pan-territorial prices are defended on equity grounds, since it is assumed that incomes will be less differentiated if farmers in remote regions are paid the same prices as farmers close to markets. This ignores the price differentials which would exist for surplus and deficit areas. It would hold true only if all farmers were endowed with the same natural resources, abilities, and tastes. Given differences, there are regions where maize would be surplus to local requirements and these surpluses sold to urban areas and deficit regions. In a free market, prices would reflect the transport costs of either "importing" or "exporting" a commodity. These social prices are given in blocks on the diagram (Figure 1).

Producer prices would be higher in deficit areas, thus increasing incomes. Where people in remote surplus areas have higher total incomes (subsistence and cash) than those in deficit areas, the pan-territorial prices will have a negative impact on equity. At the same time, where wealthy, surplus farmers are located close to distribution centres, the uniform prices implicitly tax these farmers in favour of remote surplus producers. In these circumstances equity may be promoted. In Zimbabwe most of the direct transfer is between taxpayers and remote surplus farmers with most of the implicit transfers being between deficit area and surplus area farmers. The actual impact of pan-territorial prices on equity can only be determined empirically.

Theoretical impacts on food self-sufficiency and employment

National self-sufficiency may be achieved by subsidising transport in remote surplus regions, thus encouraging greater maize production and sales to the marketing board. Regional or district self-sufficiency is, however, very much lower with pan-territorial prices. It has been shown that regional differentials reflecting comparative advantage would result in higher producer prices in deficit areas. Local prices would reflect the cost of transporting the maize from surplus areas. Producers in deficit areas would be offered higher prices, which would encourage local production. Local production (self-sufficiency) of maize in deficit areas is economic, up to the point where it becomes cheaper to import from surplus areas. Thus, despite poor agronomic conditions which result in lower yields and higher risks, if the demand for maize is high then it pays farmers in a marginal region to grow maize, provided they can produce the maize at a price no more than the cost of purchasing and transporting it from a surplus area. This is in direct contradition to the advice given by many agriculturalists who prefer to see production directed by criteria governing supply alone. Demand, however, is equally important in determining both comparative advantage and equilibrium prices which in turn affect local food self-sufficiency.

Uniform prices distort production patterns by encouraging high-bulk, low-value commodities in remote areas. If the commodities which are discouraged are more labour-intensive, then pan-territorial prices have a negative impact on employment. In Zimbabwe these commodities (tobacco, groundnuts, cotton) are all labour-intensive.

Experience from Tanzania and Zambia

Efforts were made in Zambia after independence to introduce regional pricing for maize so that surplus areas received a lower price and deficit regions a higher price. However, in 1970-71, however, uniform district prices were introduced and in 1974 uniform local depot prices were established. Although designed to increase equity, the policy increased rural differentiation and implicitly taxed Western Province farmers (the poorest in Zambia). The increased transport requirements have contributed to the large losses incurred by NAMBOARD and the marketing cooperatives (Dodge, 1977).

In Tanzania prior to 1975, only the transport costs from regional centres to distribution centres were subsidised. When the cooperative societies were abolished in favour of state marketing boards, the villages themselves served as procurement points--introducing a significant transport subsidy to the more remote regions and villages. The transport of maize from the southwest cost Tsh40 million in 1980, whereas sales of the same maize generated less than Tsh 36 million (Keeler *et al.*, 1982). Ndulu (1980), in a simulated study of the situation in four regions, convincingly showed that in 1975-76 and 1976-77, without the interregional transport subsidy policy implied by uniform prices, supplies of maize would have been greater. As the response would have come from low transport-cost regions, there would have been a net social saving. The government introduced regional pricing differentials for maize in 1981, but instead of lowering producer prices in remote surplus regions they have increased them. This is directly contrary to the principle of efficiency pricing and exaggerated the misallocation of resources. It was done in order to discourage maize production in the drier regions which are subject to crop failures and, although unstated, is because the more remote areas have a much higher official price elasticity since the high transport costs do not make parallel markets worthwhile. Suzuki and Bernard (1987) maintain that while the policy resulted in "huge financial deficits" the opportunity costs of growing high-bulk maize in the southern highlands (and thus resource misallocation) is low because of the problems which are associated with growing tobacco, assumed to be the only alternative crop. They also assume that poorer people are located in the southern highlands. Therefore, the authors maintain that the dramatic spatial swing in maize production accords with both growth and equity in Tanzania. Even if these assumptions are valid, there is insufficient evidence presented to prove that the policy accords with either growth or equity.

Evidence from Zimbabwe

When Zimbabwe moved away from regional prices to the use of average uniform into-depot prices, the "intent was for consumers in production areas to subsidize

those in deficit areas, while at the same time encouraging production in areas more suitable for maize production by giving them a higher effective return than to producers in marginal areas" (GMB, 1987). This is extremely inequitable since incomes are related to price times yield. Therefore, it is unfair to pay farmers who receive half a tonne per hectare the same as those who receive five tonnes per hectare, in the name of equity. In general, areas with an absolute agronomic advantage in producing a particular commodity (high yield areas) will continue to be the major producers. However, any policy which pays farmers in deficit areas less than the price of purchasing and transporting that maize from the surplus areas will reduce both growth and equity. The only instance in which it makes sense to pay farmers in high-yielding zones more than those in low-yielding zones is if the commodity has no demand in the low-yielding zone. In a free market, the situation would not arise since a low demand would mean that the price would not be high enough to result in production when yields are low.

Maize is widely grown and is the staple food in all farm communities, but 91% all marketed output in 1987 came from NR II. Almost all the farmers outside this area are penalised by the uniform price system. Despite a considerably smaller urban population, sales from Bulawayo exceeded those from Harare in 1986 and were only slightly lower in 1987. This indicates the much greater demand from the rural and smaller urban centres in that region.

Transport is a major factor in GMB deficits and, in particular, to the very considerable deficits on the maize account. The removal of pan-territorial pricing would significantly reduce this deficit.

An empirical example is presented below, using data for Magunje in Mashonaland West and Nkayi in Matabeleland North to indicate the consequences of the uniform into-depot prices (pan-territorial) in Zimbabwe. In 1987[6] 20,000 mt of maize were transfered from Magunje to Bulawayo (Table 6). The example uses actual transport costs shown in Figure 1.

Equity impact

Under the uniform price system of Z$180/mt, the gross revenue in Magunje is Z$540/ha, whereas it is Z$90/ha for Nkayi. Assuming that people in Nkayi are poorer than those in Magunje, this does not accord with equity. A regional price differential reflecting transport to or from Bulawayo, would mean a price of Z$138.50/mt in Magunje and Z$244/mt in Nkayi. This will still leave farmers in the better agronomic zones with higher returns, but it would reduce the differential since Magunje farmers would now get Z$415.5/ha and Nkayi farmers Z$122/ha. Figure 1 shows the impact if Magunje farmers pay the full costs of transport to Nkayi.

[6]The harvest year, which represents the 1986-87 growing year and the 1987-88 marketing year.

Table 6. Illustrative impact of pan-territorial and regional prices in two areas of Zimbabwe, 1987.

	Magunje (NR II)	Nkayi (NR IV)
GMB		
Total intake (mt)	28,900	1,500
Amount distributed	20,000[a]	local only[b]
Grain price (Z$/mt) under:		
Uniform pricing	180.00	180.00
Regional pricing	138.50[c]	244.00[d]
Yield (mt/ha)	3.0	0.5
Gross returns (Z$/ha) under:		
Uniform pricing[e]	540.00	90.00
Regional pricing[f]	415.50	122.00
Value of grain (Z$):		
Uniform pricing[g]	3,600,000	270,000
Regional pricing[h]	2,770,000	366,000
Impact[i]		
GMB (Z$)[jk]	loss -830,000	gain 96,000
Social losses (Z$)[lm]	loss -1,411,000	loss -765,000
Farmer (Z$/mt)[n]	subsidy 41.50	subsidy -64.00

[a]Transferred from Magunje to Bulawayo.
[b]No grain transferred out of depot.
[c]Computed as uniform price minus transport cost.
[d]Computed as uniform price plus transport cost.
[e]Computed as yield times uniform price.
[f]Computed as yield times regional price.
[g]Computed as uniform price times amount distributed for Magunje; and uniform price times total intake for Nkayi.
[h]Computed as regional price times amount distributed for Magunje; and regional price times total intake for Nkayi.
[i]Depot to destination route is Magunje to Bulawayo, and Nkayi from Bulawayo which assumes Nkai is a deficit area importing from Bulawayo.
[j]Excludes supply response to price which would result in higher GMB and social losses from uniform prices.
[k]GMB losses are the costs to the GMB of paying uniform prices for maize.
[l]Only includes opportunity cost of foreign currency in transport (assuming 70% foreign content worth more by a factor of 2). A very crude estimate that makes the unlikely assumption that with regional pricing, deficit areas become self-sufficient. However, the resource misallocation impact on commodity and input mixes is not included in the estimate.
[m]Social losses are the cost to the nation due to transport distortions.
[n]Farmer cost is the implicit transport tax/subsidy or the difference between what the farmer would get if regional prices were introduced, using actual costs of transport from Magunje to Bulawayo and Z$0.15/km/mt to Nkayi.
Source: GMB tenders and personal communications.

Fiscal impact

GMB currently absorb all the transport costs from depot to various zone centres. The Z$830,000 implicit loss to government from uniform prices on the 20,000 mt transfered from Magunje assumes that if regional pricing were introduced, farmers would bear transport costs and that these areas would continue to be major suppliers.

Crude estimates of actual fiscal losses from the uniform price policy can be made. Assume that 80% of Bulawayo supplies currently come from the maize surplus regions, but that this drops to 60% after regional pricing is introduced; savings on Bulawayo maize sales from the introduction of regional producer pricing would have been approximately Z$8 million in 1987. This figure cannot be accurately estimated without price elasticities of supply in the different regions.

Efficiency (growth) impact

It would be useful to calculate the net savings to the nation from reduced transport demand and better resource allocation. Given some very rough estimations and limiting assumptions, the social costs of uniform prices--with respect to Bulawayo in 1987--were in the region of Z$40 million.

This assumes that there would be a 50% reduction in the surplus production from remote areas (159,000 mt) and an equivalent increase from the Bulawayo region resulting in a Z$10 million saving on transport with foreign currency component and shadow rate as given above. It assumes that 50% of the reduced maize comes from remote commercial farms (13,250 ha) and is replaced by tobacco and fallow, while the other 50% comes from communal and resettled farmers (26,500 ha) and is replaced by cotton and groundnuts. Using social profitability per hectare from O'Driscoll and Takavarasha(1988), the opportunity cost of the pan-territorial maize price on resource allocation is calculated using the formula: area planted to new crop(s) times social return per hectare less social value of replaced maize (see Appendix 1).

Basic supply response studies for the commercial sector do exist and more accurate estimates of response in that sector are possible, but there is very little information available for the communal sector. The calculations in Appendix 1 are used for illustrative purposes only.

Similar calculations could be made for the impact on employment and food self-sufficiency. It is obvious from the evidence presented that uniform into-depot prices are inimical to growth and that with respect to producers in deficit areas, inimical to equity. The impact of transfers between surplus producers remote from and close to markets and between deficit area and surplus area consumers have not been estimated.

POLICY RECOMMENDATIONS

Partial decontrol of the market would reduce the inefficiencies arising from costs of production, pan-seasonal and pan-territorial pricing. Government could continue to both stabilise prices and maintain buffer stocks to achieve food self-sufficiency.

Although there would still be costs associated with maize self-sufficiency, these would be reduced as the government would purchase when prices were low and sell when they are high. Producers would be asssured of a minimum price which covers variable costs and consumers would be protected from exhorbitant price rises in drought years (Child, Muir, and Blackie, 1985).

Where governments prefer to continue with full state control, the negative consequences for growth, equity, and employment can be reduced by institutionalising economic analysis of policy impacts. It is possible to reduce pricing inefficiencies, or at least measure the cost and, therefore, make informed decisions. Another suggestion is that marketing parastatals should be allowed to distinguish in their cost accounting between commercial functions and those which are social operations undertaken on behalf of government--strategic grain reserves and low food prices for consumers (Coopers & Lybrand, 1988). To do this, opportunity cost prices for both producers and consumers must be established.

A preliminary analysis of the efficiency impact of different price policies has been carried out by O'Driscoll and Takavarasha (1988), showing where current prices for outputs and inputs differ from social prices. An investigation of the comparative advantage of wheat (Morris, 1988) also includes some domestic resource cost (DRC) analysis of other irrigated crops. It is recommended that such analysis is institutionalised and that a major preliminary study be undertaken to determine comparative advantage for the various regions and farming systems.

Domestic resource cost ratios (DRCs) are a measure of the local resources required to earn or save one unit of foreign currency. The policy analysis matrix, used to determine a DRC, provides a good framework for analysing policies. The impacts of government policies can be measured in efficiency terms; and the results can indicate which commodities should be promoted to maximize growth. At the same time, if policymakers decide to vary prices to achieve other objectives (*e.g.*, equity, food self-sufficiency employment, or soil conservation), to the extent that there is a trade-off with growth, it can be measured. DRC analysis measures comparative advantage and will reflect well for those commodities and technologies which rely on Zimbabwe's abundant resources in the production process. It is unlikely that any one DRC study will produce precisely the same results as another study, since they depend on the data used and social price estimates. It is, however, the relative results which are important since these will signal which commodities have the greatest comparative advantage in saving or earning foreign currency.

It is further recommended that border prices, adjusted to reflect the value of foreign exchange, be used as the basis for setting price for all commodities except maize. These prices can then be modified in response to lobbies or to achieve other goals and the impacts can be measured. It is difficult to decide whether to use export or import parity for maize. This presents a particular problem since the high bridging costs result in severe losses, both for exports and imports. A number of suggestions have been made which amount to setting the price half way between world export and import parity (Muir-Leresche, 1984) or at regional export parity (O'Driscoll and Takavarasha, 1988).

While pan-seasonal prices for maize do have some impact on parastatal deficits and partial decontrol will reduce these, the impact is minor compared to the cost of the reserve stocks necessary to reduce interseasonal fluctuations. From the social welfare perspective, it is uncertain that on-farm storage would be cheaper than centralised storage with its greater economies of size. Peasant farmers already store grains used for all home consumption during the year and usually prefer to sell any marketable surplus as soon as possible. The administrative costs of setting the prices at the correct levels to induce the desired on-farm storage of marketable surpluses would be considerable and the returns are unlikely to warrant their establishment at this stage. As the peasant sector becomes more specialised and more closely integrated in the market, this may change. Preparation can be made for this development by building the capacity to establish reasonably accurate supply and demand elasticities.

Pan-territorial pricing, on the other hand, has a major impact on both the marketing board deficits and the economy with negative impacts on both growth and equity. Where central government finances all transport costs, all surplus farmers benefit and farmers in remote surplus areas gain the most. To the extent that they are poorer, this will accord with equity but at an enormous social cost as previously demonstrated. Uniform prices act as an implicit tax on deficit area farmers, suppressing their locational advantages. Thus, uniform prices are contrary to both growth and equity, where these farmers are poorer than farmers in surplus areas. The authors strongly recommend that government introduce regional producer prices for maize which more closely approximate opportunity costs.

While it would be difficult to establish regional prices which exactly reflect opportunity costs, it is possible to set prices which take into account some of the transport costs. In the first instance, this could be done by establishing prices at surplus area depots which reflect transport costs to the nearest zone centre (*i.e.*, NRII/III farmers would bear the cost of transport to Harare or Mutare. GMB would still bear the additional cost of transport to deficit areas. Using the example in Figure 1, Magunje farmers would be paid Z$150/mt using this formula. Theoretically, the price should reflect transport costs to the main deficit region (Bulawayo), but initially it may be politically difficult to make such a sharp differential. If surplus production and exports continue to make losses, removing more of this subsidy should then be considered.

Deficit area farmers, however, should be paid the full cost of transporting the maize from surplus areas. Thus, they should be paid the f.o.r. Harare price plus transport from Harare. Given the low yields in these areas, it is unlikely that they will significantly increase output. But they should be encouraged to be self-sufficient up to the point where it becomes cheaper to import from other regions.

It is also considerably fairer--given that income is equal to price times yield--to pay farmers in low-yielding areas more than those in high-yielding areas. It would be expensive to growth to pay them more than the opportunity cost of importing maize from surplus areas, but it is inimical to both growth and equity to pay them less. Theoretically, they should be paid the depot price plus transport costs from the furthest surplus region and it may be possible to do this. At a minimum, they should

be paid the depot price plus transport costs from Harare. The calculation of these transport rates should not reflect the subsidised rail rates which the earlier analysis does. Thus, the deficit area price would be higher than that reflected in the example.

CONCLUSION

It is possible for governments to considerably increase the efficiency of marketing parastatals without changing their structure. While a number of specified goals may take precedence over growth and foreign currency earnings, it is important for policymakers to be aware of the impacts of any policies designed to achieve these goals and to choose the least-cost path. Financial and economic values differ. Whenever possible, it is important that price signals maximise social welfare through rational resource allocation. Implicit taxes or subsidies do not imply that farmers are making losses or excessive profits, but that they are being paid too little or too much to ensure the best possible choice of outputs and inputs. This movement away from economically optimum resource allocation may be necessary to achieve other goals. Therefore, it may be desirable to subsidise farmers by paying prices above world prices. On the other hand, some policies (*e.g.* uniform prices) are highly distortive and a way to implement regional prices which more closely approximate opportunity cost should be found.

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Appendix 1:

Assuming commercial farmers take 13,250 ha to produce 79,500 mt (6mt/ha) of maize; and they replace maize with 6,625 ha of tobacco (Z$ 5,423/ha) and leave 6,625 ha fallow--the opportunity cost on commercial farms is computed as: Z$35,927,375 added value of tobacco (6,625 ha tobacco x Z$5,423/ha) minus Z$9,672,500 (13,250 ha maize x Z$730) in reduced maize value, for a net charge of Z$26,254,875.

Assuming communal farmers take 26,500 ha to produce 79,500 mt (3mt/ha in NRII); and they replace the maize with 13,250 ha of cotton (Z$422/ha) plus 13,250 ha of groundnuts (Z$655/ha)--the opportunity cost on communal farms is computed as: the Z$5,591,500 (13,250 ha cotton x Z$ 422/ha) in added value of cotton, plus Z$8,678,750 (13,250 ha groundnuts x Z$655/ha) in added value of groundnuts, minus Z$9,434,000 (26,500 ha maize x Z$356/ha) in reduced value of maize, for a net charge of Z$4,836,250. The commercial plus and communal opportunity cost is approximately Z$31 million, plus Z$10 million due to reduced transport costs, for a total opportunity cost of approximately Z$41 million.

Note: The social returns/ha used in this analysis were calculated by O'Driscoll and Takavarasha (1988).

SMALL GRAIN MARKETS IN ZIMBABWE: THE FOOD SECURITY IMPLICATIONS OF NATIONAL MARKET POLICY

Charles Mbwanda and David D. Rohrbach[1]

INTRODUCTION

Over 60% of Zimbabwe's farmland lies in drought prone regions receiving an average of less than 650 mm annual rainfall. This includes 75% of the nation's smallholder farming areas. Yet, only 15% of Zimbabwe's cereal supplies are provided by the relatively more drought tolerant small grains: red and white sorghum, bulrush millet, and finger millet. Roughly 70% of national cereal calories are provided by maize. Consumption of wheat, 10-20% of which is normally imported, holds secondary importance.

The Zimbabwe Government has sought to use market policy to help redress this balance. In 1984, after a 20 year hiatus, bulrush and finger millet were again declared controlled crops. Sorghum prices have generally been set equal to or higher than the price of maize.[2] Scheduled millet prices have been set substantially higher. Access to Grain Marketing Board (GMB) buying points has recently been expanded in low-rainfall regions.

A costly consequence of this strategy has been the buildup of small grain stocks. GMB intake has increased. Meanwhile, high GMB selling prices have choked off domestic market demand. Sorghum and millet are only being purchased from the GMB for uses without close substitutes.

The contribution of this strategy to food security in the nation's drought prone regions has been limited. Smallholder small grain sales have increased faster than production. Absolute production gains in the semi-arid regions have been limited. Most GMB deliveries have been derived from a small minority of producers, many situated in relatively higher rainfall zones.

This paper argues that the construction of a market policy more attuned to Zimbabwe's agroclimatic comparative advantage requires an improved understanding of the determinants of small grains supply and demand. The different production opportunities facing large- and small-scale farmers must be considered. Producer pricing strategies must be balanced against consumer market requirements. The opportunities for expanding small grain utilization by industry require consideration.

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[2]A major exception is the sharp reduction in red sorghum producer prices in 1987. This aimed to discourage sorghum sales from the large-scale commercial farm sector.

Zimbabwe's food security and development objectives will best be served by the reestablishment of supply-demand equilibrium in the small grains subsector. Ultimately, however, price and market interventions cannot replace the need for technological change. The welfare of most farmers in Zimbabwe's semi-arid regions can only be significantly improved with advances in sorghum and millet productivity.

SMALL GRAINS SUPPLY

Small grain production in Zimbabwe has historically been dominated by the smallholder or communal farm sector.[3] At independence in 1980, smallholders planted over 95% of the nation's sorghum area and harvested roughly 80% of the sorghum crop. Virtually the entire millet crop was grown by small farmers. By 1988, smallholders had further increased their relative contribution to Zimbabwe's small grain production.

In sharp contrast, small grain marketing has historically been dominated by the commercial farm sector. In 1980, commercial farmers delivered over 90% of the GMB sorghum intake. Millet sales were uncontrolled and only small quantities were being directly purchased from small-scale producers by the brewing and feedgrain industries. Eight years later, millet sales had become controlled. Smallholder deliveries of small grains to the GMB had increased while commercial farmers had sharply reduced their deliveries to the GMB.

Commercial sorghum production and sales: 1970-1988

Commercial sorghum production has historically been restricted to red varieties, high in tannins and low in susceptibility to bird damage. Commercial sorghum production trends have been broadly characterized by sudden adjustments in area planted and rising average yields (Table 1). A decline in area planted during the mid-1970s was largely offset by continuing yield improvements. When commercial sorghum area rebounded, in 1985 and 1986, production and market deliveries increased sharply, reaching record highs.

Since commercial sorghum deliveries have dominated GMB intake, small shifts in commercial cereal grain area can have a large impact on GMB stocks. In most years since 1970, almost the entire commercial sorghum harvest was sold to the GMB. Retentions for animal feed tended to increase after drought years. But on average, approximately 80% of harvests were delivered to GMB depots. When production levels rose sharply in 1985 and 1986, the national market was flooded.

The explanation for these shifts in area planted are not easy to determine because sorghum represents such a minor commercial sector crop. On average, less than 5% of summer cropped area has been allocated to this sorghum. This crop has

[3]In this paper, the terms smallholder and communal farmer are used interchangeably. While most resettlement farmers are also small landholders, this sector still represents a small contributor to national production and sales of small grains. The commercial sector includes medium- and large-scale land owners. However, most commercial production and sales are derived from the large-scale sector.

Table 1. Sorghum production and deliveries to the GMB, Zimbabwe, 1970 to 1988.

	Commercial Farm Sector			Smallholder Farm Sector		
Harvest Year	Area (000 ha)	Production (000 mt)	Sales (000 mt)	Area (000 ha)	Production (000 mt)	Sales (000 mt)
1970	16.8	6.8	2.6	198.8	65.3	0.7
1971	12.3	7.6	2.5	240.0	136.5	1.5
1972	14.3	19.9	18.5	240.0	120.1	4.5
1973	30.5	27.9	23.6	122.0	22.8	2.2
1974	13.6	14.0	9.5	275.0	150.0	3.5
1975	5.0	5.6	4.2	210.0	105.0	0.8
1976	7.1	16.3	13.2	235.0	120.0	0.8
1977	6.5	15.2	13.5	90.0	36.0	0.5
1978	7.7	16.2	15.9	120.0	57.0	0.8
1979	7.5	18.9	19.2	76.0	30.0	0.7
1980	6.8	16.3	15.8	120.0	66.0	2.0
1981	9.3	25.1	22.9	200.0	100.0	7.5
1982	8.2	17.4	17.2	200.0	50.0	2.0
1983	7.7	7.5	5.1	280.0	44.0	0.3
1984	9.9	18.1	5.8	156.0	37.4	3.9
1985	15.0	54.0	53.4	215.0	81.0	20.6
1986	27.0	68.0	64.4	145.0	63.2	4.9
1987	7.5	11.6	2.9	172.7	40.4	0.7
1988[a]	7.1	12.7	6.8	213.0	163.2	70.5

[a]Crop Forecasting Committee Estimates, 1987-88 season.
Source: Muir-Leresche (1985), GMB (various years), AMA (various years, a), AMA (various years, b), CSO (various years, b).

never accounted for more than 10% of total commercial cereal grain area. As a result, a relatively small change in the profitability of sorghum or its principal substitutes could result in a large change in sorghum production levels.

Sorghum is commonly believed to substitute most closely with maize in production. Correspondingly, the explanation for the 80% decline in commercial sorghum area and production in 1974 and 1975 might initially be linked with a 30% decline in the sorghum-to-maize producer price ratio. Yet the commercial area planted to maize also was estimated to have declined, albeit marginally, during this period. Commercial soybean and tobacco plantings were increasing. These are not generally viewed as sorghum substitutes. Again, however, the relatively small proportion of land involved may disguise the true resource allocation determinants.

The explanation for the 1985 and 1986 increase in sorghum area and production appears similarly unclear. The sorghum-to-maize producer price ratio did not

change. Commercial farmers may have been responding, in part, to the widespread incidence of drought during the previous three years. Also, a sharp increase in fertilizer costs had reduced the net returns to fertilizer intensive crops. Yet, while sorghum acreage was growing, maize acreage also increased. Again, a tradeoff with soybeans seems apparent. Only a greater understanding of commercial land allocation patterns, however, will ultimately clarify these relationships.

In response to the sharp increase in sorghum deliveries over the previous two seasons, the government reduced the producer price of red sorghum by 40% in 1986. This pre-planting price announcement was followed by a 75% decline in commercial sorghum area. Commercial farmers refused to shift to the production of white sorghums because of fear of bird damage. During the following 1987-88 cropping season, commercial sorghum production levels and deliveries remained low. Yet the GMB sorghum stocks remained.

Smallholder sorghum production and sales: 1970-1988

Throughout the 1970s, sorghum was essentially a subsistence crop for the smallholder farm sector. Area planted peaked in 1974, then declined, during the late 1970s, as a result of the war. In contrast to the rise in commercial sector yields, smallholder yields were declining. On average, less than 3% of smallholder production was sold to the GMB.

Immediately after independence, smallholder sorghum production levels largely returned to the levels achieved ten years previous. Sorghum plantings regained their pre-war levels, but yields remained low. More significantly, smallholders began delivering an increasing proportion of their harvests to the GMB. In 1981, more than 7% of smallholder sorghum was sold. In 1985, with the introduction of GMB collection points throughout the small farm sector, approximately 25% of smallholder sorghum production was sold.

Record sorghum harvests were forecast for the smallholder sector in 1988. For the first time, smallholders were expected to deliver the majority of sorghum purchased by the GMB. Actual deliveries now appear significantly lower than the forecast levels, but the small farmer has clearly become an important market participant.

Two factors highlight the growth of smallholder participation in national sorghum markets since independence. First, smallholder sorghum sales have increased faster than production. Between 1980 and 1985, small farm production of sorghum increased by 15,000 mt. Deliveries to the GMB increased by almost 19,000 mt. The main surge in production occurred in 1981. In contrast, the major gain in smallholder sales did not occur until 1985. If smallholder production estimates are correct, sorghum retentions were declining.

Second, smallholder sorghum deliveries appear more closely dependent on market access than the official producer price. The sudden growth of smallholder deliveries in 1985 can largely be explained by the establishment of 135 temporary GMB collection points that year. The sharp decline in the number of collection points the following year brought a corresponding decline in smallholder deliveries. The

distribution of deliveries closely corresponds with the distribution of GMB buying points.[4]

The sharp decline in red sorghum prices announced in 1986 appears to have had a limited impact smallholder planting decisions. Total smallholder sorghum area increased during the 1986-87 cropping season. While market deliveries declined as a result of the drought, almost one-half of all sales in 1987 were of red varieties. Despite declining real producer prices, smallholder sorghum plantings again increased in 1987-88.

Smallholder millet production and sales: 1970-1988

Bulrush millet represents the second most important smallholder food crop after maize and is consumed in much the same manner. Finger millet tends to be used for village beer production and as a porridge for the sick. This crop is used as a maize substitute when maize supplies are depleted as a result of drought.

The production trends for bulrush and finger millet are difficult to interpret due to incomplete information (Table 2).

The area and production levels of both crops appear to have sharply fluctuated since 1970. Production levels of both crops seem to have sharply increased during the mid-1970s. Since then, millet areas have declined. For unknown reasons, average millet yields appear to be increasing.

During the 1970s and early 1980s, bulrush millet and finger millet were not controlled crops. Small quantities of these grains were purchased from producers directly by private sector millers and brewers. In 1984, the government established control over these crops in an effort to improve the incentives for smallholder millet production. Sales across district boundaries had to be made to the GMB.

The level of private sector bulrush and finger millet sales prior to 1984 is unknown. When first recontrolled, millet deliveries to the GMB stood at about 4,500 mt. Once the GMB collection point system had been established in 1985, millet deliveries increased more than tenfold. These now stood almost three times higher than smallholder sorghum deliveries.

As with sorghum, the impact of official product prices on millet production levels and marketing decisions remains ambiguous. The sharp decline in real producer prices between 1984 and 1988 seems to have had little impact on area planted. Delivery levels and the distribution of smallholder millet sales appear more closely related to rainfall levels and the changing number of collection points, than to official prices.

GMB GRAIN SALES AND THE ACCUMULATION OF SORGHUM AND MILLET STOCKS

The recent buildup in small grain stocks can only partly be attributed to the growth of GMB intake. Perhaps more significantly, GMB sales of small grains onward to

[4]This relationship will be subjected to more detail analysis in the coming year.

Table 2. Zimbabwe smallholder millet production and deliveries to the GMB, Zimbabwe, 1970 to 1988.

	Bulrush millet			Finger millet		
Harvest Year	Area (000 ha)	Production (000 mt)	Sales (000 mt)	Area (000 ha)	Production (000 mt)	Sales (000 mt)
1970	176.0	55.0	0.0	53.0	59.0	0.0
1971	191.0	73.0	0.0	35.0	51.0	0.0
1972	202.0	110.0	0.0	30.0	47.0	0.0
1973	225.0	109.0	0.0	69.0	56.0	0.0
1974	na	na	0.0	na	na	0.0
1975	441.0	146.0	0.0	76.0	38.0	0.0
1976	456.0	165.0	0.0	120.0	81.0	0.0
1977	497.0	191.0	0.0	141.0	87.0	0.0
1978	254.0	83.0	0.0	35.0	11.0	0.0
1979	233.0	88.0	0.0	150.0	58.0	0.0
1980	293.0	100.0	0.0	147.0	61.0	0.0
1981	na	na	0.0	na	na	0.0
1982	na	na	0.0	na	na	0.0
1983	na	na	0.0	na	na	0.0
1984	na	na	4.1	na	na	0.4
1985	241.0	120.5	44.7	93.0	72.2	13.1
1986	169.0	77.7	22.8	107.0	48.2	8.5
1987	187.3	56.5	1.9	109.2	40.4	0.5
1988[a]	237.0	184.0	64.9	119.6	83.7	30.2

[a]Crop Forecasting Committee Estimates, 1987-88 season. na = data not available.
Source: Muir-Leresche (1985), GMB (various years), AMA (various years, a), AMA (various years, b), CSO (various years, b).

industry remained limited. The government set the GMB selling prices of small grains at levels designed to cover the GMB's basic storage and handling costs. In contrast, the selling and/or milling costs of maize were subsidized. As a result, small grain purchases were limited to uses for which there were no close substitutes. As stocks mounted, the GMB was faced with a choice of selling the stocks at a loss or reducing the prices at which it purchased small grains. No clear strategy was chosen. Consequently, the GMB is expected to incur a small grains trading deficit of over Z$25 million during the 1988-89 market year (AMA, various years, c).

GMB sorghum stocks 1970-1988

From 1970 to 1980, the GMB's selling price for sorghum averaged 35% higher than the price of maize (Table 3). As a result, domestic demand was limited to uses such as opaque beer brewing, for which demand was inelastic. This did not present a problem as long as GMB intake of sorghum remained low. Throughout the 1970s, sorghum deliveries to the GMB roughly equalled the level of onward sales to industry (Table 4). In the occasional years when intake was low, Zimbabwe imported small quantities of sorghum. When intake was well above domestic demand (greater than 20,000 mt), small quantities of sorghum were exported.

The decline in the sorghum-to-maize selling price ratio during the early 1980s was partially offset by a milling subsidy paid on the processing costs of maize. While sorghum sales to domestic industry increased in 1982, these remained equivalent to only 2% of industry purchases of maize.

The limited industrial market for sorghum became clearly evident when both smallholder and commercial deliveries increased sharply in 1985. While 13,000 mt

Table 3. Official coarse grains selling prices (Z$/mt), Zimbabwe. 1970 to 1988.

Harvest Year	Red & white sorghum	Finger millet	Bulrush millet	Maize	Sorghum/ maize
1970	55.60	a	a	41.70	1.33
1971	54.95	a	a	41.70	1.32
1972	54.67	a	a	41.90	1.30
1973	54.84	a	a	41.90	1.31
1974	54.56	a	a	43.25	1.26
1975	54.56	a	a	51.54	1.06
1976	71.75	a	a	51.54	1.39
1977	71.75	a	a	51.54	1.39
1978	90.00	a	a	57.07	1.58
1979	98.00	a	a	63.89	1.53
1980	117.00	a	a	89.00	1.31
1981	117.00	a	a	137.00	0.85
1982	117.00	a	a	137.00	0.85
1983	147.00	a	a	157.00	0.94
1984	165.00	365.00	281.00	177.00	0.93
1985	239.00	365.00	281.00	222.00	1.08
1986	239.00	365.00	281.00	222.00	1.08
1987	239.00	365.00	281.00	222.00	1.08
1988	281.00	365.00	281.00	222.00	1.27

[a]No purchases, not a controlled crop in this year.

Source: AMA (various years, a), AMA (various years, b), AMA (various years, c).

Table 4. GMB intake and disposal of sorghum, Zimbabwe, 1970-1988.

Harvest year	Domestic deliveries (000 mt)	Imports (000 mt)	Exports (000 mt)	Local sales (000 mt)	Closing stocks (000 mt)
1970	3.0	7.0	0.0	12.0	na
1971	4.0	9.0	0.0	13.0	1.0
1972	23.0	0.0	0.0	15.0	9.0
1973	26.0	0.0	8.0	21.0	6.0
1974	13.0	3.0	2.0	17.0	3.0
1975	5.0	12.0	0.5	18.0	2.0
1976	14.0	0.0	0.0	14.0	2.0
1977	14.0	0.0	0.0	14.0	2.0
1978	16.7	0.0	0.0	14.7	3.0
1979	19.9	0.0	0.0	17.4	6.0
1980	17.8	0.0	0.0	19.3	4.0
1981	30.4	0.0	0.0	18.4	15.9
1982	19.1	0.0	2.5	23.8	8.5
1983	5.3	8.7	0.0	18.3	3.9
1984	20.7	0.0	0.0	14.2	10.7
1985	82.0	0.0	13.4	21.5	56.0
1986	77.0	0.0	1.0	25.0	106.7
1987	3.8	0.0	2.0	24.0	76.8
1988[a]	77.3	na	na	na	na

[a]Crop Forecasting Committee Estimate, 1987-88 season.
na = data not available.
Source: Muir-Leresche (1985), GMB (various years), AMA (various years, a), AMA (various years, b), CSO (various years, b).

were disposed of as food aid to Ethiopia, most of the increase in deliveries ended up in GMB stocks. Strong commercial deliveries in 1986 raised these stocks still further. By the end of the 1986-87 market year, the GMB held stocks equivalent to five years worth of domestic sorghum sales.

In early 1988, the GMB's sorghum selling prices were increased in order to partially offset the rising storage costs. This further discouraged industry purchases at a time when sorghum stocks were rapidly deteriorating. In mid-1988, the government authorized the GMB to dispose of 10,000 mt of this grain as animal feed at a 40% price discount. Even so, the GMB's trading loss continues to mount.

Low red sorghum deliveries in 1988 and the deterioration of red sorghum stocks have caused a shortage of malting quality sorghum required by the brewing industry. Paradoxically, imports of malting sorghums may be required, despite the persistence

of substantial GMB stocks. The government is under pressure to raise producer prices to promote red sorghum production while reducing the losses incurred in holding large low quality sorghum stocks.

GMB millet stocks 1984-1988

The GMB's stockholding position for bulrush and finger millet is even worse than that for sorghum. Since the GMB began purchasing these crops in 1984, sales onward to industry have been minimal. Since 1985, official selling prices for bulrush millet have remained 26% higher than the price of maize. Official selling prices for finger millet have been almost 65% higher. The only domestic purchases have been those essential for the production of established products.

At the end of the 1986-87 market year, bulrush millet stocks stood 34 times higher than the level of domestic sales. These would have been even higher if the GMB had not offered pig and poultry producers a 43% discount on almost 2,000 mt of grain. In 1988, the GMB is similarly offering a 33% discount of 10,000 mt of bulrush millet for stockfeed. As in the case of sorghum, this price cut is viewed necessary in order to dispose of deteriorating grain stocks. The 1988-89 GMB trading deficit for bulrush millet has been forecast at a level equal to almost three-quarters of the total cost of bulrush millet purchased over the previous four years.

At the end of the 1986-87 market year, finger millet stocks similarly stood 36 times higher than the level of domestic sales. The opaque beer brewing industry purchased small quantities to help flavor sorghum-based beer. A few specialty foods also used small amounts of finger millet. Yet, no prospect was available for expanded purchases.

In 1988, as with the other small grains, the GMB was authorized to dispose of 10,000 mt of finger millet at more than a 50% price discount. The forecast 1988-89 trading loss will be more than the total original cost of the finger millet purchased over the previous four years.

REASSESSMENT OF THE JUSTIFICATION FOR HIGH SMALL GRAINS PRICES

The establishment of high official producer prices for sorghum and millet has been viewed as essential for improving smallholder incomes and for discouraging the shift of smallholder land out of the more drought-tolerant small grains to maize. Yet, the GMB's correspondingly high sorghum and millet selling prices have limited the competitiveness of these crops as industrial inputs and ultimately on formal sector consumer markets. The justification for the maintenance of high producer prices merits reexamination.

High producer prices and smallholder income growth

The maintenance of high producer prices as a means to support smallholder incomes assumes those producers in greatest need of such support sell small grains to the GMB. This strategy also assumes income support through a price incentive is more

effective than alternative investments of the GMB trading loss. Both assumptions can be questioned.

To date, large-scale commercial farmers have been the greatest beneficiaries of high red sorghum prices. When smallholder sales peaked following the 1985 harvests, commercial farmers still accounted for almost 75% of GMB deliveries.

While the largest beneficiaries of high white sorghum and millet prices have been smallholders, the distribution of these benefits has been heavily skewed (Table 5). In 1984-85, the last year of widespread, good rainfall for which delivery data is available, over one-half of all smallholder sorghum deliveries came from five of the 162 communal areas in Zimbabwe. These account for only 18% of the smallholder sector's sorghum crop area and 20% of its production. Five communal areas accounted for over 70% of smallholder deliveries of bulrush millet to the GMB. These accounted for 39% of the smallholder bulrush millet area and 42% of the estimated production. Finger millet deliveries, though concentrated, correspond more closely with the distribution of production.

Table 5. Concentration of smallholder crop deliveries, Zimbabwe, 1984-85 cropping season

	Percent of total		
	Deliveries	Crop area	Crop production
Sorghum			
Top 5 communal areas	54	18	20
Top 10 communal areas	69	27	30
Bulrush millet			
Top 5 communal areas	71	39	42
Top 10 communal areas	85	48	53
Finger millet			
Top 5 communal areas	46	45	44
Top 10 communal areas	62	63	60
Maize			
Top 5 communal areas	38	19	25
Top 10 communal areas	52	25	30

Source: GMB (various years); AGRITEX (various years).

Survey data recording the distribution of crop sales within various communal areas displays even a narrower distribution of sales income[5]. Only 20% of small grain producers within each of the top selling communal areas may be responsible for 50-75% of total sector crop deliveries.

In effect, the additional income generated from high producer prices is largely flowing into the hands of better than average producers. Insofar as high GMB prices raise local village sorghum and millet prices, the poorest producers facing production deficits are being forced to pay more for their grain. The value of the disposable income of those facing the greatest food insecurity may be declining.

These observations are supported by the fact that only 27% of smallholder producers were even registered to sell crops to the GMB in 1985, the year of highest small grains sales from the smallholder sector. Every farmer registered will not sell in every year. Other farmers could sell through approved buyers or via friends, but the registered producers probably encompass the largest and most consistent sellers of crops.

In sum, a broadly-focused pricing policy will primarily affect those farmers who participate most actively in formal grain markets. In the case of coarse grains generally, and small grains in particular, this is a small proportion of the total. Alternative policies or programs could more efficiently increase the incomes or consumption levels of the poorest farm households who tend to suffer the most severe food security constraints.

Promoting the production of drought tolerant crops

The establishment and maintenance of high sorghum and millet prices has also been justified as a means to reverse the substitution of relatively less drought-tolerant maize for relatively more drought-tolerant sorghums and millets in the nation's low-rainfall zones. The existence of this trend is commonly assumed. Yet, available evidence contradicts these assumptions. Estimates of smallholder sorghum area during the 1987-88 cropping season are roughly equal to those for 1981 and only marginally lower than those in 1971. Estimates of smallholder millet area in 1987-88 are more than 50% higher than those available for the early 1970s.

The existence of this substitution trend may have been surmised from the observation that many farmers in drought prone regions of the country are growing maize. Further, smallholder maize acreage has been growing more rapidly than the acreage allocated to most other crops. The production of maize in highly drought prone, low-rainfall regions is contradictory to agronomic principal. Yet several explanations help justify these smallholder investments in the maize enterprise.

First, the high returns to maize achieved in the unusually good-rainfall year may more than offset the low returns obtained during several consecutive low-rainfall years. Dependable food aid programs may reinforce this sort of risk preference.

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[5]Preliminary results from 1988 University of Zimbabwe surveys in Mudzi, Mutoko and Buhera. See also Rohrbach (1988).

Second, a review of extension worker yield estimates for alternative coarse grains during the 1986-87 drought year indicates relative yield risks associated with low-rainfall may be less than imagined. Maize still performed better than sorghum or millet in many communal areas receiving much less than their average 650 mm of rainfall. The improvement of sorghum and millet varieties could reverse this relationship. With varieties currently available, however, the production of maize in many low-rainfall regions could be justified.

Third, some farmers in the nation's low-rainfall regions may simply be willing to forgo grain yield in return for some alternative grain characteristic. Many of these farmers state their taste preference for maize. These preferences also appear linked with the relative ease of maize processing.

Finally it must be noted that official producer prices probably have little effect on the decisions of most producers in the low-rainfall and drought-prone regions. Few of these farmers have ever sold anything to the GMB. Deliveries occurring can be much more closely linked to the accessability of GMB buying points than to the level of official prices.

THE POTENTIAL GROWTH OF SMALL GRAINS UTILIZATION BY INDUSTRY

The extent of price reductions required depends on the potential growth in industrial demand for small grains. As noted above, industry use of small grains has been relatively low and constant over the past 15 years. Purchases have been restricted for uses for which there are no close substitutes.

In a survey of five of the six largest coarse grain purchasers from the GMB, current small grain utilization patterns were assessed. A preliminary evaluation was conducted of economic factors constraining the expansion of small grain usage.

Since 1982-83[6], small grains accounted for less than 1% of coarse grain usage in the five firms surveyed (Table 6). The lack of close substitutability between the alternative grains is indicated by the relatively consistent levels of usage despite changes in price. Between 1982 and 1987, the GMB's selling price for sorghum increased 25%, relative to that for maize. Sorghum usage appears little affected. In effect, small grains appear closer compliments than substitutes with maize. Surprisingly, finger millet usage appears to have been largely unaffected by the establishment of product market controls in 1984. Throughout the 1982-83 to 1987-88 period, purchases of white sorghum were minimal and no use was made of bulrush millet.

Over the six-year period, the largest quantities of sorghum and millet were used in beer and stockfeeds. Beyond this, the small grains are simply used in specialty products. Only one company produced a product containing more than 15% sorghum. This was a 100% red sorghum porridge. In other products red sorghum was employed simply to impart a preferred reddish color and unique taste. Firms

[6]This was the earliest year the firms were allowed to provide data due to government restrictions.

Table 6. Coarse grain usage (mt) in the production of alternative products, five firm sample, Zimbabwe, 1982 to 1988.

Product	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88
Flour						
Maize	142,847	93,096	73,249	107,475	111,033	103,344
Beer[a]						
Maize	45,660	44,000	3,600	41,200	7,100	42,200
Red sorghum	695	747	62	749	07	720
Finger millet	85	80	13	93	3	100
Stockfeed						
Maize	3,000	2,000	2,000	2,000	2,000	2,000
Red sorghum	130	180	10	120	50	170
Porridge						
Maize	383	618	65	585	60	550
Red sorghum	41	39	6	34	1	28
White sorghum	2	2	2	2	2	2
Snacks						
Maize	20	21	4	22	3	24
Subtotal						
Maize	191,910	139,735	19,538	151,282	50,716	148,118
Red sorghum	866	966	28	903	88	918
Finger millet	85	80	13	93	3	100
White sorghum	2	2	2	2	2	2
TOTAL	192,863	140,783	20,481	152,280	51,699	149,138

[a]Includes premix beer
Source: Industry survey (1988).

noted that in the case of most maize-based products, however, these traits discouraged the use of sorghum.

The lack of substitution across coarse grains partly reflects the high levels of small grain selling prices. Representatives of each firm were asked what sorghum selling price adjustments were required in order to promote greater use of these crops. The respondents indicated they would be interested in using greater quantities of red sorghum if current selling prices declined by 10-20% (Table 7).

Table 7. Proposed selling price adjustments by interviewed firms, Zimbabwe, 1988.

	Percentage discount sought from current selling price[a]	
Firm	Red sorghum	White sorghum
A	20	50
B	10	40
C	15	40
D	10	50
E	20	50

[a]Current selling prices for both red and white sorghum are Z$281/mt.
Source: Industry survey (1988).

Table 8. Firm ratings of factors influencing sorghum use levels, Zimbabwe, 1988.

	Firm				
Factor	A	B	C	D	E
GMB selling price	1	1	2	1	1
Flour selling price	3	3	2	2	1
Price of other grains	2	1	2	3	2
Level of consumer demand	2	2	1	1	1
Consumer concerns about price	2	2	1	3	1
Availability of technology	4	3	1	1	1
Cost of processing technology	2	3	2	1	1
Appropriate processing technologies	1	3	1	1	1

Codes: 1 = very important, 2 = important, 3 = minor problem, 4 = not important.
Source: Industry survey (1988).

They would use greater quantities of white sorghum following a 40-50% price decline.[7] This implies a change in red sorghum prices from Z$281/mt to around Z$239/mt and a reduction in white sorghum prices from Z$281/mt to Z$155/mt. The GMB's current selling price for maize is Z$222/mt.

The five firms were also asked to rate a series of factors influencing their use of sorghum in current and future grain-based products. The GMB selling price was cited as the most important determinant of sorghum usage (Table 8). In addition, most of the firms questioned consumer acceptability of sorghum-based products. Consumers are believed to have a strong preference for maize-based products. Most of the firms also expressed concerns about the availability of appropriate processing technologies for sorghum. Technology investment costs were regarded as high. Such investments were also viewed as risky as long as the government's small grains market policy remained unclear.

In addition to the above constraints, four of the companies indicated improved grading of sorghum varieties is essential for greater utilization. It was suggested that such grading should distinguish variety differences required for different end uses. The respondents noted that grain currently received from the GMB includes mixtures of different varieties and substantial foreign matter. This makes grain processing difficult.

Gomez (1987) reviews the potential for expanded use of sorghum as a replacement for maize and wheat and in the manufacture of new products. This study identifies a potential demand for almost 500,000 mt of sorghum for products such as sorghum meal porridge, biscuits, clear beer, pasta, starch, a rice substitute, and glucose. Many of these alternatives still need to be tested for their economic and technological feasibility. Also, consumer preferences require further evaluation. But this report helps convey the potential scope for expanding domestic sorghum and millet food utilization.

Gomez did not consider the opportunities for the expanded use of sorghum and millets in stockfeeds. Yet, this could provide the largest single source of growth in sorghum and millet consumption over the next ten to twenty years. The only significant constraint to the expanded use of small grains in livestock feed is relative feed grain prices.

FUTURE SMALL GRAINS POLICY

The development of an improved market policy for small grains requires a clear perception of the broad range of price and non price variables influencing production levels, market deliveries, and industrial demand. Available evidence has shown that the link between producer price adjustments and the food security of most sorghum

[7]White sorghum had been hypothesized to be a closer substitute to maize than red sorghum. These surprising results could reflect a preference for small quantities of red sorghum for specialty products. Greater usage of red sorghum might require larger price discounts. In other words, the demand schedule could be kinked. This issue will be subject to further investigation.

and millet producers is limited. The high levels of small grains stocks indicate the need for a reduction in both producer and consumer prices. In the long run, the welfare of both producers and consumers in the nation's low-rainfall regions can best be served by strategies aiming to balance sub-regional and national small grains supply and demand.

Red sorghum market policy

In late 1988, the Zimbabwe opaque beer brewing industry announced the existence of critical shortages in the availability of brewing quality red sorghum. Though stocks stood almost three times the average level of domestic industrial demand, most of these had deteriorated below standards required by the brewing industry. Paradoxically, despite the still high stocks, consideration was being given to the need to import malting quality red sorghum grain. An increase in red sorghum producer prices was offered to stimulate deliveries to the GMB.

The disruption of national red sorghum markets, during the mid-1980s largely resulted from an unexpected, and still difficult to explain, sharp increase in large-scale commercial farm deliveries in 1985 and 1986. Prior to 1985, marketed supplies and demand remained in rough equilibrium. Since 1986, the government has adjusted producer prices in response to each year's expected deliveries. Despite evidence of low demand, the only consumer price adjustments have been for limited quantities of deteriorating stocks. The losses associated with maintaining these stocks continue to mount. A new long-term market strategy is badly needed. This must encompass improved understanding of the determinants of red sorghum supply and demand.

Though accurate estimation of commercial sector red sorghum supply response remains difficult, the above assessment of recent production and sales patterns highlights several factors requiring consideration. Commercial producers are highly responsive to producer prices, particularly to the relative level of these prices. Since red sorghum represents a relatively minor crop, the reallocation of only small proportions of commercial land to and from sorghum can have a major impact on GMB intake.

The recent growth in commercial sector retentions of sorghum for animal feed represents an additional variable in the supply response equation. Over the past two years, commercial farmers have more than tripled their sorghum retentions for livestock feed. This results in part because feedgrain-to-beef price ratios have reached historically low levels. In 1986, commercial farmers were offered a Z$0.30/kg price incentive for export quality beef. Strong interest has been sparked in the establishment of pen-feeding enterprises. Longer-run trends in red sorghum use for feed will depend on livestock prices and competitiveness with its main substitute--yellow maize.

Smallholder supply responsiveness remains similarly difficult to estimate. Smallholder sorghum deliveries during the 1984-85 marketing year were originally forecast at 36,000 mt, but only 19,700 were delivered. In 1988-89, deliveries were

forecast at 67,500 mt. Actual GMB intake, however, may be closer to 15,000 mt.[8] These differences arise, in part, from difficulties encountered in the estimation of production levels, but they also indicate a lack of understanding of the range of factors influencing marketed output.

The above analysis suggests market deliveries may be more heavily contingent on the level of market accessability in red sorghum producing areas than on the level of official producer prices. Further investigation of these relationships is required.

A major ingredient in the future market outlook for red sorghum in Zimbabwe is the potential for expanding industrial demand. To date, such demand side considerations have been largely ignored. The structure of industrial demand has changed little over the last 20 years because red sorghum substitution has remained uncompetitive. Maize has been priced cheaper and industry has received little encouragement to develop alternative coarse grain utilization technologies. As long as such circumstances continue, red sorghum will remain a minor industrial input. Supply incentives will remain limited by demand constraints. Such demand constraints could be resolved through the establishment of a consistent and long-run strategy of promoting sorghum utilization.

White sorghum and millet market policy

White sorghum, bulrush millet, and finger millet--in contrast to red sorghum--are primarily smallholder sector crops. At least in the near term, market policy for these crops will primarily affect communal area producers. Policy adjustments will have the greatest impact on the limited number of small farmers participating actively in national grain markets.

As in the case of red sorghum, smallholder sales responsiveness for white sorghum and the millets is difficult to estimate. In 1988-89, smallholder bulrush millet deliveries to the GMB were forecast at 63,000 mt. Actual deliveries will be closer to 10,000 mt. Finger millet deliveries were forecast at 27,000 mt. Halfway through the marketing season these appear unlikely to reach one-tenth of this level.[9]

Again, one reason for these discrepancies may be inaccurate estimates of production levels. Alternative estimates of smallholder crop area frequently differ by more than 100% (Table 9). Alternative yield estimates have shown similar differences. Officially published (CSO, various years, c) estimates of smallholder sorghum production can only be viewed as extremely rough. These publications do not even provide estimates of millet production levels. Even if production levels were known, these would not necessarily correspond with the levels of market deliveries.

Perhaps more significantly, the development of a market policy for these crops must consider the requirements for stimulating a consistent and growing level of

[8]These data are for both red and white sorghum. The forecasts were made by the CSO Crop Forecasting Committee based on information available during the midst of the production season. The latest estimate of 1988-89 deliveries was made in August 1988.

[9]See footnote 7.

Table 9. Alternative estimates of coarse grains crop area for the smallholder sector Zimbabwe, 1987-88 cropping season.

Coarse grain	CSO	AGRITEX	
	agricultural survey	Extension worker	Aerial photo
Maize	1,164	1,548	1,945
Bulrush millet	218	172	391
Sorghum	108	154	445
Finger millet	34	90	63

Source: CSO (various years, a), AGRITEX (various years), AGRITEX (1988).

industrial demand. The build-up of white sorghum, bulrush millet, and finger millet stocks has largely been a result of the simple lack of small grain purchases from the GMB. These crops have been priced out of the market. Substitution for maize and wheat has not been encouraged. Without industry purchases, the GMB will simply increase its stocks. In the future, producer prices must better reflect the determinants of industrial demand. Adjustments in regulatory and investment policies affecting industrial usage of coarse grains could further stimulate the usage of more drought-tolerant crops.

SMALL GRAINS TECHNOLOGIES AND SMALLHOLDER FOOD SECURITY

Adjustments in market policies will have a limited impact on the food security of the majority of smallholder small grain producers, given their lack of participation in national markets. A larger and more direct impact will come from improvements in crop production technology geared to production systems characterized by limited resources. Such technologies could serve to improve average yields or raise the minimum yield experienced in years of drought. Improved technologies could also serve to reduce storage losses and reduce processing costs.

Survey results in some of the major sorghum and millet producing regions of the country indicate few of these farmers employ fertilizer or insecticide.[10] Yet, these farmers have shown an almost universal proclivity to adopt hybrid maize. Such adoption patterns indicate a clear perception of the value of the relatively low cost

[10]Initial results of SADCC/ICRISAT and UZ/MSU surveys during the 1987-88 and 1988-89 cropping seasons.

seed input. In contrast, the chemical inputs are viewed as highly risky or as offering low returns.

Until recently, little breeding research had been conducted to develop improved sorghum and millet varieties or hybrids attuned to the needs of Zimbabwe farmers. Recent advances by the SADCC/ICRISAT and Zimbabwe sorghum and millet research programs offer the prospect for major improvements in smallholder yields. These are likely to have a substantially larger impact on smallholder food security than simple adjustments in alternative coarse grain prices.

The ultimate impact of these biological research gains on domestic small grains markets depends on the specific form of the technological advance (*e.g.*, its degree of adaptability) and its relationship to consumer preferences. In recent University of Zimbabwe surveys in Buhera Communal Area, farmers in three out of six wards expressed a strong preference for consuming maize. In contrast, each ward was dominated by sorghum and millet production. Given good access to producer and consumer market outlets, these households could sell their small grains and purchase maize. Some farmers were doing this.

Market analysts must recognize that the impact of improved sorghum and millet varieties will depend on the grain characteristics. Alternative variety traits could lead to increased small grain consumption or to an increase in market deliveries. Smallholders also have the option of feeing greater quantities of sorghum and millet to livestock. Animal sales could fund larger purchases of maize.

Improved sorghum and millet varieties are probably essential for improving smallholder food security in Zimbabwe. The form of this relationship will depend, however, on the relative correspondence between variety characteristics and alternative channels of consumer demand. Food security may be attained either through direct consumption or via the income generated by market sales of small grains or small grain-based products.

This analysis has shown that adjustments in market policy will not provide a sufficient basis for improving smallholder food security. This must be coordinated with improvements in small grain technologies, but the reestablishment of domestic small grains market equilibrium will ultimately prove necessary to support expanded sorghum and millet production.

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SELECTED RESEARCH FINDINGS FROM RWANDA THAT INFORM POLICY THEMES IN SOUTHERN AFRICA[1]

Scott Loveridge, Surge Rwamasirabo, and Michael T. Weber[2]

OVERVIEW AND BACKGROUND TO RWANDA FOOD SECURITY POLICY ISSUES

Paper overview and objective

Section I of this paper reviews recent events in Rwanda. In section II we identify principal research findings from Rwanda with the objective of helping inform five important food security themes in Southern Africa.

Food and agricultural policy foci in Rwanda

Rwanda faces tremendous challenges in its food and agricultural sectors. The landlocked country is struggling against high population density (the country is 90% rural) and poor links with seaports to improve the performance of its economy.

The Government of Rwanda's (GOR) main objectives in the agricultural sector have been to increase food self-sufficiency and rural incomes. In the past, the GOR's means of achieving these goals have been relatively successful. The country has focused on cropping previously unused land, maintaining soil fertility, improving some crop varieties, and trying to stabilize bean and sorghum prices. They also have tried to modestly increase prices paid to farmers for selected food crops while maintaining a buffer stock to attenuate consumer price increases when food supplies contract.

Recent improvements in information in Rwanda

In 1982 the GOR, with support from USAID and other donors, began a series of initiatives to improve understanding of the rural economy. The first was to begin the Agricultural Survey and Statistics Service (SESA) in the Ministry of Agriculture. SESA fields and analyzes annually national representative surveys on rural households. A second activity was to field a national rural and urban budget and consumption survey through the Ministry of Planning.

In 1985, Michigan State University began collaborating with the GOR in these initiatives through its Food Security in Africa Cooperative Agreement and its Rwandan Employment and Enterprise Policy Analysis Project. MSU researchers

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Scott Loveridge, Nicholas Minot, and Donald Mead have completed long-term assignments, working with Rwandan researchers to increase knowledge about the rural and urban economy. Among other things, these cooperative research programs have helped establish a series of research and policy working papers at SESA and another at the Ministry of Finance. These working papers and reports have been used to help institutionalize seminars and other more informal exchanges to inform policymakers on production, employment, and income issues in Rwanda. Much of the data and analysis in the present paper comes from various SESA working papers and the Ph.D. dissertation that the principal author, Scott Loveridge, has recently completed. It also benefits from the work of Nicholas Minot and colleagues in the Ministry of Plan who have analyzed the national budget and consumption survey.

Past and current performance of the Rwandan agricultural sector

Figure 1 indicates that caloric production from the eight major crops[3] kept pace with Rwanda's high population growth until about 1981. This large increase in total output is largely attributable to expansion in the area cropped. From 1981 onward, population appears to have begun to gradually grow faster than food output, reflecting reduced availability of new lands, decreased average soil fertility, and lower marginal productivity of additional labour in agricultural production. Figure 2 shows a decline in per capita sorghum production beginning well before the decline in per capita caloric production. Farmers appear to be shifting away from sorghum to beans and tubers. Tubers provide more calories per unit of land than sorghum, while beans provide much more protein than sorghum but roughly the same calories per unit of land.

It now appears that Rwanda may have a more severe chronic food security problem than earlier believed. Analysis by the Ministry of Plan of the 1983 rural budget and consumption survey displayed in Table 1 indicates that well over 40% of rural households are consuming less calories than the estimated 2,100 kcal/capita required for maintenance of good health. Table 1 also shows that the disparity between high and low kilocalorie consumption groups is not large compared to other countries, indicating a fairly even income distribution. On the other hand, Table 1 does show that a higher proportion of households with inadequate calorie consumption are concentrated in two regions of the country: the Southwest and South-central areas.

Households at all levels of caloric intake allocate the vast majority of their total income[4] to food, as indicated in Table 2. Affordable food in the market is a critical element for the survival of the many rural households that do not produce enough food on their own farms. On the other hand, Table 3 indicates that agriculture provides over 60% of rural families' income. High prices might therefore help increase farm incomes. This presents a dilemma for Rwandan policymakers: raise

[3]These account for over 95% of total caloric production.

[4]"Income" includes production of food, goods, and services that are consumed rather than marketed.

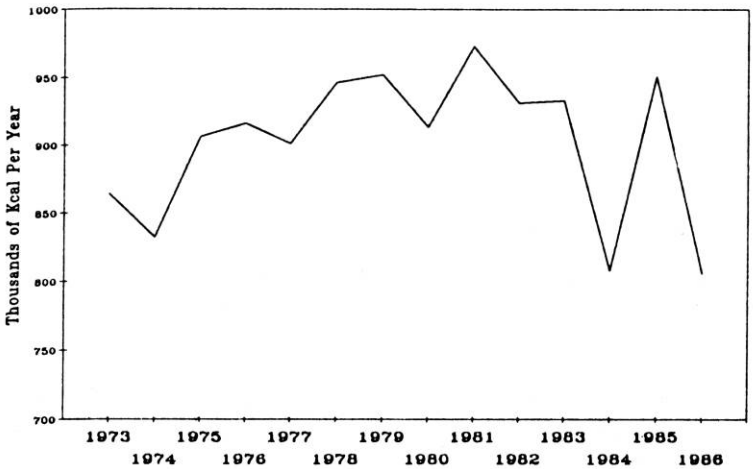

Figure 1. Per capita calorie production (8 major crops), Rwanda, 1973 to 1986.

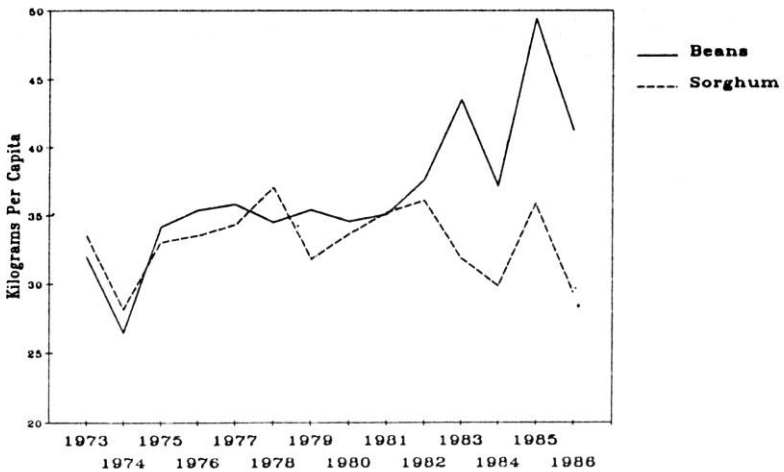

Figure 2. Per capita bean and sorghum production, Rwanda, 1973 to 1986.

Table 1. Characteristics of rural households by level of caloric consumption, Rwanda.

	Caloric consumption (quintiles of Kcal/ae/day)					
	1st	2nd	3rd	4th	5th	Rwanda
Average value of consumption (FRW/capita/yr)	8,069	9,698	11,784	13,327	15,979	11,763
Principle occupation (% of households)						
Agriculture	28.6	18.9	33.7	38.9	40.3	32.1
Agric./artisanry	40.3	51.0	38.8	30.4	26.4	37.4
Artisanry	2.1	7.4	13.1	10.2	10.8	8.7
Commerce	4.5	3.7	6.5	1.6	2.4	3.7
Salaried	4.7	6.2		5.3	5.5	4.4
Other	19.8	12.8	7.9	13.6	14.6	13.8
Total	100.0	100.0	100.0	100.0	100.0	100.0
Food self-sufficiency (%)	61.6	67.2	70.4	67.6	70.6	67.4
Caloric consumption (kcal/day/ae)[a]	1,458	1,896	2,292	2,743	3,838	2,443
Average farm size (ha)	1.2	1.4	1.5	1.2	1.2	1.3
Geographical zone (% of Households)						
Northwest	13.8	10.0	6.1	19.4	24.1	14.7
Southwest	24.6	16.8	15.2	14.8	8.9	16.1
North-central	18.8	21.9	22.5	26.5	23.7	22.7
South-central	28.1	29.7	25.7	13.0	10.7	21.4
East	14.7	21.6	30.5	26.3	32.5	25.1
Total	100.0	100.0	100.0	100.0	100.0	100.0
Average household size (people)	5.7	5.7	5.2	4.5	3.6	4.9
Female-headed households (% of households)	27.0	12.3	19.2	14.8	29.9	20.6
Average age of household head (years)	48.9	49.3	48.2	46.5	48.3	48.2
Number of households surveyed	58	57	49	52	54	270
Weighted percentage of households	20.2	20.1	19.5	20.2	19.9	100.0

[a]ae is adult equivalent.

Table 2. Structure of rural final consumption by level of caloric consumption, Rwanda.

Item	Caloric consumption (quintiles of Kcal/ae/day)					
	1st	2nd	3rd	4th	5th	Rwanda
Final consumption (% of total)	100.0	100.0	100.0	100.0	100.0	100.0
Food consumption	82.3	77.0	79.1	79.4	85.7	80.6
Cereals	3.1	2.4	3.0	3.7	4.3	3.3
Tubers/bananas	30.0	27.3	27.7	27.2	24.0	27.1
Legumes	19.1	21.2	20.7	20.6	24.7	21.3
Fruits/vegetables	4.3	2.6	4.0	3.3	2.7	3.3
Animal products	5.1	5.2	5.8	3.8	13.9	6.8
Beverages	17.1	23.0	20.9	20.6	14.3	19.4
Other foods	3.6	3.1	2.7	2.5	2.1	2.8
Non-food consumption	17.7	23.0	20.9	20.6	14.3	19.4
Clothing	6.3	6.0	8.4	7.7	4.6	6.6
Housing	4.1	8.7	4.1	6.6	3.7	5.5
Furnishings	1.3	2.5	2.3	1.4	1.7	1.9
Water/energy	1.1	1.1	0.9	1.1	1.0	1.0
Health/hygiene	2.2	1.6	1.4	1.5	1.5	1.6
Education	0.8	1.1	0.4	0.3	0.1	0.5
Transport	0.5	1.2	1.6	1.2	0.9	1.1
Tobacco	0.9	0.6	0.8	0.6	0.4	0.6
Leisure/services	0.6	0.2	1.0	0.2	0.4	0.5
Final consumption (FRW/household/year)	43,913	54,375	59,291	58,652	55,735	54,360

[a]ae is adult aquivalent

prices to increase incomes and output, or lower prices to help the rural poor?

Surveys and analysis to inform food security policy in Rwanda

In 1985 SESA was already collecting annual production statistics from a nationally representative 1000+ rural household sample. MSU collaborated with SESA in designing, fielding, and analyzing several additional surveys for the same sample to address critical policy questions on beans and sorghum. The additional national fielded surveys collected information on farm level bean and sorghum marketings, as well as several smaller surveys with merchants and farmers to investigate issues related as information on farmer production constraints. SESA and MSU also fielded smaller surveys with farmers and merchants to investigate issues related to beans and sorghum, for which SESA's national sample was inappropriate.

Table 3. Structure of value added in rural areas by level of caloric consumption, Rwanda.

Sector	Caloric consumption (quintiles of Kcal/ae/day)					
	1st	2nd	3rd	4th	5th	Rwanda
Value added (% of total)	100.0	100.0	100.0	100.0	100.0	100.0
Agriculture	59.0	59.2	63.2	61.0	67.0	62.1
Crops	54.5	51.8	57.4	55.4	50.5	53.9
Livestock	4.5	7.4	5.9	5.6	16.4	8.2
Artisanry and services	23.7	24.6	24.5	25.3	20.5	23.7
Banana wine	17.6	17.0	14.9	14.6	11.0	14.8
Sorghum beer	1.8	2.1	2.4	3.7	3.0	2.7
Other	4.2	5.5	7.3	7.0	6.5	6.2
Commerce	5.0	5.6	10.1	4.9	1.5	5.4
Salary	12.4	10.6	2.1	8.8	11.0	8.7
Agricultural worker	8.3	3.1	1.5	6.2	1.9	4.0
Public sector	1.8	6.3	0.1	1.2	5.1	2.9
Other	2.2	1.2	0.5	1.4	4.0	1.8
Value added (FRW/household/year)	42,081	54,092	60,182	60,445	59,693	55,259

FINDINGS FROM RWANDA THAT HELP INFORM SELECTED POLICY THEMES

Constraints to using price policy alone to increase agricultural output and farm income

As the SESA/MSU study progressed in 1986, it became clear that conventional beliefs about bean and sorghum market relationships were poorly informed. Prior to the SESA/MSU research, it was thought that Rwanda was essentially self-sufficient in beans and sorghum. As shown in Figure 3, farmers in the aggregate bought more beans than they sold in ten out of twelve months in the normal 1986 crop year.

Tables 4 and 5 show dry bean household net transaction categories derived from the production and transaction data. For beans (and sorghum) a small percentage of Rwandan households are large net sellers, and these households account for the vast majority of net sales for both crops. Net seller households tend to have relatively larger farms and higher per capita kilocalorie production than net buyers.

The majority of Rwandan rural households are net bean (and sorghum) buyers. In fact, some 30% of all rural families are purchasing an estimated 50% of their yearly bean utilization. In the short run, higher bean prices for these households, especially in light of their overall low per capita production of calories, would make them much worse off. Without significant improvements in farm and nonfarm productivity, higher prices would also make them worse off in the long run. In

Table 4. Net sales of dry beans by household net transaction category, November 1985-October 1986, Rwanda.

Household net transaction category	Number of H.H.	% of H.H.	Tons sold by class	% of sales	Farm size (ha)
Amount sold					
>60 Kg	72,224	7	13,977	82	2.0
30-59 Kg	39,913	4	1,738	10	1.6
<30 Kg	123,471	11	1,399	8	1.6
No net transactions	51,499	5	na	na	1.4
Amount bought[a]					
<30 Kg	265,475	24	-4,295	- 8	1.0
30-59 Kg	202,991	18	-8,847	-16	1.0
>60 Kg	341,518	31	-41,379	-76	1.1
Total	1,097,091	100	na	na	na

[a]Negative numbers indicate purchases.
na = not applicable

Table 5. Per capita availability of dry beans by household net transaction category, November 1985-October 1986, Rwanda.

Household net transaction category	% of H.H.	Kg beans produced per capita	Kg beans transferred per capita[a]	Kg beans available per capita	Total Kcal/cap produced
Amount sold					
>60 Kg	7	136	48	88	4,658
30-59 Kg	4	83	13	70	3,442
<30 Kg	11	73	5	68	3,072
No Net Transactions	5	49	0	49	2,600
Amount bought					
<30 Kg	24	34	-5	39	1,966
30-59 kg	18	30	-11	40	1,773
>60 Kg	31	24	-24	48	1,781
Total	100	na	na	na	na

[a]Transfers include purchases, sales, gifts given and gifts received. Availability includes seed and storage losses. Total per capita Kcal production is based on the eight major crops in SESAs production survey.
na = not applicable

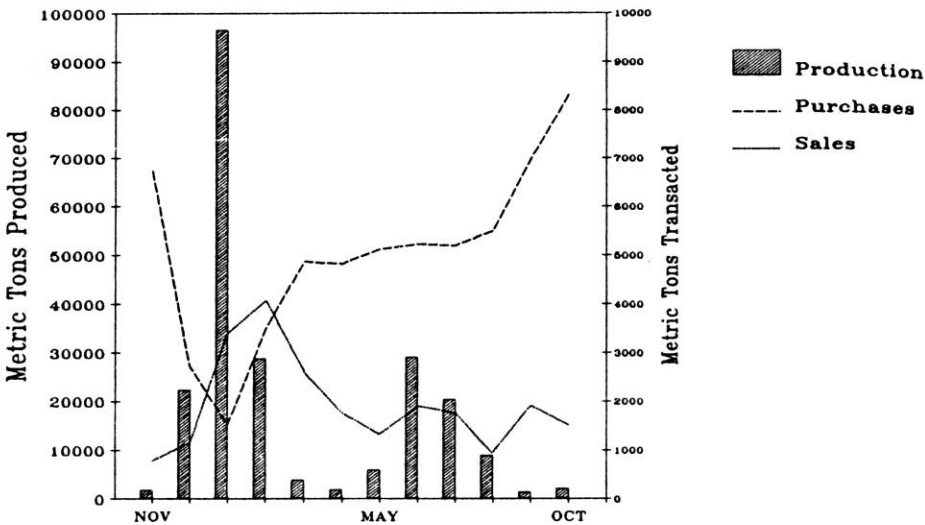

Figure 3. Monthly rural dry bean production, purchases, and sales, Rwanda, 1986 Agricultural Year.

contrast, higher prices would benefit the few seller households who are already producing the most calories per capita.

Perceived production constraints are quite different for the different transaction groups (Table 6) and tell us something about whether higher output prices alone might call forth additional output. Sellers mention drought and labour problems most frequently, while buyer households cite land shortage and low soil fertility most frequently. Resource and technology constraints thus appear to be more binding than low prices under current circumstances, although some net sellers did mention price.

Utilizing a net informal import identity and estimates from the national level production and transaction survey, selected market/trade indicators were developed (Table 7). Among other things, these show that the rural areas of Rwanda are importing some 14% of rural dry bean (20% for sorghum) utilization. These are informal imports previously unreported in official statistics, and are quite significant when compared to the value of all official commercial and food aid imports. These are of approximately equal value, and each are equal to roughly 5% of the value of

Table 6. Biggest production constraints by household net bean transaction category, Rwanda.

Principal constraint	Net household bean transaction category							
	Net dry bean sellers who sold:			No net trans-actions	Net dry bean buyers who bought:			
	>60 kg	30-59 kg	<30 kg		<30 kg	30-59 kg	>60 kg	Rwanda
Fertilizer /soil fert.	16.2	25.7	27.5	22.1	28.2	33.9	37.2	30.8
Surface area	17.8	15.1	18.6	17.1	37.9	32.2	29.3	28.9
Labor	29.4	9.5	24.1	24.1	14.0	16.6	8.7	15.3
Drought	27.5	39.5	16.6	27.4	12.4	12.6	14.3	16.2
Too much rain	3.9	6.4	8.7	4.6	3.0	2.7	6.8	5.0
Seed	0.0	0.0	0.0	0.0	1.0	0.0	1.5	0.7
Lack of pesticides	0.0	0.8	0.0	0.0	0.0	0.0	0.1	0.0
Low food prices	4.4	3.9	0.0	0.0	0.0	0.4	0.3	0.6
Other	0.9	0.0	3.7	4.0	3.4	1.7	1.7	2.3
No response	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0

Table 7. Assumptions and realities about beans and sorghum in Rwanda.

Selected market/trade indicators (Percentage)	Traditional assumption	SESA/MSU estimate
Dry bean production marketed	30	10
Rural self-sufficiency in dry beans	100	86
Rural dry bean purchases coming from imports	0	60
Sorghum production marketed	35	21
Rural self-sufficiency in sorghum	100	80
Rural sorghum purchases coming from imports	0	50

national production of the eight major Rwandan food crops.

Had the government been successful in 1986 in trying to implement a country wide floor price for beans of 35 FRW/kg (a price significantly above the prevailing open market price to farmers of about 23 FRW/kg), major additional imports would have been encouraged. In addition, only a small percentage of Rwandan farm households would have benefitted at the expense of a large number of rural and urban consuming households, assuming the higher floor price to farmers would have raised the retail price to these consumers.

IMPORTANCE OF PRIVATE MERCHANTS IN SUPPLYING PURCHASED FOOD TO RURAL AS WELL AS URBAN CONSUMERS

The vast majority of rural food purchases in Rwanda are from private merchants, generally fixed place merchants and/or rural market vendors (farmer to farmer sales are also important in certain crops). Several tests of market competition indicate that these private merchants are functioning reasonably well, given the underlying level of economic development in Rwanda. In various tests of market integration, bean prices behave better than other commodities, and indicate that both urban and rural markets are well connected. Rural bean markets appear to react more to the rest of Rwanda as a whole than to price changes in a particular market. Accounting for seasonal changes in the direction of product flow also improves results from models of market integration.

Overall, it is not collusive merchant behavior, but thin markets, product specific characteristics, high assembly costs and spatial production patterns which hamper market integration. High transport and transaction costs appear to be the principal barriers to better market integration in Rwanda. Reducing transaction costs will be difficult because they are related to the low levels of marketable surplus produced by the typical farm enterprise.

During the most recent significant drought (1984) farmers indicated that they mostly pursued a strategy of buying food from the market to supplement inadequate home production (Table 8) These results highlight the importance of effective private markets in times of food crises.

Table 8. Farmer Methods of Food Acquisition in 1984, Rwanda

Response[a]	Percentage
Buy food/sell labour	70.7
Eat more tubers	37.7
Eat more bananas	5.8
Gifts from neighbour	2.2
Government aid	0.7
Not applicable	1.8
Other	5.1
Total	124.0

[a]Multiple responses possible

IMPORTANCE OF STRATEGIC PUBLIC SECTOR ACTIONS TO FACILITATE THE GROWTH OF PRIVATE SECTOR ACTIVITIES

Rwanda has invested heavily to improve its basic road system, especially those routes connecting major urban centers. As shown in Table 9, the completion of a paved road between major markets is associated with increased market integration as measured by the market-pair regression model for testing market integration. These results highlight the importance of basic public investments in facilitating the movement of goods and improved performance of basic marketing functions.

Throughout most of recent history, the GOR has operated under a system of "indicative" prices for beans and other basic food commodities. Yet merchants, for the most part, have been allowed to openly buy and sell at any price, while the parastatal OPROVIA would try to move market prices towards its "target" price through modest market purchases and sales of beans and sorghum. This willingness to tolerate private commerce and to keep parastatal actions in relative proportion has helped to slowly develop a much more vigorous private sector in Rwanda.

The Ministry of Plan has collected market clearing retail prices in major towns for at least the past 18 years. Although they have not actively utilized this information for on-going market analysis or diffusion to potential public and private users, they have at least tried to keep the data base up to date. This price information has been extremely useful in SESA/MSU analysis of market performance, and is a fundamental building block in the development of more informed market policy.

During most, if not all, past transitory food insecurity problems in Rwanda the GOR has not used massive quantities of food aid. One of the benefits of such actions is the freedom from large and unpredictable negative effects on private merchants' business environment. Certainly Rwanda is constrained through

Table 9. Market-pair regressions on detrended urban retail dry bean prices before and after paved roads, Rwanda[a].

		Prior to paving		After paving	
Market pair	Construction years	Adj R^2	No. obs.	Adj R^2	No. obs.
Ruhengeri-Gisenyi	1974-1977	-.03	24	.35	52
Kigali-Kibungo	1974-1977	-.07	12	.45	71
Kigali-Gitarama	1978-1983	.51	48	.83	45
Kigali-Butare	1978-1983	.48	47	.80	38

[a]The analysis covers MINIPLAN data from the years 1971 through 1987. Construction years are excluded from both regressions for each market pair. Detrending was accomplished using the BNR consumer price index.

difficult transport in accessing food aid, but the lesson for Southern African countries is to try to reduce the disruptive effects of food aid, not just on farmers but also on the longer-run viability of private merchants serving the effective food and consumer good demand of rural consumers.

In Rwanda, as in many other African countries, some market observers argue that seasonal price increases (generally in the hungry season) are caused by private merchant speculation that exploits rural and urban households purchasing relatively greater quantities during these periods. This is obviously an empirical question, but our study in Rwanda--and most other studies in Africa--find that seasonal price trends in open markets are not out of line with seasonal transfer costs. Studies frequently also find high costs and very risky returns to investment in storage. For example, in Rwanda over the 17-year period from 1971 to 1987, bean prices increased seasonally 11 times, went down 2 times and stayed about the same 4 times. The important conclusion is not to blame price increases on merchant speculation without careful analysis of costs and risks associated with spatial and temporal arbitrage. High costs may be present but are frequently not easily lowered without strategic public good investments in infrastructure, information, etc.

When price increases are in line with costs and normal profits required to encourage private agents to invest, the dynamic opportunity is to further encourage private agents, not make them into scapegoats. If government marketing organizations decide to try to keep prices from increasing seasonally and spatially, it must be recognized that taxpayer resources are being used to cover the real costs involved. Given limited public investment budgets, this means fewer resources will be available to invest in more essential public goods such as improved roads and agricultural research, which are investments that private agents generally find unattractive. The long-run solution for households who cannot afford to maintain required food purchases during seasonally high price periods is to find ways to raise household income and/or entitlements, perhaps through careful use of food aid. Yet over the longer run, a reliable rural market for purchased food and other inputs is needed to help contribute to increases in productivity by giving households more opportunity to specialize, rather than trying to produce themselves all needed food and other inputs. Rural households in Rwanda seem to find the private market quite reliable, even in times of scarcity. Research on the effects of market changes in Mali by Dione and Staatz (reported at this conference in 1987) found that rural households were most pleased with the improved rural market for purchased food. Farmers especially liked not having to incur high uncertainty as well as search and waiting costs for needed food items.

THE IMPORTANCE OF STRENGTHENING DIVERSIFIED INCOME SOURCES OF RURAL HOUSEHOLD

Rural households in the SESA/MSU sample were asked to indicate their principal sources of cash revenue and expenditure. These responses are listed in Tables 10 and 11, according to the same net bean transaction categories used earlier in this paper. Note that this information does <u>not</u> refer to percentage of revenue or

Table 10. Largest source of revenue by household net dry bean transaction category, Rwanda[a].

Revenue source	Household net dry bean transaction category							Rwanda
	Net dry bean sellers who sold:			No net transactions	Net dry bean buyers who bought:			
	>60 kg	30-59	<30 kg		<30 kg	30-59	>60 kg	
	Percentage of households							
Alcoholic beverages	37.2	48.6	50.1	40.0	35.2	38.2	28.2	36.1
Foodcrop sales	41.7	35.2	18.6	20.4	13.5	16.1	12.4	17.2
Industrial crops	9.2	10.7	15.0	15.0	17.3	16.9	19.3	16.7
Field hand	2.0	1.9	7.3	5.9	14.6	11.1	18.1	12.5
Work at a project	0.0	0.0	0.0	0.0	3.3	2.1	3.0	2.1
Salary	5.5	0.0	2.0	1.9	2.3	2.1	3.8	2.8
Livestock sales	0.7	0.0	3.2	2.8	0.7	2.6	1.8	1.8
Artisanry	2.3	0.0	1.0	1.7	3.5	2.9	5.4	3.4
Commerce	1.5	3.7	1.2	3.1	3.4	3.3	4.1	3.2
Gifts from relatives	0.0	0.0	0.6	4.8	1.3	0.7	0.0	0.7
Renting fields	0.0	0.0	0.0	0.0	0.5	1.4	0.6	0.6
Other	0.0	0.0	0.0	1.9	2.6	2.6	2.8	2.1
No response	0.0	0.0	0.9	2.4	1.6	0.0	0.3	0.7

[a]The figure in each cell represents the percentage of households mentioning the item as their largest source of income, not the percentage of income.

expenses. It is the percent of the respondents who said the various items were their principal source of revenue or expenses.

As shown in Table 10, a large proportion of households buying the largest quantities of beans depend on the sale of: a) industrial crops (coffee and tea); b) labour to other farmers; and c) various other sources of off-farm wage and/or salary employment. A high proportion of households selling the largest quantities of beans obtain revenue from the sale of banana and sorghum beer, and the sale of other food crops. Recall that seller households have relatively larger farm sizes and are able to produce surpluses for sale or to process into products to be sold (beer).

Households buying the most beans list food as their principal expenditure item most frequently, while those selling beans list labour and clothing most frequently (Table 11).

Sources of revenue are significantly more diversified for net purchasers than for net sellers. We also know these households are ones with the least land to farm, and with perhaps the greatest soil fertility problems because they have been forced to reduce fallow and grow more root crops to maximize the availability of calories for household consumption.

Table 11. Largest expenditure by household net bean transaction category, Rwanda[a].

Revenue source	Household net dry bean transaction category							Rwanda
	Net dry bean sellers who sold:			No Net transactions	Net dry bean buyers who bought:			
	>60 kg	30-59	<30 kg		<30 kg	30-59	>60 kg	
	Percentage of households							
Food	10.3	41.2	29.9	34.7	55.8	60.3	74.5	55.1
Clothing	22.2	14.2	19.6	21.7	11.2	12.8	7.7	12.7
Labour	35.2	20.9	11.1	4.0	3.5	1.0	3.1	6.5
Medicines	9.4	5.2	5.9	13.0	6.7	4.7	4.3	5.9
Taxes	0.0	0.0	1.1	0.0	2.7	3.9	3.4	2.6
School fees	3.7	1.9	4.0	1.0	2.8	2.0	1.1	2.2
Kerosene	6.8	4.4	4.0	5.2	4.1	0.7	0.9	2.7
Alcoholic beverages	1.1	6.8	3.5	0.0	3.2	2.8	0.7	2.2
Soap	0.9	3.2	4.4	0.0	0.7	1.6	0.8	1.4
Kitchen ware	4.5	0.9	2.3	11.8	2.1	2.0	1.2	2.4
Renting fields	1.5	0.0	4.1	1.7	2.4	1.8	1.0	1.9
Seed	0.0	0.0	1.5	0.0	2.5	2.0	0.2	1.2
Tools	3.9	0.0	4.2	2.8	1.1	2.9	0.0	1.7
Other	0.5	1.3	3.4	1.9	0.9	1.4	1.0	1.4
No Response	0.0	0.0	0.9	2.3	0.4	0.0	0.0	0.3

[a]The figure in each cell represents the percentage of households mentioning the item as their largest expense, not the percentage of expenses.

The Ministry of Plan's budget and expenditure survey measured quantities of revenue and expenditures, including the estimated value of household food production that is consumed. Results show that households depending on agriculture for the majority of their revenue are consuming significantly less than households depending on non-agricultural income (Table 12). Households not selling beans and getting a majority of their income from agriculture have the lowest value of consumption per capita. The relatively few (15%) who are able to obtain significant nonfarm employment opportunities are better off from a value of consumption standpoint.

The challenge facing Rwanda, and increasingly for many countries in Southern Africa, is how to expand both on- and off-farm income-generating opportunities for people living on very small farms. Agricultural technology development for these households will need to focus on yield enhancements and other features that complement the households' need to also allocate labour to other nonfarm and off-farm employment activities. With such small farm sizes it appears highly unlikely that farming will provide adequate levels of living. Yet in the short-to-medium term, it likewise does not seem feasible to generate sufficient off-farm jobs for such large segments of the rural population. For this reason technological improvements for

Table 12. Value of consumption of rural households by gross quantity of beans sold and importance of agriculture in revenue-generating activities, Rwanda[a].

	Importance of agriculture in revenue					
	Less than 50%			More than 50%		
Gross qty. of beans sold[b]	% of families	Value (FRW) of consump. per capita	Ave. farm size (ha)	% of families	Value (FRW) of consump. per capita	Ave. farm size (ha)
0 kg	15.0	14,691	0.64	49.6	11,914	1.23
1-100 kg	3.8	12,846	1.61	25.9	13,297	1.48
> 100kg	1.1	18,807	0.57	4.5	16,801	1.86
Total	19.9	14,756	0.82	80.1	12,632	1.34

[a]MINIPLAN defines value of consumption as cash expenditure on goods destined for own use plus probable acquisition cost of food consumed from own production plus the value of goods received through gifts or barter. [b]Kg/family/year
Source: Personal communication, Nicholas Minot, National Budget and Consumption Survey, MINIPLAN.

crop and livestock enterprises on very small farms are necessary, while simultaneously improving technology for households with more land resources.

At the same time that household level research is helping identify critical needs of the smallest of smallholders, agricultural research and development investment should not focus exclusively on these farmers. From a food security standpoint, output increases by the smallest and by the relatively larger smallholders are needed. This will help first to better satisfy own household food needs of the most at risk nutritionally, but second to increase employment opportunities and marketed surplus on farms with more resources available. The latter, in turn, will help expand off-farm income of the smallest rural households and keep aggregate food prices relatively low for the benefit of urban and rural consumers who must still purchase from the market. Both household and national, and supply and demand dimensions of food security are important. The research and policy challenge is to strike an effective balance among these.

THE IMPORTANCE OF UNDERSTANDING INFORMAL BORDER TRADE TO HELP INFORM DOMESTIC PRODUCTION AND MARKETING POLICIES

As indicated by the data in Table 13, rural Rwandan households buying the most beans and with the least land resources available have clearly shifted their cropping patterns towards those crops producing the most calories per unit of cultivated area: tubers, especially sweet and irish potatoes.

We have already shown that Rwanda has significant informal bean (and sorghum) imports from neighboring countries. Figures 4 and 5 reveal the geographical importance of the informal imports, and that even with imports, rural households in Southwestern prefectures of Rwanda have significantly lower per capita bean utilization.

Importantly, from real price information displayed in Figure 6 (in 1987 FRW/kg) observe that long-run average consumer prices for dry beans in Rwanda have shifted downward during the 1980s, although it is not entirely clear why this has happened (reduced regional transfer costs, civil unrest in Uganda in the 1980s expanding Ugandan sales to Rwanda and expanded per capita production in Rwanda may all have contributed to the lower prices).

It is tempting to say that it makes good economic sense for Rwanda to further specialize and rely on neighboring countries for beans and sorghum under these circumstances, but the picture revealed in Figure 6 suggests that market instability is not to be forgotten, among other things. For example, during the two most recent serious droughts in Rwanda (1974 and 1984) bean prices increased significantly in the precise period when consumers need to purchase larger quantities. Also, in both of these periods high prices persisted for at least six months (longer in 1974). The good news in Figure 6 is that high prices seem to always go away (including 1988, with current retail prices around 40 FRW/kg), and a reasonable seasonal price increase is present in "typical" years, such as 1983, when prices dropped in the first quarter of the year with Rwanda's principal harvest and increased through the marketing year in accordance with normal seasonal transfer costs. Some bad news for Rwandan "sellers" in this review of historical prices is that there are years (such

Table 13. Average proportion of kilocalories from each crop by household net dry bean transactions category, 1986, Rwanda[a].

Household net transactions category	Proportion of per capita kilocalorie production in:							
	Beans	Peas	Sorghum	Maize	Sweet pot.	Manioc	Potatoes	Bananas
Sold								
< 60 kg	.27	.01	.24	.06	.10	.08	.01	.22
30-59 kg	.24	.02	.15	.10	.14	.06	.01	.27
< 30 kg	.23	.01	.15	.08	.23	.10	.01	.19
No net transactions	.21	.02	.11	.13	.18	.08	.01	.27
Bought								
< 30 kg	.20	.02	.10	.13	.27	.08	.03	.18
30-59 kg	.19	.01	.10	.12	.28	.10	.04	.16
> 60 kg	.18	.01	.11	.08	.30	.09	.05	.18
Rwanda	.20	.01	.12	.10	.26	.09	.03	.19

[a]Averages computed from household level per capita values.

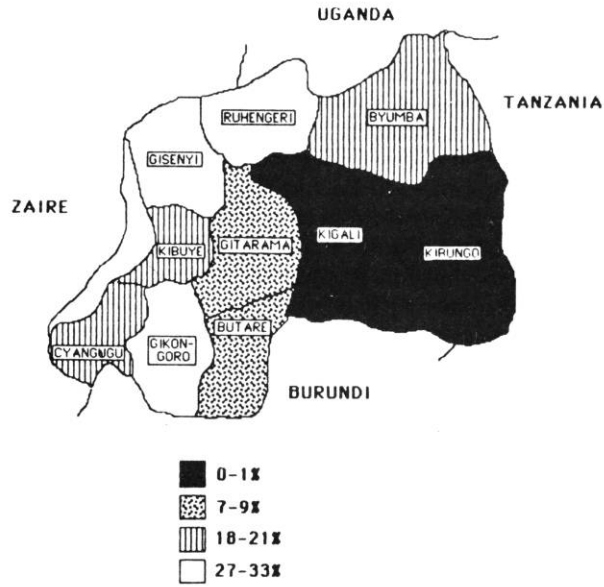

Figure 4. Percentage of dry bean availability coming from imports, by prefecture in Rwanda, 1986 Agricultural year.

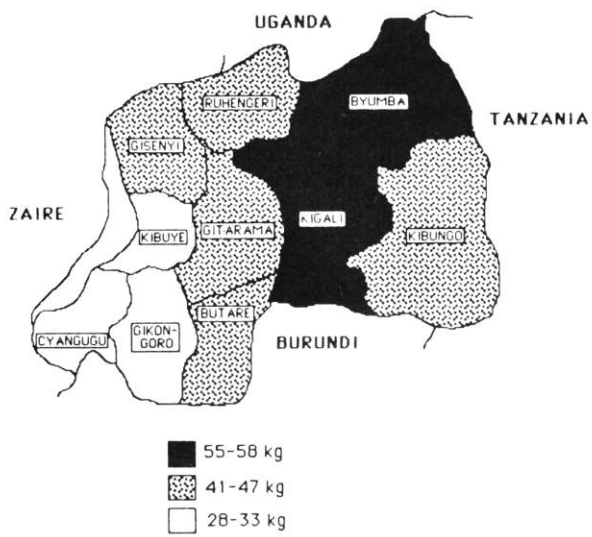

Figure 5. Per capita dry bean availability in rural Rwanda 1986 Agricultural year (gifts included).

as 1973, 1980, 1981, and 1986) when prices remain low throughout the marketing year.

The overall hypothesis is that weather drives shifts in regional supply, and simultaneous offsetting shifts in demand for beans, yielding highly variable open market price behavior. Therefore, it is virtually impossible for the Rwandan parastatal to try to either raise or lower the market-clearing price within Rwanda alone. An important question to be further studied in Rwanda is whether joint action with neighboring countries to predict shortfalls and improve trade flows is a feasible and desirable alternative to national buffer stocks?

A difficult question is what can Rwanda do to specialize, taking advantage of its labor supply, without subjecting itself to undue instability. Over the longer run, what can Rwanda produce and market competitively to its neighbors in return for food? What role can technological, institutional, and policy changes play in improving the competitive advantage of selected activities in Rwanda? At a minimum, it appears that highest priority should go towards research to increase the productivity of sweet potatoes and perhaps manioc. Investment in these certainly appears to be much more self-selecting for the poor, compared to maize or sorghum for example. Sweet potatoes would also appear to give a better nutritive balance, assuming households will be able to earn sufficient income to purchase beans and sorghum from the market.

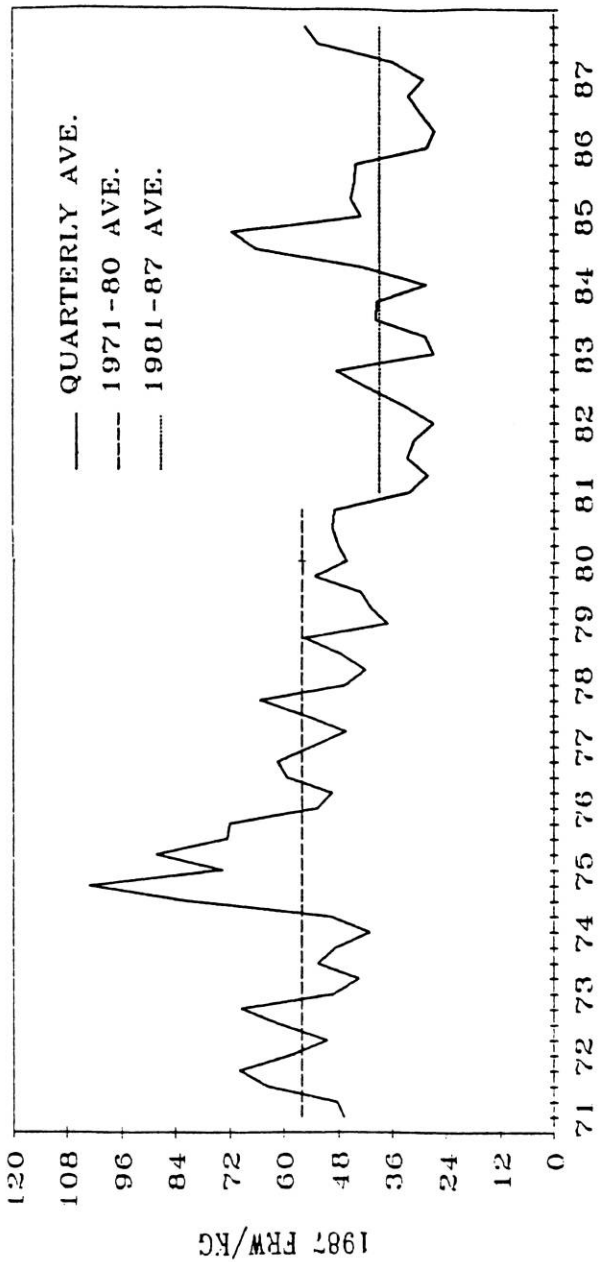

Figure 6. Quarterly average urban dry bean prices 1971-87.

Annex I. Food security in Africa cooperative agreement, Department of Agricultural Economics, Michigan State University.

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Loveridge, Scott, and Michael T. Weber. *Relationships between food production, marketing, and farmer perceptions in five prefectures of rwanda.*

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--------. Volume 2, Nov. 1986: *Structure du budget des ménages.*

--------. Volume 3, Mai 1988: *La consommation finale et les sources de revenu des ménages ruraux.*

The above publications are available from: Acquisitions Department, Agency for International Development, PPC/CDIE/DI, 2109 SA-18, Department of State, Washington, DC 20523.

NEW TECHNOLOGY TO IMPROVE HOUSEHOLD FOOD SECURITY

RESEARCH ON GRAIN LEGUMES IN SADCC COUNTRIES

D.M. Naik[1]

INTRODUCTION

Agriculture forms the mainstay of the economy of the SADCC region. At present food production is largely in the hands of smallholders who depend on agriculture for their livelihood and who comprise just over 70% of the region's population (Devres, 1985). The agriculture sector in the SADCC region has performed poorly for the last three decades. The equivalent of about 20% of food availability in the region is obtained from grain imports. Cereal supply from within the region following the 1986 harvest was a nominal 179 kg per annum per person which is comparable to FAO estimates for the region of 175 kg per person during 1979-81 (SADCC, 1988).

Against this background, lagging food production is a concern for balancing cereal-based diets with protein, as well as carbohydrate rich grain legumes. This urgency is heightened by sporadic reports of malnutrition affecting up to 35-50% of young children in the drought-prone areas of the midlands of Zimbabwe during 1987-88 (*The Herald*, 1988), an occurrence which is all too common in other SADCC countries as well.

In the context of the overall food production situation in SADCC, usually measured in terms of staple cereals, this paper describes the situation *vis-a-vis* grain legumes and the role of the SADCC Grain Legume Improvement Programme (SADCC-GLIP). The paper examines the potential impact of the research programme on the improvement of groundnuts, beans and cowpeas, and considers other grain legumes that could be included as the programme develops. The paper concludes by assessing some factors that could influence the quantities of grain legumes that become available for daily consumption and trade.

MAJOR GRAIN LEGUMES IN THE SADCC REGION

The grain legumes discussed here include groundnuts (*Arachis hypogaea L.*), beans (*Phaseolus vulgaris L.*) and cowpeas (*Vigna Unguiculata (L) Walp.*)., which presently comprise the SADCC Grain Legume Development Programme (GLIP). Legumes are regarded as contributing only a minor portion of the total daily caloric intake and a relatively small percentage of the protein intake of diets. But, statistics do not accurately describe the importance of grain legumes in the region. Most small-scale, rural farmers produce grain legumes for household use and local as well as urban markets. For instance, a survey on production and utilization of cowpeas conducted

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in Zimbabwe, revealed that almost 90% of 145 farm families from 13 districts of six provinces grew and used cowpeas. Furthermore, one-half of them indicated that their total production was usually insufficient for their household needs (Naik *et al.*, 1987).

Reliable data on production and yield of grain legumes in SADCC countries, as elsewhere, are difficult to compile. Several different legumes may be grouped together under a general term such as pulses, or dry beans. Furthermore, grain legume crops are often not only cultivated for their seeds, but also for their pods and leaves as is with cowpeas. Another factor contributing to the inaccessibility of accurate production figures is that grain legumes are commonly intercropped with one or more other crops (Summerfield and Lawn, 1987).

The total amount of grain legumes (pulses) produced in the SADCC countries in 1986 was estimated by FAO (1987a) to be 740,000 mt (1.2 million mt with groundnuts), a figure not much higher than an estimated 678,000 mt (1.1 million with groundnuts) in 1981. Malawi and Tanzania accounted for 76% of the total production. Between 1981 and 1986, the hectarage planted was static and the average yield was about 0.5 mt/ha (Table 1).

Table 1. Total production of grain legumes, SADCC countries, 1986[a].

Location	Area ('000 ha)		Yield (kg/ha)		Production ('000 mt)	
	1979-81	1986	1979-81	1986	1979-81	1986
Country						
Angola	110	110 F	385	364	42	40 F
Botswana	30	30 F	622	467	19	14 F
Lesotho	16	15 F	536	411	8	6 F
Malawi	335	329 F	609	603	204	198
Mozambique	124	125 F	459	480	57	60 F
Swaziland	5	5 F	576	609	3	3 F
Tanzania	693	672 F	454	539	315	362 F
Zambia	19	9 F	340	622	7	6 F
Zimbabwe	41	69	566	734	23	51
SADCC						
Totals	1,373	1,364	na	na	678	740
Means	153	152	505	537	75	82
Africa	9,112	10,872	588	646	5,359	7,026
World	60,515	68,403	676	807	40,882	55,200

[a]Crops harvested for dry grain only. F = FAO estimates. na indicates data not available.
Source: FAO (1987).

Groundnut production
Total groundnut production in the region, equivalent to one-tenth of Africa's production, has remained static during this decade at about 400,000 mt annually. Similarly, average yields have remained unchanged at a little above 0.5 mt/ha. In 1986, Malawi contributed 44% of regional groundnut production (FAO, 1987a).

Dry bean production
The SADCC region produced about 450,000 mt of dry beans in 1986, about a quarter of Africa's production. While there was no increase in the hectarage planted to beans during the 1980s, there was a small increase in total production, possibly explained by the improvement of average yields in Tanzania and Zimbabwe by 20% and 30%, respectively (FAO, 1987a).

Cowpea production
Production of cowpeas is difficult to estimate as it does not enter into market statistics. However, an area of approximately 500,000 ha is believed to be planted to cowpeas. Considering the widely held view that cowpea yields average 240-300 kg/ha, total production of cowpea grain would be in the region of 120-150,000 mt annually. Mozambique and Tanzania are reputed as having the largest hectarage under cowpea (SADCC, 1984).

Productivity constraint
The productivity of the already disadvantaged grain legumes is severely curtailed by a host of insect pests and diseases (SADCC, 1984). The extremely poor seed supply situation further reduces their potential productivity. Breeding advances in disease and pest resistance and a supply of healthy seed will undoubtedly deliver more of the largely unrealized potential of existing cultivars.

Other grain legumes in SADCC
In addition to groundnuts, beans, and cowpeas which currently form the SADCC/GLIP, the *Grain Legume Feasibility Study* (1983) also recommended consideration of other legumes less widely grown in the region:

- Bambarra groundnut, *Vigna subterranea* (L.) Verdo.;
- Pigeon pea, *Cajanus cajan* (L.) Millsp.;
- Chick pea, *Cicer arietinum* L.;
- Mung bean, *Vigna radiata* (L.) Wilczek; and
- Pea, *Pisum sativum* (L.).

Bambarra groundnut
Bambarra groundnut (*Nyimo* in Zimbabwe) is ubiquitous in the region, primarily grown for consumption of its grain by rural farmers. It has an enviable reputation as a hardy crop because of its tolerance of drought conditions and its ability to yield a reasonable crop when grown on poor soils. The bambarra groundnut is indigenous to Africa, where total annual production is estimated to be about 330,000 mt (Kay, 1979), mostly from West Africa. Some research on this crop is being conducted in

Mozambique, Swaziland, Zambia, and Zimbabwe. Mozambique and Zambia have a modest collection of local germplasm (SADCC, 1984).

Chick pea and dry pea

In 1986, Malawi and Tanzania produced a combined total of about 30,000 mt of chick peas on 60,000 ha. Tanzania and Lesotho are the major producers of dry peas with Tanzania producing twice as much of the total 12,000 mt (FAO, 1987a). Most of the chick pea and dry pea production is exported.

Pigeon peas and mung beans

Pigeon peas and mung beans are grown on a very limited scale in Malawi, Tanzania, and Zambia. Introduced varieties of mung beans have been evaluated and released for production in Tanzania, while minimal research restricted to evaluation of introductions of pigeon peas is conducted in Malawi and Zambia (SADCC, 1984).

TRADE IN GRAIN LEGUMES

A total of 66,000 mt of grain legumes, including groundnuts, was exported from the SADCC region between 1984 and 1986. Groundnuts accounted for about one-half of this total. Malawi exported 83% of the groundnuts, and together with Tanzania, the two countries were responsible for 87% of the exports of legumes (Tables 2 and 3). Among these, chick peas are an important export commodity from Malawi and Tanzania, while dry peas are exported primarily by Lesotho and Tanzania. Relative to Africa, groundnut and other legumes were 13% and 26%, respectively, of total exports but these figures represented less than 1% of worldwide trade in grain legumes (Tables 2 and 3).

GRAIN AND LEGUME CONSUMPTION

While statistical summaries tend to underestimate the role of grain legumes in people's diets, there is little doubt about their widespread use and popularity in SADCC countries. Groundnuts, beans, cowpeas, and bambarra groundnuts were ranked among the top four most important legumes in SADCC by the *Grain Legume Feasibility Study* (SADCC, 1984). However, the frequency of use of these legumes may be limited by supply.

Respondents to the 1985 cowpea survey in Zimbabwe indicated that they consumed cowpeas at least twice and sometimes thrice a week in various forms: green leaves as a vegetable relish (*munyemba*), dried, stored leaves (*mufushwa*), green peas (*mukove*), dry grain boiled with maize (*mutakura/inkobe*), and cowpea paste (*nupiza/bhiza*) (Naik, *et al.,* 1987). Similar, diverse uses are prevalent in other SADCC countries.

Table 2. Trade in pulses, SADCC countries, 1984-1986[a]

Location	Imports		Exports	
	mt	US$ ('000)	mt	US$ ('000)
Country				
Angola	30,000 [b]	14,000 F	na	na
Botswana	5,000 F	3,000 F	na	na
Lesotho	5,000 F	1,700 F	700	210
Malawi	na	na	17,798	4,859
Mozambique	5,400 [b]	3,100 [b]	na	na
Tanzania	1,000 F	600 F	10,000 [b]	5,500 F
Zimbabwe	402	166	3,538	2,099
Totals	46,802	22,816	32,036	12,668
Africa	289,855	162,414	123,713	56,319
World	4,412,831	1,903,150	4,627,560	1,867,539

[a]The word pulse is used here to be consistent with FAO usage which would normally exclude groundnuts. [b]unofficial figure. F = FAO estimates. na indicates data not available.
Source: FAO (1987a).

Table 3. Trade in groundnuts (shelled), SADCC countries, 1984-1986.

Location	Imports		Exports	
	mt	US$ ('000)	mt	US$ ('000)
Country				
Angola	6,600	5,050	na	na
Botswana	246	315	132	80
Malawi	na	na	28,420	13,409
Mozambique	na	na	3,400	2,150
Zimbabwe	235	136	2,421	1,666
Totals	7,081	5,501	34,373	17,305
Africa	109,272	60,909	260,745	151,107
World	2,470,949	1,857,689	2,511,364	1,711,332

na indicates data not available.
Source: FAO (1987a).

Beans are grown primarily for their dry seeds which are cooked after soaking and usually served whole. The preferred seed colours are red, white, yellow, and speckled types. Immature pods and seeds, as well as tender green leaves, are also utilised. Leaves are often cooked together with mashed groundnuts. In addition, pea beans are canned as baked beans, which are popular in the urban areas.

Groundnuts are the most popular food legume. Almost mature pods are boiled and the cooked seed is then consumed whole, while dry seed is either eaten raw or roasted. A very popular use of dry groundnut seeds is to pound them and use the mashed seeds to prepare vegetable dishes. Industrially, groundnuts are used in the production of cooking oil, cake meal, and peanut butter, while processed confectionery nuts are important in local and export trade.

THE SADCC GRAIN LEGUME IMPROVEMENT PROGRAMME

Cooperation for Development in Africa (CDA), an informal association of seven donor nations: Belgium, Canada, France, Italy, United Kingdom, Unites States of America, and the Republic of Germany; launched a reconnaissance visit to all SADCC countries in March, 1983. In their report, CDA members recommended the expansion of the Regional Groundnut Programme, based in Malawi, to include other important grain legume crops in the region. The Consultative Technical Committee (CTC) of SADCC, comprising national directors of research (which now forms the Board of SACCAR), agreed with the recommendation and proposed a comprehensive feasibility study for a Grain Legume Improvement Programme for SADCC.

Following the report of the feasibility study which was conducted during late 1983, the CTC chose to implement one of three alternatives which would include groundnuts, beans, and cowpeas in a SADCC-GLIP, with headquarters for each component to be based in Malawi, Tanzania, and Mozambique, respectively.

Programme goal

The goal of the programme is to increase grain legume production within the region and thus reduce food shortages and incidence of malnutrition due to low productivity caused by constraints to production such as diseases, insect pests, drought, and low-yielding varieties. To achieve this goal, the programme envisages the improvement of germplasm through breeding, introductions, and adaptive testing, as well as the strengthening of national grain legume improvement programmes through training.

Programme strategy

The SADCC-GLIP is a single, multicomponent programme whose strategy for achieving the goals of the programme is largely similar for the three component crops which is described in general terms below.

Germplasm improvement

The three international agricultural research centres which are individually responsible for the groundnut, bean, and cowpea improvement programmes, respectively--each holds a world germplasm collection of the respective legumes. Thus, the centres are a primary source of diverse germplasm for the programmes. Indigenous germplasm collections add to the introductions, and this pool of germplasm is further augmented through the breeding activities of the national and regional programmes. In addition, national programmes are assisted with breeding crosses made at their request for specific requirements.

Adaptive testing

Varieties developed in both national and regional programmes are formulated into test nurseries for evaluation of yield potential, resistance to diseases and/or pests, tolerance to drought, and other agronomically desirable attributes. The nurseries are widely-tested by national programmes in collaboration with the regional programmes for adaptation to various agroecological zones.

Training

Training plans encompass both long-term training at the MSc and PhD levels, as well as regional training and monitoring workshops designed to sharpen the skills of technical and professional staff. The international centres also offer short research and production courses which are attended by staff from both research and extension services of the national programmes.

Planning

Each of the components of the SADCC-GLIP has a steering committee composed of national grain legume scientists, regional scientists, a SACCAR representative, and a donor agency representative who meet annually. The steering committee reviews the overall programme of activities as well as the annual plan of work related to each commodity of the GLIP. These annual meetings are aided by the monitoring workshops which provide national scientists with an opportunity to assess the performance of germplasm in the field. The meetings also serve as a forum to address the needs of national programmes for training, germplasm, and research facilities.

PRESENT STATUS OF SADCC-GLIP

The first five-year phase of the groundnut programme was established in July, 1982, under the ICRISAT Regional Groundnut Programme for Southern Africa near Lilongwe (Malawi) with funding from the International Development Research Centre of Canada. This programme is now funded by the Federal Republic of Germany.

The bean programme, funded by Canada, was established in July, 1986, when the regional coordinator was posted to Arusha, Tanzania. Recruitment of the full team

of four scientists at Arusha was only completed this year, while a further team member to be based at Lilongwe has still to be recruited.

The cowpea programme has yet to be established in Maputo, Mozambique, but funding is anticipated from the European Economic Community.

As these programmes are quite young, the impact of the SADCC-GLIP can only be stated in terms of its potential.

Groundnut improvement programme

Several factors affect the productivity of groundnuts. The most important of these in the region include: soil fertility, cultural practices, availability of good quality seed, suitability of cultivars for different agroecological areas, labour and draft power, diseases and insect pests, drought stress, and prices.

Major constraints

Leaf diseases of groundnuts, caused by fungi and viruses, are a major constraint to increased production in the region. Yield losses ranging from 26-75% from rust and leafspot infections have been estimated through crop loss trials in Tanzania and Malawi. Among the virus diseases, groundnut rosette virus is the most important and is capable of causing almost 100% loss in late-planted crops grown with wide spacing (Nigam and Bock, 1985).

Programme objectives

The regional programme focuses on three areas: diseases, identifying suitable cultivars, and drought stress. In order to do so, present activities are concentrated on:

- o breeding for resistance to the diseases of regional importance; and
- o breeding for increased yields, seed quality, and earliness (Nigam and Bock, 1985).

Ongoing research

The search for resistance to early leafspot (ELS) caused by *Cercospora arachidicola,* a widespread foliar disease in the region, continues to be elusive. During the 1987-88 season, over 20,000 second generation plants, derived from crosses between several lines which had exhibited leaf retention for significantly longer periods, were screened for tolerance or resistance to ELS. None of these was resistant, but many were selected for other desirable trains.

Natural incidence of the rosette virus disease is usually patchy in the field, a situation unsuitable for screening breeding material for resistance. Epidemiological studies conducted to discern the pattern in which the disease is spread in the field by its aphid vector, have contributed to perfecting a rosette screening technique that can generate a 99% incidence of rosette. This has enabled the programme to screen over 15,000 second and third generation plants in the field during the 1987-88 season (Bock, 1988). Using this screening technique, prospects are very good for identifying resistant cultivars.

The regional programme supplied material to the national programmes in Botswana, Mozambique, Swaziland, Zambia, and Zimbabwe for regional trials, consisting of promising spanish, valencia, and virginia germplasm for assessment against locally recommended varieties. One of the regional selections, ICGMS 42--which yielded about 30% higher than the locally recommended variety, Makulu Red, in Zambia--is now in the pre-release testing stage in that country.

Observations from the spanish and virginia types regional trials in four countries indicated that regional selections are promising and show approximately 15% gain in yield over locally recommended varieties. There were no yield increases in the spanish types over local cultivars in Botswana and Zimbabwe, but an impressive 30% increase was recorded in Malawi (Table 4). Virginia types showed an average 16% improved yield over local cultivars in Malawi, Zambia, and Zimbabwe (Table 5). Yields in Zimbabwe were the highest among all locations, which may reflect better and perhaps ideal management practices at this location.

Support to national programmes

First, the regional programme has organized three regional groundnut research workshops and offered specialist training in breeding and pathology methodology to technicians from the national programmes. Funds have also been made available to national programmes to manage regional trials. Second, the programme continues to respond to specific requests for assistance with hybridizations. Third, the programme has increased its ongoing efforts to select high yield and quality types in response to the European market's requirements for uniformity, blanchability, and shelf life. Finally, the programme is considering establishing a quality assessment facility at Chitedze near Lilongwe as a regional service.

Bean improvement programme

Bean production in the region is largely in the hands of small-scale farmers who grow the crop with a low level of inputs.

Major constraints

Insect pests, especially bean fly (*Ophiomyia* spp.), diseases, soil infertility, and periodic water deficits are considered the principal agronomic yield constraints. The most important diseases include anthracnose (*Colletotrichum lindemuthianum*), angular leaf (*Phaeiosariopsis griseola*), rust (*Uromyces uppendiculatus*), scab (*Elsinoe phaseoli*), common (*Xanthomonas phaseoli*) and halo (*Pseudomonas phaseolicola*) bacterial blights, and bean common mosaic (Bean Common Mosaic Virus). As most of these diseases are also common in Latin America where CIAT is based, control measures developed there could be usefully transferred to the region. Nevertheless, the transfer of improved technology is a stop-gap measure and not a substitute for strengthening local research capability (Allen, 1987).

Programme objectives

Three broad objectives of the bean programme have been identified as:

Table 4. Comparative performance of two high-yielding spanish type groundnut varieties from the regional programme to recommended varieties in four SADCC countries, 1985-87[a].

Country	Recommended varieties[b] (kg/ha)	Regional varieties (kg/ha)	Difference (%)
Botswana	380	380	0
Malawi	1,650	1,280	30
Zambia	1,390	1,210	15
Zimbabwe	2,470	2,370	4
Means	1,480	1,310	13

[a]Figures are means of shelled nuts for all varieties considered for 2 sites and 2 seasons, except the following: Botswana, 1 site; Malawi, 3 sites in 1985-86; Zimbabwe, 1 site, 1 season, 1986-87.
[b]Recommended variety, by country: Botswana, Sellie and 55-437; Malawi, Malimba, Spancross and JL 24; Zambia, Natal Common and Comet; Zimbabwe, Valencia R2.
Source: Bock (1988).

Table 5. Comparison of two high-yielding virginia type groundnut varieties from the regional programme with control varieties in three SADCC countries, 1985-87[a].

Country	Recommended varieties (kg/ha)	Control[b] (kg/ha)	Difference (%)
Malawi	2,000	1,700	18
Zambia	1,390	1,180	18
Zimbabwe	4,280	3,730	15
Means	2,560	2,200	16

[a]Figures are means of shelled nuts for all varieties considered for 2 sites and 2 seasons, except the following: Malawi, 1 site in 1985-86; Zimbabwe, 1 site, 1 season, 1986-87.
[b]Control varieties by country: Malawi, Mani Pintar, Chitembana, Mawanga; Zambia, Makulu Red, Egret, MGS 2; Zimbabwe, Egret, Flamingo.
Source: Bock (1988).

- o increasing the productivity and production of food beans by breeding and selecting higher-yielding genotypes that are acceptable to consumers;
- o developing more productive systems of cropping, utilizing new varieties, and varietal mixtures when appropriate, while ensuring that such innovations do not adversely disrupt existing farming systems; and
- o assisting to strengthen national research programmes through training.

Research progress

Some progress in bean improvement has been achieved by the national programmes. Significant increases in yields of new test varieties, over locally recommended ones, have been recorded in the different countries. Yields in excess of 2 mt/ha are being achieved, which is indicative of the potential of the improved bean germplasm being evaluated. Even under current farmer management practices and low inputs, trials on farmers' fields in Tanzania and Zambia showed yield improvement of about 60% (Table 6).

Identification of genotypes resistant to important diseases and the major insect pest, bean fly, augurs well for the development of higher-yielding bean varieties. Among lines with resistance to common mosaic, ZPV292, G5066, G10357, and G13595 were especially promising in Zambia. Twenty-one lines selected from CIAT's disease nurseries were found to possess combined resistance to angular leaf spot, aschochyta blight, and anthracnose; and also exhibited good yield potential. Sources of resistance to scab were identified, as well as partial resistance to bean fly was confirmed in two CIAT lines, A62 and A74 (Allen, 1987).

Table 6. Research plot and on-farm performance of new bean varieties compared to locally popular varieties in some SADCC countries, 1986-87.

Country	New variety (kg/ha)	Local variety (kg/ha)	Reference
Research plot			
Lesotho	(1) 1,074 (2) 1,039	497	Allen (1987b)
Swaziland	2,174	747	Allen (1987b)
Tanzania	1,813[a]	(1) 1,703 (2) 1,439	Allen (1987b)
Zambia	1,282	694	Zambia (1986-87)
Zimbabwe	2,324[b]	1,480	O.Z. Venge (1987-88)[c]
On-farm			
Tanzania	300	178	Mbiha *et al.* (1987)
Zambia	450	279	Waterworth (1988)

[a]Mean of 7 test varieties. [b]Mean of 3 test varieties at 2 sites for 3 seasons. [c]Pulse Breeder, Crop Breeding Institute, Department of Research and Specialist Services, Harare.

Support to national programmes
The regional programme convened a bean fly workshop in 1986 at Arusha which provided an opportunity to national scientists to pool information, learn about the identification of bean fly species, and consider strategies to control this intractable pest of beans. In addition, a training course on methodologies for bean and cowpea research for technical assistants was held in Lilongwe, Malawi during March, 1987, by CIAT and IITA in collaboration with SACCAR.

Cowpea improvement programme
Cowpea is one of four most important grain legumes in the region (SADCC, 1984). The oldest archeological evidence for cowpeas comes from Ghana (1450-1400 BC) while the second oldest (100AD) is from Malawi. Thus, part of the SADCC region is considered a centre of diversity of wild subspecies and related species of cowpea (Mithen, 1987). The indeterminate form with a spreading growth habit is the predominant type grown in the region.

Major constraints
Grain yields of cowpeas are not only low, but also very susceptible to damage in storage by the ubiquitous cowpea weevil (*Callosobruchus* spp.) (Giga *et al.*, 1988). Cowpeas are subject to attack from several insect pests from seedling to harvest and, when not controlled, they can often cause a complete loss of grain yield (Singh and Jackai, 1985). Important diseases of cowpea in the region are virus mosaic (Cowpea Aphid-borne Mosaic Virus), bacterial blight (*Xamthomonas vignicola*), aschochyta blight (*Aschochyta phaseolorum*), and root knot (*Meloidogyne* spp.). The witchweed, *Alectra bogelii* and *Striga* spp., is an important problem in some places (SADCC, 1984).

In addition to such biological factors which constrain cowpea production in spite of its indigenous reputation, other limiting factors include a lack of suitable disease and pest resistant cultivars, periodic moisture stress, unavailability of good quality seed, and an absence of market incentives.

Programme objectives
The basic objectives of the proposed cowpea improvement programme are similar to those of the other two SADCC-GLIP components. An important consideration in varietal improvement will be the regional preference for cowpea leaf as a vegetable, which will require developing a dual purpose cowpeas for both leaf and grain.

Research progress
Although the programme is yet to be implemented, the potential for improving farm-level cowpea yields is indicated by the results achieved by three national programmes in the region. Usually, cowpea research trials are conducted under a minimum level of inputs to simulate farmers' actual production practices. New varieties yield significantly higher than local varieties under similar testing conditions, and are considerably better than farmers' estimated yields (Table 7).

Table 7. Grain yields of new cowpea varieties compared to the local variety and average farmer yields in three SADCC countries.

Country	Research plot yield (kg/ha)		Farm yield	Reference
	New variety	Local variety	(kg/ha)	
Botswana	56[a]	94	107-125	Botswana (1987-88)
Zambia	1,280[b]	677	250-300	J. Kannaiyan *et al.* (1986)
Zimbabwe	1,750[c]	608	300-400	O.Z. Venge[d] (1987-88)

[a]Mean of 4 varieties being considered for release to farmers. [b]Mean of 3 highest-yielding varieties over 2 sites in 1983 and 3 sites in 1984 under low levels of inputs. [c]Mean of 3 highest-yielding, early-maturing varieties which received 60 kg/ha P_2O_5. [d]Pulse Breeder, Crop Breeding Institute, Department of Research and Specialist Services, Harare.

CONCLUSION

Grain legumes not only contribute protein to cereals-based diets, but they are also important in regional and international trade. While production levels and average yields of these crops have remained low and static, national research programmes have clearly demonstrated the potential for improvement. The SADCC-GLIP promises to further the development of yield-increasing technologies and to eventually lead to self-sustaining national research systems in grain legumes.

However, several factors contribute to the low rate of improvement in grain legume productivity (Summerfield and Lawn, 1987):

- o National grain legume improvement programmes receive limited funding, compared with resources devoted to staple cereals, industrial, and export crops. While this is certainly understandable, the implicit neglect of legumes is not. Perhaps with the exception of Tanzania, in most national programmes individual scientists are responsible for several legume crops, and there are very few grain legume specialists in the extension services.
- o Farmers generally considered grain legumes as secondary crops and give them less attention with regards to management. The secondary label attached to these crops is not surprising, in the absence of any coherent pricing and marketing policy for them. While women usually cultivate legumes, they are not specifically targeted by the extension services. Generally, systems to supply good quality seed do not exist for crops not featured in the marketing infrastructure. Until grain legumes command a place in official markets, it will be necessary to devise alternative means to disseminate the new varieties. On-farm demonstration trials--in collaboration with extension services, nutrition, and community development groups, as well as non-governmental organizations involved in rural development--could be the starting point for seed multiplication and distribution.

- Cultivar development in several species of grain legumes has been based on an extremely narrow range of germplasm. In SADCC countries, researchers have made minimal effort to collect, preserve, and evaluate indigenous germplasm for characteristics that could contribute to grain legume improvement. Varietal improvement has generally depended on introductions of materials from elsewhere, with minimal use of local germplasm. However, the inception of a SADCC Gene Bank project promises to alleviate this serious shortcoming in the region.
- Legumes require more energy than cereals. In spite of this, grain legumes are invariably gown under conditions of low or zero level of fertilizer inputs. In view of the already overburdened budget of small-scale growers, it behoves the researchers to investigate systems of production that optimize yields with minimum inputs. Grain legumes have an important role to play in the beneficial agronomic practice of crop rotation which is largely unexploited in the region. Yet, it is ironic that the potential contribution of legumes to the amelioration of soil fertility cannot be exploited unless they are themselves gown on a well-managed basis.

SADCC development initiatives have an inherent commitment to eventual self-sufficiency and continued growth on an independent basis. Not only does the potential for improving plant species exist at both national and regional level, but also the infrastructural capacity is present to extend new technologies to the farmers. A concerted effort among research, extension, nutrition, community development, and marketing organizations will surely lead to an increased contribution to national economies through greater food legumes production, which should inevitably lead to a greater commitment of national and regional resources to these various but interrelated activities. Only in this way, can the long-term viability of grain legumes at both national and regional level be ensured.

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BIOTECHNOLOGY: ITS POTENTIAL IMPACT ON FOOD SECURITY IN SOUTHERN AFRICA

A. Ian Robertson[1]

INTRODUCTION

I am a Scotsman, and a scientist by origin and training, but I am a Zimbabwean and an optimist by choice. I have two little girls who were born in Harare and they go to Groombridge school near the University. Perhaps that introduction allows me to ask a ridiculous question of you all. If you met a fairy with a magic wand or a genie who popped out of a bottle--as happens in the stories I read to my girls--what would you ask for if either one of them granted you the traditional three wishes? I shall give you my own answer a little later on.

Mahatma Gandhi once said, "There is enough in the world for everyone's need, but not for everyone's greed." His grandson, Rajmohan Gandhi has a habit of adding, "If everyone cared enough and everyone shared enough, then surely everyone would have enough." Food security has a lot to do with shifting the motives of men from predominantly selfish towards a degree of unselfishness. Some try to legislate and fail. So what to do? I am not unaware of the weaknesses of human nature, yet biotechnology offers a stunning array of movable genes and organic products that could transform our agricultural and rural health care potential. We need, and biotech could provide, a quantum leap in agricultural effectiveness and in primary health care. There are genes--or are they genies?--available in bottles today that, given competent scientists working for our advancement, could transform our lives here in Africa.

My rather crude needs analysis, from a survey of newspaper and radio and TV suggests the following aspects of food security that biotech might help on:

- We have unpredictable rainfall and a long dry season. An increasing proportion of the national herd of cattle each year finds it hard to make it through to the next rains. We need cattle fodder that can be grown and stored locally.
- Many SADCC countries play host to many refugees. I have heard it estimated that 250,000 might have died of starvation last year in Mozambique. That generates insecurity and hunger that must be resolved. We need to grow more food--there and here.
- As the price of beef goes up, the amount of protein our children receive goes down. We need more and cheaper animal and vegetable protein.

Our rural people are very quick to adapt a good thing. Witness how Zimbabweans have taken to hybrid maize, to Moneymaker tomatoes, to planting

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eucalyptus, even to growing Burley tobacco. If biotech has anything good to offer, I believe our peasants are wiser than we in choosing what they want and need. We need to make the offer, demonstrate what is available. Maybe it is cheeky of a *muzungu* to say so, but I have observed this over eleven years of commitment to Zimbabwe. Some biotech could be transferred to rural schools and growth points.

WHAT IS BIOTECHNOLOGY?

My assigned topic is "Biotechnology and its potential impact on Food Security in Southern Africa." Biotechnology can and does encompass many things. As it is currently rather trendy, it seems to encompass almost anything to do with biology, agriculture or medicine.

My definition will, however, be fairly narrow--simply because today I have been allotted 20 minutes. Biotech is an assembly of modern techniques which gives us skills in two broad areas: tissue culture and recombinant DNA manipulation. First, tissue culture allows us to culture, keep alive, animal and plant cells in the lab, in the petri dish, in the test-tube, under sterile conditions--which permits growth and development of those cells.

Some of these cells can be manipulated with hormones and nutrition and physical conditions to express their totipotency, i.e., their inherent ability to develop from a single cell into a whole plant, a normal plant. If you start with one cell you get one plant, but if you start with a thousand cells (e.g., leaf mesophyll cells) you can potentially finish with a thousand plants, a thousand copies, a thousand clones of an original cell. I speak of plants because in some plants this is now routine. In animals, cloning is confined to a few experimental animals derived from embryos removed, split, cultured, and reinserted into the mother. When brought to term, the mother delivers cloned identical sibs (twins, triplets, etc.). In humans, no one has dared try as yet, but it is technically possible.

Some cells in culture can be manipulated to force them to express desirable biochemical products like insulin or growth hormone. Yeasts and bacterial cells are good at this kind of thing.

Yet other cells can be fused to combine the characters carried by the two somatic parents. Thus, a lab in Nottingham Power has combined the bright colours of one parent with the scrambling habit of the other. He has produced a novel species of petunia to satisfy the lovers of hanging baskets who are longing for a beautiful petunia that cascades, falling gracefully over the side of the basket.

Some human cell lines can be fused to generate new cells that are both immortal (they can live forever in the test-tube because one parent was a cancer cell) and are able to produce some useful antibodies, also forever, because the other parent was a spleen cell). These products are called monoclonal antibodies and they are revolutionising diagnostics and could dramatically help primary health care capabilities.

The second group of techniques has to do with manipulation of DNA. Biochemists can analyse the genetic programme of life, the DNA in the cell--or at least bits of it. Then, they are in a position to synthesise genes to order--designer

genes. If you have done the work and know the sequences of the DNA, you can make the gene. You can also steal genes from one organism and offer them to the organism of your choice. Thus, you can take single genes fished out of a scruffy useless plant and sew them into a crop plant of your choice.

APPLICATION OF BIOTECHNOLOGY IN THE SADCC REGION

So much for the theory. I shall describe three practical examples of relevance to Zimbabwe and SADCC.

Disease-free clonal planting material.
In vegetatively-propagated plants, you start with good clean disease-free planting material. This goes for potato, sweet potato, strawberry, cassava, yam, *tzedza*, and many more stem- and root-propagated crops. It also goes for all flowers and fruits that are propagated by cuttings, many of which have a large export potential.

Normally, in the first cropping season you get a good yield, but then disease begins to take its toll--bacteria, fungi, viruses, and mycoplasms enter, debilitate the plants and travel round in the tubes reaching all parts. So next year, you plant with infected material and lose maybe 10-20% of your yield. The year after, it is down another 20% and the year after you are making a loss. Inputs exceed output. Our communal farmers never get clean stock to plant with, so their yields tend to be terrible. If you plant rubbish, rubbish will grow.

Comparatively low biotech--a tissue culture lab--can clean up the diseased material and redistribute it as disease-free plants. We have the capability and the product at UZ's Crop Science Department now for potato, cassava, and strawberry--plus some carnations and orchids and even hops--if you should want them. We need funding and capital to gear the potential up into a service or a business. To prove it is possible, I have started a plant biotech factory on a shoestring and the products will be marketed in 1989.

Introduction and multiplication of new varieties.
If someone elsewhere selects or engineers a good new variety, tissue culture will first allow you to import disease-indexed, phytosanitarily inspected material simply and with minimum risk. Second, it will allow you to multiply from a few plants, or even just one, to have a million within a year (or maybe two). We are in the process of doing this for sweet potato from South America, Asia, and Nigeria and also with carnations from Europe. On the way, with an early batch of 36 plants, we can carry out variety trials. By the time the trials give their verdict, we can have large quantities of each line multiplied and ready for release. In this way, you can save several years between acquisition and release. Similarly, you can multiply-up promising new varieties of, say, potato that your own breeders are producing so that while they are being tested in field trials, you have them multiplying in the lab--again saving several years of bulking-up prior to release.

These are two important services--the production of "disease-free" clean stock-

and the ability to import and multiply elite foreign lines--without which no SADCC country should be. The alternative costs you millions in lost production because you are always starting with poor material, or in lost opportunity because you never get to use the best of other nations' breeding and selections.

Genetic improvement by adding genes to established varieties.
This opportunity is the one that we should all consider carefully. How would you like stemborer resistant maize? How would you like a cotton crop that resists the pink bollworm? How about potato, or tomato, or tobacco crops that are totally unaffected by a chosen herbicide? (This means that instead of spraying 2-6 times to protect your crop from weeds you can spray only once or twice and your crop is not even set back a day by the herbicide).

These are not fairy tales, not dreams, not wishful thinking, or ivory tower discussion points. The technology is available now, the resistant plants exist. I have seen them and handled the plants in other people's labs in Europe and America. The vital genes are becoming available, perhaps even in the public domain. I supervise a Zimbabwean student working on one of these revolutionary improvements. Another student is setting about cloning elite coffee for the Coffee Growers Association. A third is multiplying cassava he has selected that yields in excess of 40 mt/ha/year.

This year Zimbabwe is proposing to spend Z$17 million on herbicide and Z$ 20 million on insecticide. This year Zimbabwe will lose Z$10 million of its maize crop to the stemborer--whatever insecticide the farmers might pour on to destroy it. The pink bollworm will gobble up, despite sprays if you can afford them, many more millions worth of our peasant farmers' yield of cotton.

POTENTIAL ECONOMIC AND SOCIAL IMPACT OF BIOTECHNOLOGY

For three million dollars, we could build a Biotech Institute. We could employ Zimbabwean scientists and pay them a decent salary to do exciting work. It could be self-financing in three years because it would save a large slice of that $Z37 million and all of that Z$10 million I mentioned earlier. We could then supply high-quality planting material and genetically-improved seed for Zimbabwe, for SADCC if they wish, and for Africa. We could even train the scientists needed to sustain this kind of effort in our neighbouring countries. The seed produced would have, permanently, the added qualities of resistance to chosen viruses, chosen caterpillars, chosen beetles, selected herbicides, and maybe one day chosen fungi. Please take note that what we are looking at here is a reduction in chemical inputs; a reduction in foreign exchange needs; a reduction in labour on the farm; a reduction in disappointments when insects consume a hard-won yield; and a reduction in chemical excesses assaulting the soil, the water, and the environment. Also, of major significance is that all these reducing factors will bring the use of these modified

seeds and plants into the grasp of the rural, communal farmer. His (her) main difficulty is said to be lack of cash to buy inputs: as we reduce the need for these very inputs, we bring the fruits of good biotech to the rural doorstep or at least the local school, or store, or growth point.

At this point, I should say that well-considered and well-planned endeavours with good biotech could be one of the means to the end of "sustainable development" that was so ably argued for by the *Brundland Report* and by the Technical Advisory Committee (TAC) of CGIAR in its 1988 *Report on Sustainable Agricultural Production*.

A fourth example, for which we have no time, is the big question of genetically-engineered vaccines. Four separate vaccines for malaria are on trial right now in pilot work. The early ones are not yet too effective, but they will improve. Big teams are working on schistosomiasis vaccine. A French team has tested one successfully on mice, rats, monkeys, and baboons. We await eagerly the news of careful human trials. In fact, should we not offer to help in the testing? Can you imagine an Africa free of malaria, free of bilharzia, free of these debilitating, parasitic diseases? That is my dream, those are the three wishes I would ask of my good fairy--or is it the scientist with his genie captured in his mysterious bottle? I would ask for a chance to play a part in ridding Africa of hunger, of disease, and then with a bit of luck and an honest administration, we could also eliminate the burden of debt.

HOW IS ALL THIS POSSIBLE?

Biotech can be used for good and for bad. We could engineer terrifying new weapons. We could irresponsibly release crazy combinations. Some high tech applications could put some of the third world crops out of business. Vanilla and cocoa are being worked on. The answer is not to ban it or to boycott it, but to design sane policies putting biotech to work for our interests before other users gain a monopoly.

In this context, I have some guidelines that I personally aim at when deciding what to do with my time:

- o If we grow enough food for our own nation, we will insulate ourselves from world economic forces that we cannot control, so we generate the dignity that springs from self-respect.
- o If we export more than we import, we create autonomy where not even the World Bankers will want to tell us what to do. So comes self-sufficiency.
- o If we choose to help our neighbours where we can, we will generate self-control at home, and reap future security in our region.

To achieve the potential described above, we need:

- o a Biotech Institute;
- o master's programme in Biotech in SADCC;
- o to negotiate for access to the genes of interest to us (this involves honouring plant breeders' rights and international patent law); and
- o decent funding for graduate students and post-doctoral candidates to tackle these exciting goals.

I intend to give it a go--and am looking for anyone who wants to help.

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FAMILY FOOD SECURITY STRATEGIES IN LOW-RAINFALL AREAS

FAMILY INCOME SOURCES AND FOOD SECURITY

Charles J. Chopak[1]

INTRODUCTION

Background

A major objective of all governments in Sub-Saharan Africa is to improve food security--defined "as a situation in which all individuals in a population have access to a nutritionally adequate diet" (Eicher and Staatz, 1985). There are two sides to the food security equation: food availability and food access (Rukuni and Bernsten, 1988). Food availability is defined as the national availability of food through either production, storage, or trade. Food access is defined as the ability of the household to acquire food through production, purchases, or transfers.

To date, much of the concern about food security in Africa has focused on national food availability issues such as constraints on expanding food production, increasing national storage capacity, intraregional grain trade, and food aid. This concentration on food availability issues is understandable, given the periodic drought-induced famines that have occurred during the past decade. But as a result of favorable rainfall throughout Africa in 1986 and 1987, about a dozen countries became self-sufficient in food. In fact, several governments requested assistance from international agencies in finding market outlets for their surpluses.

National food availability does not necessarily lead to household food security. Over the past decade, policymakers, researchers, and donors have increasingly recognized that hunger, malnutrition, and family food insecurity are--to a large extent--caused by poverty; resulting from a shortage of rural nonagricultural employment opportunities and a lack of resources at the household level to produce enough food (Zimbabwe, 1981). Furthermore, in many countries, family, village, and public food transfer programs have failed to adequately make-up these shortfalls (Eicher, 1985). Therefore, research is needed on expanding household access to food.

Research problem

Although Zimbabwe is classified as a middle-income economy (World Bank, 1987), a large portion of its population is food insecure. A World Bank task force on food security reported that in 1980, 50% of Zimbabwe's population was malnourished. The Zimbabwe Government has recognized the need to assure the food security of its people, by initiating efforts to expand access to food in rural areas (Zimbabwe, 1981).

The incidence of food insecurity in rural Zimbabwe is largely determined by agroecological factors. The country is divided into five natural regions. Natural

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Region I has the best, and Natural Region V has the poorest quality soil and lowest rainfall. The largest numbers of food insecure households live in Natural Regions IV and V. This is because these natural regions have the highest population density (relative to their resource base), lowest productivity, and highest incidence of agricultural production risk. For these reasons, this study focuses on analyzing the food security status of households in Natural Regions IV and V, and identifying alternative strategies for improving household food security in these areas.

Research objectives

The general objective of the proposed research is to provide a better understanding of family food security in low-rainfall areas of Zimbabwe in order to identify alternative policy interventions to reduce food insecurity. This study will address the general objective through five specific objectives.

- Determine the incidence and degree of family food insecurity; and explain the inter-household variability in terms of social characteristics, resource ownership, and access to off-farm income opportunities.
- Determine the contribution of the three major sources of household access to food: production for home consumption, income generating activities, and transfers; and the importance of the specific subcomponents within each of these food access categories.
- Assess the impact of commercialization on family food security.
- Develop a model to evaluate the impact of policy and institutional interventions on households with varying degree of food security; and constraints facing households with differing socioeconomic characteristics from being able to respond to these interventions.
- Recommend changes in policies and institutions to improve family food security.

Organization of the paper

This paper is organized into five sections. Section two presents research strategies and methods that will be used. Section three provides the framework to analyze the structure and determinants of household income sources and expenditures. Section four discusses the potential of achieving food security through crop production. The last section will discuss the some emerging themes of preliminary analysis.

RESEARCH STRATEGIES AND METHODS

Research area selection criteria

The following seven criteria were used to select the survey areas:

Natural region

Food insecurity is greatest in the poorest agroclimatic regions, defined by rainfall and soil characteristics. Therefore, the research sites (villages) were selected in Natural Regions IV and V, areas of the country with relatively less rainfall and less fertile soils. Rainfall averages 400-600 mm/year in Natural Region IV and somewhat less

in Natural Region V. Both regions have a unimodal rainfall pattern, distributed over only three to four months.

The regional stratification will provide data for assessing the differing food security situation in the two contrasting agroecological regions.

Production system

The selected sites were chosen because farmers in these sites utilize diverse cropping patterns that includes maize, small grains (sorghum, pearl millet, and finger millet), and oilseeds (groundnuts and sunflower). Also, across these sites, livestock are of varying importance, but relatively more important in Natural Region V.

Crop production is a primary component of household food security. Staple grains provide food for home consumption and cash crops to provide income to purchase food and meet other expenses. In addition, livestock sales are an important source of cash income.

The diversity in production system will provide data for assessing the differing food security situation given different enterprise mixes.

Access to markets

Previous research (Stanning, 1985; Rohrbach, 1987) has shown that distance to market is an important determinant of a household's food security strategy. In particular, market access will influence a households' production strategy. Consequently, villages were chosen that range from 10 to 80 km from the nearest Grain Marketing Board (GMB) depot or collection point.

Sources of off-farm income

Off-farm employment provides households with opportunities to improve their food security supplementing agricultural income with wage earnings (Helmsing, 1987; Chuta and Liedholm, 1979). The selected sites have a diversity of opportunities for households to generate income through off-farm activities--thereby providing an opportunity to analyze the role and contribution of off-farm employment on household food security.

Potential of new technology

New agricultural technology can reduce food insecurity by both increasing and stabilizing crop yields (Waddington and Kunjeku, 1988)--thereby increasing own production and marketable surplus.

Some of the sites were selected adjacent to where the Department of Research and Specialist Services (DR&SS), Ministry of Agriculture, Lands, and Rural Resettlement will conduct on-farm experiments and the extension service (AGRITEX) will site on-farm demonstrations. Since these agronomic trials are conducted under agroecological (soil and rainfall) and sociocultural conditions similar to those found in the survey areas, the trials/demonstrations will provide indicative technical coefficients to assess the potential impact of new crop technology on improving household food security.

Potential to expand small-grain utilization

Studies have reported that in recent years, households in low-rainfall areas have increasingly substituted maize for small grains to meet food needs (ENDA-Zimbabwe, 1987). The labor intensity of home-processing small grains, relative to maize, is cited as a major reason. A site was selected near a small-grain dehuller to assess its impact on the role and uses of small grains in food security strategies of communal farmers in Natural Regions IV and V.

Access to transfers

Food transfers, particularly cash provided through food-for-work programs in drought years, are an important means for improving household food security (Reutlinger, 1985). While not an explicit selection criteria, food-for-work programs have provided access to food in varying degrees across then villages selected.

Table 1 shows the distribution of sites (villages) with respect to these criteria.

Table 1. Distribution of research sites with respect to selection criteria and district, Zimbabwe, 1987-88.

	Mutoko/Mudzi						Buhera					
Criteria	1	2	3	4	5	6	1	2	3	4	5	6
Natural region												
IV (450-650mm	x	x	x	x	x	x						
V (<600 mm)							x	x	x	x	x	x
Production system												
Maize	x	x	x	x	x	x						
Small grains							x	x	x	x	x	x
Oilseeds	x	x	x	x	x	x	x	x	x	x	x	x
Access to markets												
Poor	x			x		x					x	x
Average		x			x				x	x		
Good			x				x	x				
Non-agricultural activities importance												
High				x				x				x
Medium	x				x	x	x			x	x	
Low			x	x					x			
Proximity to trials												
Yes						x		x	x		x	
No	x	x	x	x	x		x			x		x
Proximity to dehuller												
Yes					x							
No	x	x	x	x		x	x	x	x	x	x	x
Access to transfers	x	x	x	x	x	x	x	x	x	x	x	x

Research location (district and village)

The research will be conducted in two survey areas: Mutoko and Mudzi Districts (140 km northeast of Harare) and Buhera District (300 km southeast of Harare). Although Mutoko District is in both Natural Regions III and IV, all research sites are in Natural Region IV. Mudzi District is entirely in Natural Region IV. Buhera District spans Natural regions III, IV and V, but all the research sites are in Natural Region V. A total of 12 villages were selected, based on the criteria presented. Six villages were chosen in each of the two survey areas.

Household sample

In each village, 25 households were randomly chosen, using population lists provided by village leaders. The total sample will include 300 households, 150 in each of the two Natural Regions (IV and V). The distribution of the sample is presented in Table 2.

Data collection

The data will be collected through household interviews (single visit recall interviews and monthly monitoring), key informant interviews, and on-farm experiments and demonstrations.

Data have been collected on household characteristics (single visit), field characteristics (single visit), beginning inventory (single visit), and income and expenditure (four rounds). This paper presents the framework that will be used to analyze the structure of incomes and expenditure, and also some preliminary analysis. The purpose of preliminary analysis during the data collection period is useful to check data consistency and completeness. More important, this mid-data collection analysis permits emerging themes of the early data collection to be incorporated into subsequent modules. This successive tinkering during data collection will clarify relationships not apparent during the initial data collection.

Table 2. Distribution of the sample of households for the University of Zimbabwe Food Security Research Project, Zimbabwe, 1987-88.

Cluster			
Stage I (Natural region)	Stage II (village)	Stage III (households)	Total sample Households)
Natural Region IV Mutoko/Mudzi Districts	6	25	150
Natural Region V Buhera District	6	25	150
TOTAL	12		300

STRUCTURE OF INCOME SOURCES AND EXPENDITURES

As noted earlier, food insecurity arises from a household's inability to assure a sufficient net income--through production for home consumption, income generating activities, and transfers--to acquire enough food for a nutrition-adequate diet. The importance of income sources to household food security has been demonstrated by many researchers. Studies that have verified the significant contribution of small-scale rural enterprises to household income include research by Chuta and Liedholm (1979) and Helmsing (1986 and 1987). Transfer payments (cash or in-kind) represent a short-run strategy to increase real incomes of food insecure households (Reutlinger, 1985; George, 1979; World Bank, 1988).

Figure 1 shows the components of net household income which, summed together, measure the household's food security status. Similar income-based measures of income have been used by Kumar (1986) and Reardon, Matlon, and Delgado (1987).

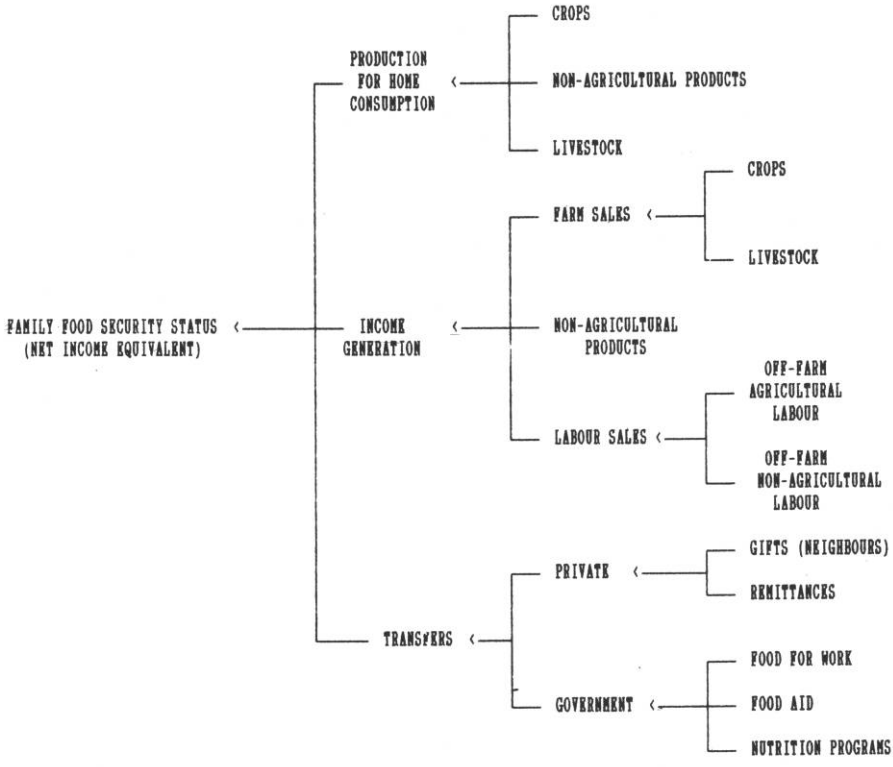

Figure 1. Components of family food security status.

Indicators of food insecurity

Per capita income

The analysis will first estimate the total annual net per capita household income (net household income) defined as a cash-equivalent of production for home consumption (crops, livestock, and non agricultural products), cash from income-generating activities (sales from farm products, non-agricultural products, and labor) and cash-equivalent of transfers (private and government). In calculating net household income, the costs of acquiring the farm products and cash are subtracted from the total amount received by the household. The residual is the monetarized value of cash and farm products the household has left for consumption, investment, and savings requirements. Figure 2 illustrates the relationship between net household incomes which determines food security status and food consumption.

The purpose of the analysis is to assess the distribution of net income by income deciles--across districts and within villages in each region. This will show the percentage of the households in each income decile. In addition, the distributions will be presented in the form of Lorenz curves to show the variability of income across districts and within villages in each district.

Food adequacy

The analysis will next focus on estimating the incidence of food adequacy by estimating a food-adequacy index. The index will be estimated by calculating net per capita income (previously analysis), and then deducting cash and in-kind investments and expenditures. The residual is the monetary value of "income available for food" purchases and savings.

Then, per capita household caloric requirements will be estimated using WHO minimum requirements and then converted to the dollar cost of supplying this minimum level through the purchase of staple grains. Finally, a food-adequacy index will be calculated as a ratio of 'income available for food' to the cost of acquiring the minimum caloric requirements. While this measure is only a proxy indicator of food adequacy, it will indicate the approximate incidence of food insecurity by showing the value of income remaining after accounting for all nonfood expenditures, compared to the cost of meeting minimum daily per capita food needs. The distribution of this food-adequacy proxy will be examined between districts, villages, and across the total sample to identify the incidence and distribution of food inadequate households.

Seasonal variability

Annual food security--measured by net household income and the food-adequacy index--is a necessary, but not a sufficient condition for food security. Due to the seasonal nature of income and expenditure flows, a household may be food adequate on an annual basis, but food insecure during a given period of the year. Analysis of the seasonal distribution of net household income and the food-adequacy index will seek to identify the seasonal incidence and distribution of food insecurity not captured through annual-based analysis.

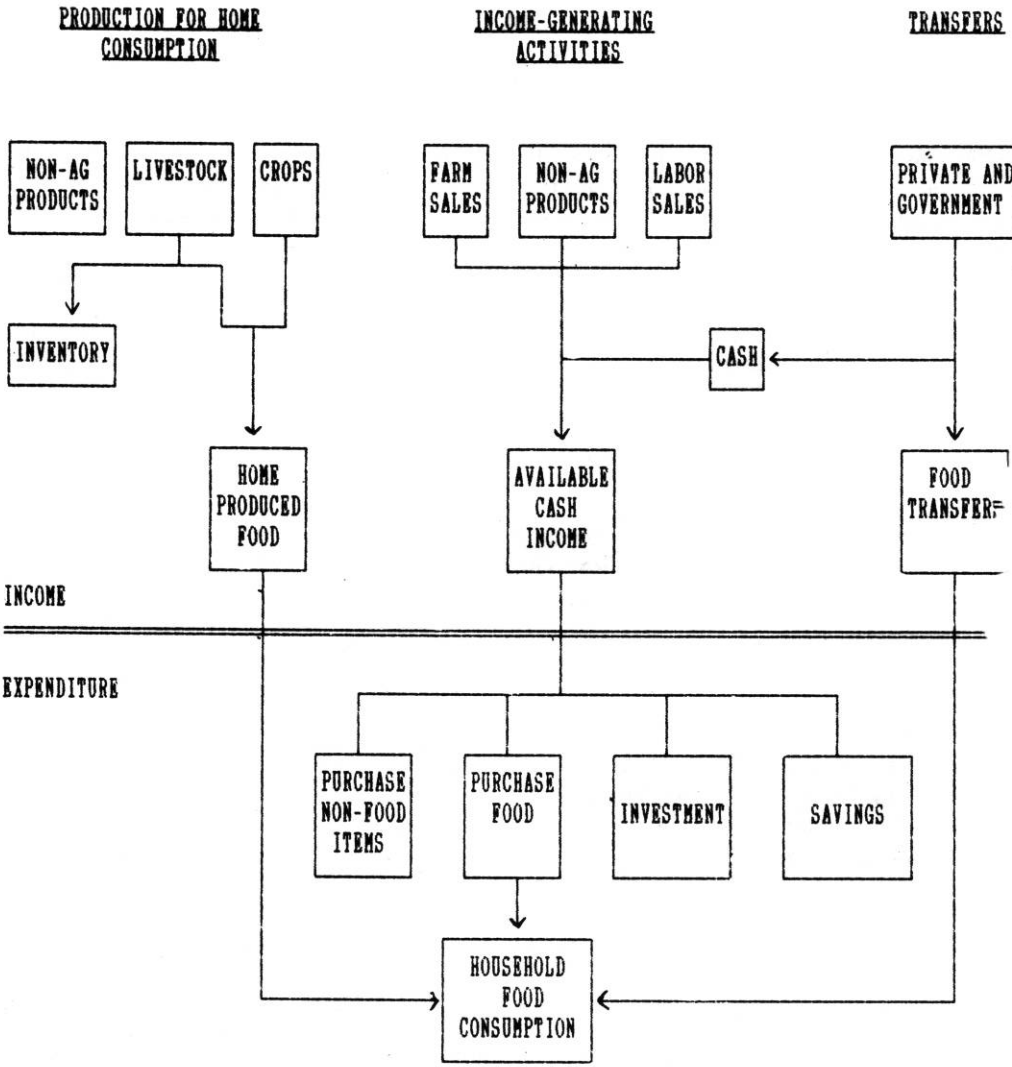

Figure 2. Relationship between food security status, income sources, and household food consumption.

Net household income, estimated through this analysis, will subsequently be used as a dependent variable to explain the determinants of household food security.

Structure of income and expenditure

In semi-subsistence households, household decisions concerning production, consumption, and investment are interrelated. The proposed analysis will examine the structure of both household income (cash and in-kind) flows and expenditures, at a further level of disaggregation by constructing a series of production, income-expenditure, capital formation, and transaction accounts for each household, similar to those developed by Hayami (1978). This analysis will serve to identify the major sources of income, expenditures, and transactions between households. This information will be used to provide insights into what policies can assist food insecure households.

Household accounts structure

The household accounts system will include six major subaccounts: current agricultural production, current nonagricultural production, income-expenditure, fixed capital production, capital finance, and transactions. These accounts will show how households allocate their resources (family owned and borrowed); the major categories of income and expenditure for agricultural and nonagricultural production; identify sources of funds for financing investments; and identify the major transactions and flows categories.

Household accounts analysis

Various components of the accounts system will be examined in greater detail to assess the absolute and relative contribution of the various aggregations.

Absolute contribution of subaccount components

The data will be used to:

- o estimate income and expenditure accounts for each household, aggregated by net income quartiles, village, and by natural region;
- o assess the differences in account structure across income groups, villages, and natural regions;
- o identify the absolute level of net household income from the various income sources *i.e.*, production for home consumption (crops, livestock, and non-agricultural production), income-generating activities (farm sales, non-agricultural product sales, and labor sales), and transfers (private and government); and
- o estimate the absolute level of expenditures, by major expenditure category, *i.e.*, include consumption (food and nonfood goods), investment (physical and human), and savings (residual).

Relative contribution of subaccount components

The evaluation of the relative contribution of the subcomponents will be conducted in exactly the same manner as with the absolute contribution. The relative

contribution will be assessed across income groups, villages, and natural regions. This analysis will also identify the net household income sources and levels and the expenditure uses and levels.

Determinants of net household-income and expenditure

Other researcher have shown that household income varies considerably between households (Jackson and Collier, 1988; Stanning, 1989). Greater understanding of factors explaining interhousehold income variability is needed to assess the impact of current and future policies on various income strata.

Income categories

This analysis will estimate the contribution of various independent variables in explaining the variability in net income from each major source (*i.e.*, home production, income-generating activities, and transfers) using net household income (for income category) as the dependent variable.

For each income quartile, an econometric model will be constructed for each of the three income sources to explain the variability across households. These econometric models described below will explain the contribution of each independent variable to net income for each income quartile--providing insights into the relative contribution of each source across income groups.

Home production	=	f (region, resources, socioeconomic characteristics, institutional factors)
Income generation	=	f (region, resources, socioeconomic characteristics, institutional factors)
Transfers	=	f (region, resources, socioeconomic characteristics, institutional factors)

where: region	=	natural region
resources	=	land, labour, and capital
socioeconomic	=	family size, education, literacy, etc.
institutional	=	distance to GMB depot/collection point AFC loans, small grain dehuller

Total net household income

The next section will explain the overall effect of various independent variables on net household-income. The econometric model is:

Net household income	=	f (region, resources, socioeconomic characteristics and institutional factors)

Expenditure determinants

Finally, the variability in the relative importance of the major household expenditure, food, for each of the income quartiles will be examined. The percentage of

household income spent on food will be explained using region, resources, socioeconomic, and institutional variables.

Percent of cash = f (region, resources, socioeconomic income spent on food characteristics and institutional factors)

POTENTIAL OF ACHIEVING FOOD SECURITY THROUGH CROP PRODUCTION

During the harvest season, farm product inflows from own production represented between 85-91% of all inflows to households during the 1987-88 harvest season.

To assess the potential of achieving household food security solely through crop production, total crop output was converted to its energy (kilocalorie) equivalents, using World Health Organization (WHO) nutritional conversion rates. The grains were converted directly into their energy equivalents. Oilseeds, cotton, fruits, and vegetables were converted to a dollar value (using local prices), and then to a maize-meal energy equivalent. The total grains-equivalent energy value was then calculated for each household.

To determine the total annual energy needs of each household, the energy needs of resident household members were calculated using WHO nutritional rates. The difference between energy produced and the energy required by each household to meet minimum needs demonstrates the degree to which the household can meet its energy needs through crop production alone.

Crop production adequacy (1987-88 and 1986-87)

Farmers in both Mutoko/Mudzi (Natural Region IV) and Buhera Districts (Natural Region V) indicated that the rains were better in 1987-88 than the previous three seasons. Therefore, the 1987-88 agricultural season is used to represent a good year, and 1986-87 is used to represent a bad year. Table 3 shows the distribution of the number of months of energy (kcals) equivalents produced by households during the 1987-88 and 1986-87 agricultural seasons.

The assumption guiding this analysis is that all grains are consumed, and all nongrain crops are sold for cash to buy maize meal. These calculations do not take into account any nongrain consumption needs of the household. Therefore, estimate of the food adequacy of the households overestimates the household's food production adequacy.

Even in a good rainfall year (1987-88), a majority (59%) of communal households produce insufficient grain-equivalents to supply household caloric needs. During a poor rainfall year, an additional 20% of the households fail to produce sufficient grain to meet household caloric needs.

Table 4 presents the distribution of households which are deficit and surplus grain producers by natural regions and land ownership groups for the two agricultural

Table 3. Energy produced by sample households, Zimbabwe, 1987-88 and 1986-87.

Months of energy produced (Grain-equivalents)	1987-88 season			1986-87 season	
	Sample size (N)	Percent (%)	Cumulative percent (%)	Percent (%)	Cumulative percent (%)
0 to 4 months	61	21	21	41	41
4 to 8 months	59	20	41	26	67
8 to 12 months	51	18	59	12	79
12 to 16 months	30	10	69	7	86
16 to 20 months	19	6	75	4	90
20 to 24 months	16	6	81	4	94
> 24 months	56	19	100	6	100
Total	292	100	100	100	100

Source: Mudzi/Mutoko and Buhera surveys.

seasons. These preliminary results highlight the importance of land ownership (given existing technology) for households to produce enough grain-equivalents to meet annual consumption needs. In both natural regions and in both seasons, households producing a surplus grain-equivalents over their annual energy needs tended to be in the upper half of the land ownership strata shown in Table 4. Also, households in both natural regions, across both land ownership groups, are more production inadequate (grain-equivalents) when rainfall is poorer (1986-87). The effect of poor rainfall is larger in Natural Region V, where an additional 19-26% of households failed to produce enough estimated grain-equivalents in 1986-87.

Table 5 presents the distribution of the average degree that households are either surplus or deficit by natural regions and land ownership groups for the two agricultural seasons. These results demonstrate the average degree of surplus and deficit the households could attain across natural regions and land ownership group for the two seasons. Households with more land tended to produce a slightly higher degree of grain-equivalents to meet household consumption needs, except in Natural Region IV in the poorer rainfall year.

Implications

The preliminary analysis of the household's ability to produce enough grain to feed its family clearly illustrates the importance, in both poor and good rainfall years, of alternative income sources. Most households in Natural Regions IV and V, regard-

Table 4. Household grain-equivalents status by natural regions and land ownership groups, Zimbabwe, 1987-88 and 1986-87[a].

Household level land ownership group (ha/rhm[b])	Sample size (N)	1987-88 season Grain-equivalents status		1986-87 season Grain-equivalents status	
		Surplus (%)	Deficit (%)	Surplus (%)	Deficit (%)
Natural Region IV					
0.0 - 0.46	77	34	66	27	73
>0.46 +	77	59	41	45	65
Natural Region V					
0.0 - 0.54	24	30	70	11	89
>0.54 +	33	44	56	18	82

[a]Sample size is 229.
[b]RHM is resident household member.
Source: Mudzi/Mutoko and Buhera surveys.

Table 5. Grain equivalents as percentage of estimated annual needs by natural regions and land ownership groups, Zimbabwe, 1987-88 and 1986-87[a].

Household level land ownership group (ha/rhm[b])	Sample size (N)	1987-88 season		1986-87 season	
		Surplus (%)	Deficit (%)	Surplus (%)	Deficit (%)
Natural Region IV					
0.0 - 0.46	77	193	46	168	39
>0.46 +	77	231	60	178	34
Natural Region V					
0.0 - 0.54	68	158	42	125	31
>0.54 +	70	178	50	181	33

[a]Sample size is 229.
[b]RHM is resident household member.
Source: Mudzi/Mutoko and Buhera surveys.

less of the quality of the rainfall year, do not produce enough to assure grain consumption needs. The effect of a bad rainfall year was much larger in Natural Region V, compared to Natural Region IV.

EMERGING THEMES OF PRELIMINARY ANALYSIS

The preliminary analysis discovered two emerging themes: the importance of cash income sources during the hunger season and the production inadequacy of households in Natural Region IV and V.

Hunger season income sources

Three important income sources during the hunger season of 1986-87 have emerged during the preliminary analysis. These income sources are labour payments, remittances, and transfers.

Labour payments

Labour payments were the largest income source during the hunger season. The contribution of these payments to total income during the hunger season highlights the importance of off-farm employment to net household income. Further analysis will quantify the magnitude of labour payments and evaluate off-farm employment opportunities of households in Natural Regions IV and V.

Remittances

The next most important income source was remittances from a family member who sent money home during the hunger season. Further analysis will investigate the relationship between education and the relationship of the remitter to the magnitude of money received by the household. It is hypothesized that income from this source plays an important role in household cash flow.

Government transfer payments

The third most important income source was government transfer payments. These payments are important to household income, especially after poor harvests. These programs can play an important role in combating transitory food insecurity by bridging the gap until the next crop is harvested.

Inadequate food production potential of communal households

It was demonstrated that communal households in Natural Regions IV and V are likely to be deficit producers in terms of grain-equivalents from own production. The estimated production inadequacy grain-equivalents through own production across sample households in a good year was 59%, and in a bad year was 79%. Households in Natural Region V were more susceptible to poor rainfall years, compared to households in Natural Region IV. The large magnitude of households who fail to produce enough grain-equivalents highlights the importance of alternate income sources to households. Further analysis will investigate policies to stimulate

nonagricultural production, employment generation, and government transfer programs to improve the food security of households in these marginal areas.

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HOUSEHOLD STRATEGIES FOR COPING WITH FOOD INSECURITY IN LOW-RAINFALL AREAS OF ZIMBABWE

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INTRODUCTION

Since the late 1960s, the countries of Sub-Saharan Africa have been struggling against severe food shortages and the crisis appears to be worsening rather than improving. A number of factors account for the continent's growing inability to feed its rapidly expanding population. We have previously argued that one aspect of the food crisis that has received relatively little attention from policymakers is the role and status of local village-based strategies for coping with food deficits (Zinyama *et al.*, 1987). It is at the level of the village that most food is produced and at which the majority of the African population seek security and protection against food shortages. When there is a food deficit, it tends to begin in villages and households that are most vulnerable and it frequently spreads over a wider geographical area. National and international concern is seldom raised until widespread hunger exists, by which time the villages and households initially affected may be in dire straits. It is now recognised that between the emergence of the problem and the arrival of external assistance, villages and farmers will employ a variety of strategies to mitigate the food shortage. In many cases, the strategies are sufficient to prevent famine and death and to reduce the need for external assistance. But in other cases, these village-based strategies are eventually overwhelmed by the magnitude of the crisis such that hunger, starvation and even death ensue.

The literature on strategies for coping with food insecurity in rural Africa in general, and in the SADCC countries in particular, was reviewed in our earlier paper (Zinyama *et al.*, 1987). The aim of this paper is to extend our understanding of Zimbabwean household responses to food insecurity by examining the coping strategies of a small sample of rural families in low-rainfall areas which are prone to regular food shortages, with particular emphasis on the main gender and inter-village differences in strategies. The paper is divided into three sections: the first section summarises some of the principal theoretical and conceptual issues in household coping strategies; the second outlines the methodology of the research; and the third discusses some of the preliminary results of the research from data collected in two villages in the southeast and one village in the northwest of Zimbabwe.

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COPING STRATEGIES: SOME CONCEPTUAL ISSUES

There is general agreement that strategies for coping with recurrent food shortage are an integral part of the total rural socioeconomic system. Coping strategies include activities which may appear insignificant and not identifiable from the overall rural food production system in years of plenty; but assume increasingly greater importance in times of food deficits. These strategies represent adjustments which societies develop, either within their socioeconomic systems or in their interaction with the local environment in order to reduce both the risk and consequences of food shortages--many of which are associated with environmental hazards such as drought and crop damage by pests. Studies from different parts of the continent have shown that the use of village-level coping strategies is widespread; that the strategies differ from one society to another; and that they are adopted in an identifiable sequence in which the most palatable are taken first and those representing major disruptions of societal norms are taken last (Campbell, 1986; Watts, 1983). Further, it is possible to classify the diversity of coping behaviour into economic, social, and environmental strategies.

Economic strategies

Economic strategies for coping with food insecurity include the diversification of activities in terms of crops grown, animals owned, and both on-farm and off-farm supplements to household income. By diversifying the household's activities, the risk of food insecurity is reduced, as a downturn in one activity can be offset against another. Diversification also allows for some flexibility in the allocation of household resources such as labour. Other economic strategies are based on the liquidation, either for own-consumption or through selling, of household savings and other assets such as livestock, goods or stored grain. Changing economic conditions and the incorporation of villages into the wider national and international economy have extended the geographical area of operation of these economic strategies to include interregional trade, labour migration to urban areas as well as cash cropping. The money earned from these activities is then used to purchase food in times of deficits.

Social strategies

Social strategies for mitigating food shortages are based on reciprocal arrangements and social relationships among families and communities. These may include sharing labour, loaning food or cash, sending children to live with better-off relatives, etc. It is important to emphasise that these social coping strategies are reciprocal.

Environmental strategies

Environmental strategies are based on the careful and selective use of the local physical resource base in times of food deficits. Hill slopes and river valleys provide different local environments which make it possible for households to diversify their cropping strategies and therefore reduce the risk of food shortage. Grazing areas and woodlands provide seasonal fruits, berries, roots, and wildlife which, in times of food insecurity, may become increasingly important sources for survival.

Factors affecting choice of strategy

Most studies on coping strategies have stressed the sequences in their adoption by households. But few have examined in detail the differences in the use of these coping strategies among different social groups both within and between villages, *i.e.* poor versus wealthy families, young versus old, or men versus women. The limited available evidence suggests that there may be important gender, age, and economic class differences in the recourse to, and types of, coping strategies adopted. Poorer families are likely to enter and move along the sequence of strategies--from the more palatable to the least palatable and most irreversible--earlier than wealthier households; women may bear the initial responsibility of guiding the family through the crisis, whereas the men become involved only if the shortage persists and intensifies. Thus, the types of strategies and their adoption within a country will vary according to local sociocultural, geographical, environmental, and political circumstances, while within the same community they will also vary according to such variables as economic status, gender, and age.

THE STUDY AREAS AND RESEARCH METHODOLOGY

Four areas within agroecological Regions IV and V were selected for comparative study, but so far detailed field surveys have been completed in only two of them. The study areas include both communal lands and resettlement areas. The two areas where the field surveys have been completed are the Dewure Resettlement Scheme east of Bikita Communal Land in the southeast and Gokwe Communal Land in the northwest of the country. The other two areas where field surveys are still to be completed are at Mudzi and Buhera Communal Lands in the northeast and southeast, respectively.

Dewure Resettlement area

This area used to be part of the Devuli Ranch, an extensive tract of land between Bikita Communal Land and the Save River. The western portion of the ranch adjacent to Bikita Communal Land was acquired by government for resettlement and the first group of settlers moved onto the scheme in 1982. The inhabitants are settled in 31 villages under Model A, which comprises individual arable holdings and communal grazing with nucleated village settlement. At the time of the field survey in January 1988, there were 944 households on the scheme, with an average of 30 families per village. Two of the villages, Village 3 just south of the border with Buhera near the Dewure River and Village 14, some 15 km south of the main Birchenough Bridge-Masvingo road, were randomly selected for the survey.

Gokwe Communal Lands

In this site, a part of Chitemo VIDCO (the lowest local government unit) near Chireya Mission in Chireya I Ward, was selected for study. The ward is situated in the extreme north of Gokwe near the border with Omay Communal Land. It is 150 km north of the district service centre at Gokwe.

Selection criteria

These survey areas, including Buhera and Mudzi, were chosen for the following reasons:

- o They are located in areas of low rainfall.
- o They are known to experience periodic food shortages.
- o The resettlement area was included in order to examine whether newly resettled people have different coping strategies, compared with those in long-established communities within the communal areas.

Site characteristics

Although the study areas are located in low-rainfall areas, they differ in terms of certain cultural, economic, and physical characteristics. Chireya and Dewure Village 14 are situated in agroecological Region IV. This region is ideally suited for semi extensive farming, based on livestock production supported by the cultivation of drought-resistant crops. The rainfall is low (450-650mm per year) and periodic seasonal droughts and severe mid-season dry spells in excess of 20 days are common. Dewure Village 3, located in the valley of the Dewure River above its confluence with the Save, lies in agroecological Region V, which is ideally suited only for extensive livestock and/or game ranching, except where crop irrigation is practised. Because of the climatic constraint imposed by low and unreliable rainfall, crop failure induced by moisture stress is fairly common in the three villages, even in relatively normal years. Households in these areas are therefore at risk of food shortages on an annual basis. The soil characteristics in the three areas also contribute towards low crop yields. Village 14 has fersiallitic soils which belong to the kaolinitic group. These soils have low water-holding and cation exchange capacity, which renders them inherently infertile. Village 3 contains lithosols which are generally shallow and stony. On the other hand, Chireya has sodic soils. These have high levels of exchangeable sodium which is detrimental to plant growth.

The population of Chireya is quite heterogeneous, comprising both long-standing inhabitants as well as recent immigrants, some of whom came from as far as Masvingo and Matabeleland Provinces. In recent years, settlement in the area has increased following the northward retreat of the tsetse-fly belt. In Dewure, most of the adult inhabitants in the two survey villages were born on Devuli Ranch. They or their parents used to work on the ranch until 1964 when, according to local village leaders, their families were evicted following a dispute with the ranch owners. Some of them went to live in Buhera, while others went to Bikita. When selection for settlement was being carried out soon after independence, preference was given to former residents of the area. Thus, most of the residents of Village 3 came from Buhera to the north, while those in Village 14 came from Bikita to the west.

Sample characteristics

The field surveys on the three villages were conducted during January-February 1988. This involved the administration of a structured questionnaire schedule. All the households in each village were to be interviewed. In each case, the head of the household and the spouse were to be interviewed, unless one of them was absent

from home. (In a few cases where the husband was not present or was dead, an adult son was interviewed together with the mother--provided he was still a member of that household.) The household was defined as a group of persons, usually bound by kinship ties, who normally reside together and share meals from a common kitchen. A single household normally consists of two or, in some cases, three generations comprising a husband (who may reside and work elsewhere away from home) and his wife, their unmarried children (including those who may be non-resident), and sometimes one or more of their aged parents as well as one or more of their grandchildren. A total of 44 households in Chireya were surveyed, 24 in Dewure Village 3 and 26 in Village 14 (Table 1). The total populations in the samples were 379 in Chireya, 216 in Dewure Village 3, and 274 in Village 14, giving average household sizes of 8, 6, 9 and 10.5, respectively.

Data collection approach

The questionnaire was divided into two parts. The first section sought information about the household, including its demographic structure and size, amount of arable land owned and land utilisation, ownership of agricultural resources, participation in wage labour and in local organisation, and the general socioeconomic status of the family. This first module was administered one each per household, the respondents being either the husband or wife alone or, preferably with both spouses present. Thereafter, the spouses were separated in order to answer the second, or main, part of the questionnaire. This dealt with the individual respondent's experience with regard to food insecurity and the coping strategies which they had adopted to mitigate the recent shortages. Every precaution was taken to ensure that there was no collaboration between spouses in responding to questions in the second part of the questionnaire. The numbers of male and female respondents in each of the three villages are given in Table 1. Overall, 45.6% of the respondents were male and 54.4% female, a distribution that allows for comparative analysis of coping strategies by gender.

Table 1. Size distribution of respondents by sex and village, Zimbabwe, 1988.

Village	No. of households	No. of respondents			% of total
		males	females	total	
Chireya	44	36	39	75	46.9
Dewure V.14	26	20	24	44	27.5
Dewure V.3	24	17	24	41	25.6
TOTAL	94	73	87	160	100.0

Source: Field survey

HOUSEHOLD COPING STRATEGIES WITHIN THE SURVEY AREAS

In recent years, Zimbabwe has experiences erratic climatic conditions with frequently recurring severe droughts. The unfavourable climatic conditions would have a direct impact on food supplies within the communal areas where households depend primarily on rainfed production to see them from one harvest to the next. While Zimbabwe's policies, aimed at promoting peasant agricultural production since 1980, have received worldwide acclaim, what has received much less publicity is the emerging inequitable social and spatial distribution of benefits from these policies. A large proportion of the increased national output and sales to the statutory marketing boards (*e.g.*, 66.6% of the small-scale sector's total maize deliveries between 1980 and 1986, rising to over 95% in drought years) come from only a little over one-quarter of the sector's farmers who are located in the medium rainfall areas of Mashonaland and Central, East and West Provinces (Stanning, 1987; Zinyama, 1988). These spatial differences clearly show that households in much of the country face low and fluctuating agricultural incomes and periodic food insecurity.

Incidence of food shortages

The precarious food supply position facing many communal area households in low rainfall areas is indicated in Table 2.

Nearly 90% of the respondents in the three sample villages had experienced regular food shortages in recent years, with 45.6% reporting that this occurred annually. Only less than 10% had not faced the problem of food shortage. A larger proportion of respondents in Chireya faced shortages annually than in the other two villages in Dewure. This may partially be due to the fact that the latter, being part of a resettlement scheme, tend to receive greater allocations of staff and resources from government departments (particularly AGRITEX and Department of Rural Development) such that impending food shortages will be reported and relief

Table 2. Frequency of food shortage experienced in recent years, by village, Zimbabwe.

Frequency	Number and % of respondents							
	Chireya		Village 14		Village 3		Total	
	No.	%	No.	%	No.	%	No.	%
Annually	42	56.0	14	31.8	17	41.5	73	45.6
Frequently/occasionally.	23	30.6	24	54.6	23	56.1	70	43.7
Seldom	8	10.7	6	13.6	1	2.4	15	9.4
Not specified	2	2.7	0	0.0	0	0.0	2	1.3
Total	75	100.0	44	100.0	41	100.0	160	100.0

Source: Field survey

programmes implemented more quickly than in the case of communal areas. Thus, 86.4% of the respondents in Dewure Village 14 and 92.7% of those in Village 3 reported that they had received assistance from the government during recent food shortages, compared with 66.7% of those in Chireya[3]. Another contributing factor for spatial differences in the provision of government assistance in times of food insecurity may be the geographical remoteness and relative inaccessibility of Chireya, even from the district administrative offices at Gokwe service centre.

Gender differences in perception of food shortages

An important aspect in studies of rural household coping strategies aimed at establishing village-level early-warning systems against impending food shortages is the identification of possible differences in behaviour patterns between males and females. Because wives are directly involved in food preparation on a daily basis and usually have day-to-day control of the family's food stores, they are likely to become more sensitive to any impending shortages earlier than their husbands. Often, the shortage may even pass (following a good harvest) without the husband being fully aware of it. These gender differences in the degree of awareness and perceived frequency of food shortages in the three sample villages are indicated in Table 3. A little over one-half the female respondents in the three villages reported that they faced food shortages annually, compared with 37% of the male respondents. On the other hand, 16.4% of the male respondents reported that they seldom experienced food shortages, against only 3.5% of the females.

Coping strategies employed

If most of the households in the three areas have experienced regular food insecurity due to the recurrent droughts of recent years, this raises the question as to what

Table 3. Frequency of food shortage by sex of respondents, Zimbabwe.

	Males		Females	
Frequency	No.	%	No.	%
Annually	27	37.0	46	52.9
Frequently/occasionally	33	45.2	37	42.5
Seldom	12	16.4	3	3.5
Not specified	1	1.4	1	1.1
Total	73	100.0	87	100.0

Source: Field survey.

[3]However, the distribution of government food aid at the time of the field survey was irregular in Dewure Village 3, unlike in Village 14 where food was being received on a more regular basis and some of the inhabitants were engaged on "food for work" projects.

coping strategies they use in order to ensure against the effects of these shortages. The respondents were asked a series of questions to establish how, both as individuals and as family heads, they had coped with recent as well as any past food shortages. Their responses to the question which asked what they personally usually do to offset the effects of food shortages are summarised in Table 4.

The responses show that a wide range of social, economic, and environmental strategies are used by rural households to mitigate food insecurity. The most frequently cited strategies by both males and females in the three villages were the purchase of grain and maize-meal, obtaining cash or food through local short-term contract work for other people (Shona: *maricho*), and selling livestock, particularly small stock such as goats. The large proportion of respondents that were dependent on purchased maize-meal underscores the significant role of small-scale rural traders or general dealers in the distribution of food during times of food insecurity. In many of these households, the money for purchasing maize-meal was obtained principally from doing contract work locally, and from sales of livestock and crafts.

Table 4. Strategies that respondents personally usually adopt to offset effects of food shortages (respondent stated up to 4), Zimbabwe.

Strategy	% of respondents in each group							
	Chireya		Vill. 14		Vill. 3		Total	
	M	F	M	F	M	F	M	F
Buy grain	58	46	42	18	59	28	54	34
Buy maize-meal from shops	42	23	47	32	71	36	50	29
Sell labour locally (*maricho*)	28	33	16	46	18	32	22	36
Sell crafts	56	13	16	9	6	8	33	10
Sell livestock	19	15	32	36	6	12	19	20
Gather wild food	6	21	11	14	12	36	8	23
Sell garden vegetables	14	18	0	0	0	0	7	8
Borrow food from relatives	3	0	11	14	12	16	7	8
Food gift from relatives	3	0	11	14	6	12	6	7
Cultivate early crops in vleis	8	10	5	9	0	0	6	7
Use stored food	8	5	11	0	6	4	8	3
Brew beer for sale	0	0	0	14	6	21	1	9
Borrow food from friends	0	0	11	5	0	12	3	5
Borrow money from relatives	0	0	0	9	18	4	4	3
Seek off-farm work	0	3	0	5	12	4	3	3
Begging	3	3	0	0	0	8	1	3
Food gift from friends	0	0	5	0	6	4	3	1
Sell fuelwood/thatching grass	0	0	0	0	0	12	0	3
Sell prepared food	0	3	0	5	0	0	0	2
Hunting	0	0	11	0	0	0	3	0
Ask for government help	0	0	5	0	6	0	3	0
Sell cotton	3	0	0	0	0	0	1	0
Sell tobacco/snuff	0	0	0	5	0	0	0	1
Not specified	3	3	0	0	0	0	1	1

Source: Field survey.

Gender and inter-village difference

Table 4 also provides some important gender and inter-village differences in coping strategies. The inter-village differences are largely related to the nature and availability of local resources and the opportunities provided by the local environment. For example, a large proportion of the male respondents in Chireya reported that they make mats (listed under crafts) for sale both locally and even as far as Gokwe centre. They use reeds obtained from the nearby Ume River and its tributaries. Similarly, the cultivation of vlei (wetland) gardens for either early season crops or for vegetables (the latter for both domestic consumption and for sale) is more common in Chireya than in Dewure. This is mainly because of the availability of surface water for hand irrigation from the Ume River. In the two villages in Dewure, there is no reliable and permanent surface water within easy walking distance of the villages. Instead, the inhabitants obtain their domestic water from boreholes which are located considerable distances from the settlements. These distances further preclude the cultivation of garden produce.

The gathering of wild fruits to be eaten raw or after some processing, as well as the brewing of beer for sale, are predominantly practised by women. Similarly, women are also more likely than men to engage in the production of vegetables and early season crops in vlei gardens. On the other hand, more males than females are likely to engage in the production and selling of crafts. In each of the villages, a larger proportion of males than females reported that they had mitigated the crisis by purchasing grain or maize-meal. This gender difference may be explained by the fact that most of the money for food purchases comes from the husband, although the actual buying may be done by the wife.

Coping strategies infrequently reported

Three other strategies require brief comment. A smaller than expected proportion of respondents mentioned begging and hunting as coping strategies. In the case of the former, this may be explained in part by the fact that begging is socially humiliating, so that the respondents may have deliberately avoided mentioning it.

Second, both Chireya and Dewure are, in comparison with communal areas generally, still better endowed with game because they are areas of recent resettlement. However, most of the respondents denied that they did any hunting or knew anyone who hunted. This may be mainly because they are aware that unauthorised hunting is illegal and therefore did not want to implicate themselves or their relatives and neighbours.

The third concerns the role of government food relief programmes in mitigating food insecurity. In Dewure, over 70% of both male and female respondents reported that the free food that they were periodically given by government since they were resettled had been one of the principal strategies mitigating the food shortages of recent years. In Chireya on the other hand, government food relief programmes had been insignificant, with the residents relying primarily on their local environment and ingenuity to overcome the shortages. This discrepancy in the provision of official assistance also raises the question pertaining to the greater vulnerability of people in newly settled areas where their traditional coping strategies

may have broken down and new ones have not yet fully evolved. In the meantime, such people would require greater external assistance to cope with the food shortage.

Food transfers between households

Field observations, as well as discussion with the respondents, showed that food shortages during the past few years have been more severe and protracted in Dewure Village 3 than in the other two villages. Preliminary comparative analysis of data on the extent of food transfers between households, either through food loans or as gifts, suggests that these reciprocal arrangements tend to weaken as food insecurity becomes worse and protracted. In each village, most of the residents are bound by kinship ties and, in the case of the two Dewure villages, the settlers came from the same localities in either Buhera or Bikita. It would therefore be expected that these relationships would form the basis for reciprocal transfers of food to assist households in need. However, only 29.3% of the respondents in Village 3 (the worst affected), compared with 40.9% in Village 14 and 38.7% in Chireya, said that they had given food (either as a loan or as a gift) to other households faced with food insecurity. The disintegration of these social arrangements is because the basis of reciprocity--that some members still had food while others had run out--would have been eroded as everyone eventually became severely affected by the shortage of food.

Use of the bush as a food source

Studies on coping strategies elsewhere in rural Africa have found that during times of food shortage there is an increase in household use of the bush as a source of food through hunting and collecting wild fruits, berries, and roots. However, as mentioned earlier, very little hunting was reported in the two areas. But the gathering of wild fruits, roots, and grasses was more common. The respondents were asked if they collected any wild foods during the recent shortages and, if they did, whether their dependence on them had changed from the patterns of normal seasons. In Chireya and Dewure Village 14, between one-half and two-thirds of the respondents (both males and females) said they had not collected these famine foods. In Dewure Village 3, however, three-quarters of the respondents said that they had done so. When asked further if their use of wild foods had changed, less than one-third of the respondents reported an increase (Table 5).

This limited dependence on wild foods may be a reflection of a number of factors including: first, the fact that these foods are frequently eaten as a matter of course, even in good seasons such that any changes in consumption patterns may not be observed readily (this is implied in the high proportion reporting no change in Dewure Village 3, the village with the highest dependence on famine foods); second, the local availability of more effective alternative coping strategies which households can adopt before resorting to wild foods; third, the possibility for relief provided by external food distribution agencies such as the government's food-for-work scheme; and fourth, the depletion of wild foods through bush clearing for settlement, cultivation, and fuelwood such that the bush no longer has its former significance as a source of food in times of hardship.

Table 5. Changes in household dependence on famine foods from the wild during recent food shortages, Zimbabwe.

Change	Number and % of respondents					
	Chireya		Village 14		Village 3	
	No.	%	No.	%	No.	%
Increased	25.0	28.2	15.0	33.3	17.6	29.2
Decreased	2.8	2.6	5.0	0.0	17.6	4.2
No change	13.9	17.9	20.0	0.0	14.2	45.8
Unspecified/not applicable	58.3	51.3	60.0	66.7	23.5	20.8
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Field survey

The main wild foods that were reported to assume greater significance in times of food shortage in Chireya were *tsangu* (a wild grass which produces small grains similar to finger millet) and *svozve* (a fruit). Twenty-nine percent and 24% of the respondents said they had been using *tsangu* and *svozve*, respectively, to supplement their household food supplies during the recent shortages. *Tsangu*-seed is winnowed, ground into a flour, and cooked into sadza in a similar manner as ordinary mealie-meal. In Dewure, the manner in which certain fruits are consumed changes between good and bad years. In good years the fruits of the *Rhamnus zeyheri* (*munyii* or red ebony) and *Sclerocarya caffra* (*mukwakwa* or *marula*) trees are eaten fresh. During food shortages, the marula fruits are processed, dried, and stored for later use. The fruits of the *Rhamnus* are sun-dried before storage. These are then eaten during the day while the traditional main meal of sadza made from grain meal is restricted to the evenings--thereby extending the household's declining food reserves. The baobab fruit is pounded, sieved, and the flour is also cooked into a form of sadza in place of ordinary mealie-meal. In the two villages in Dewure, 46.3% of the respondents in Village 3 and 15.9% in Village 14 said they had been collecting the fruits of the *Rhamnus* tree to varying degrees. The respective figures on the use of the baobab fruit are 39% in Village 3 and 11.4% in Village 14. These figures are consistent with the observations made earlier that food insecurity was more sever in Village 3 than in Village 14.

Migration in search of food or employment

In addition to trying to overcome the problems of food insecurity using resources available within their local area, one or more household members may migrate to other areas in search of employment or food. A conceptual problem arises here in that it is often not possible to distinguish between normal rural-urban migration which occurs regardless of the household's food supply situation, from migration specifically brought about by food insecurity. Often, food insecurity may actually serve to hasten the decision to migrate in search of employment. Migration aimed

specifically to mitigate food insecurity tends to be short-term, unlike the other type which may be life-long. Moreover, it tends to be more confined to the males alone, while the wives and children remain behind at home.

In the three villages, over 90% of the female respondents reported that they had not left their homes during the period of food shortage. Likewise, a large proportion of the male respondents--58.3% in Chireya, 58.8% in Dewure Village 3 and 80% in Village 14--had not left during the same period. The low levels of outmigration in the two villages in Dewure are largely attributable to the government's stipulated conditions for resettlement (only recently relaxed) that the settler had to permanently reside on the scheme. In Chireya, remoteness and inaccessibility may account for the low level of migration--the single gravel road serving the area was upgraded only recently, but it can still become impassable in places during the wet season. Among the male respondents who had left Chireya at some point, their principal destinations were Gokwe centre to look for employment or to sell or barter their goods, or to adjacent communal areas where they had visited better-off relatives. The few male respondents who left the two Dewure villages mostly went to seek employment on adjacent commercial agricultural estates, at Devuli Ranch or ARDA's Middle Sabi Estate. The remainder either visited relatives in adjacent communal areas of Buhera and Bikita or went to urban areas.

CONCLUSION

This paper has presented some preliminary results of ongoing research into local village-based household strategies for coping with food insecurity in low-rainfall areas of Zimbabwe. The authors are quite aware that there are a number of important issues which they have not addressed, including perhaps one of the most crucial in improving rural food insecurity, the question of rural-urban linkages and food transfers from urban to rural areas during periods of food shortages. However, our aim in this paper was to focus discussion only on the identification of the strategies that households adopt within the context of their local environment.

Another issue which has not been examined is the sequence, if any, in the adoption of these coping strategies. This is particularly important for formulating and successful implementing a of village-based early-warning systems to identify impending food shortages. However, the examination of the range and characteristics of coping strategies adopted by rural households--the theme of this paper--must precede the identification of any sequential adoption patterns. We see the latter as the next stage in our ongoing research.

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GRAIN MARKETING BY COMMUNAL FARMERS IN ZIMBABWE: PRELIMINARY RESULTS FROM MUTOKO, MUDZI AND BUHERA DISTRICTS

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INTRODUCTION

Approximately 60% of Zimbabwe's total land area and 40% of communal households are in marginal areas in Natural Regions IV and V. Because these areas have poor soil and low and erratic rainfall (averaging 600 mm annually), crop production is a risky undertaking.

Since independence in 1980, the government has sought to both increase the incomes of communal farmers and improve household food security in these areas Zimbabwe, 1983) by encouraging farmers to increase their production and marketing of small grains (sorghum and the millets) and oilseeds (groundnut and sunflower). Several specific policies have been instituted to elicit increased production and marketing of small grains:

- o In 1984-85, the government made bulrush millet and finger millet controlled crops, enabling farmers to sell them to the Grain Marketing Board (GMB).
- o In the same year, government established an incentive guaranteed price structure for finger millet and bullrush millet. Before 1984, these crops were sold locally and to stockfeeds and brewing companies who were offering an average price of Z$75/mt for bulrush millet and Z$100/mt for finger millet (Meltzer, 1983). However, in 1984-85 the guaranteed minimum price was set at Z$250/mt for bulrush millet and Z$300 for finger millet, representing an average increase of 200% and 240%, respectively.
- o Government increased the price of red and white sorghum from Z$80/mt in 1979-80 to Z$180/mt in 1985-86, an increase of 120%.

Additional policies that were not necessarily targeted at small grains, but served to support increased small grains production and marketing included:

- o expansion of smallholder credit through the Agricultural Finance Corporation (AFC) for input purchases;
- o establishment of GMB depots and collection points throughout the communal areas, which reduced farmers' grain marketing cost;
- o construction and upgrading of roads which improved access to markets and reduced transport costs; and
- o expansion of the extension services into the communal areas which improved farmer access to technical information.

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Aggregate data show that farmers have responded to these policies, with total marketings of sorghum to the GMB increasing from 25,000 mt in 1984-85 to 190,000 mt in 1986-87 (Table 1). For the millets, marketings to the GMB increased from 4,502 mt to 127,000 mt over the same period. Yet, available evidence suggests that increased production and marketings are both concentrated in certain regions; and within these regions, most of the marketed surplus is produced by a small proportion of the households (Stanning, 1987; Rohrbach, 1987).

Paradoxically, while these policies have increased communal marketings, the GMB has been unable to dispose of the marketed surplus, particularly red sorghum, finger millet, and bulrush millet, raising questions as to the sustainability of current pricing policies.

OBJECTIVES OF THIS STUDY

The general objectives of this study are to examine farmer marketing behaviour including crops marketed, amounts marketed, market channels, reasons for selling to each, buyer, and the different farmer grain marketing strategies. The specific objectives of this study are to:

- o identify social, economic, and institutional factors which affect the amount of small grains farmers market and/or retain;
- o estimate the distribution of benefits, identifying characteristics of households benefiting most from these policies and those not benefiting;
- o characterize when, where, and why farmers market their crops;
- o evaluate the rationale of farmer market behaviour, especially the timing of sales and market channel used and relate this behaviour to the GMB's marketing practices; and
- o identify market problems faced by farmers and identify policy options to relax these constraints.

Table 1. GMB intake and disposal of sorghum and the millets ('000 mt), 1981-87.

	Sorghum			Bulrush millet			Finger millet		
Marketing Year	Intake & stocks	Sales	Closing stocks	Intake & stocks	Sales	Closing stocks	Intake & stocks	Sales	Closing stocks
1980-81	24	20	4	Not controlled			Not controlled		
1981-82[a]	35	19	16	Not controlled			Not controlled		
1982-83[a]	35	27	8	Not controlled			Not controlled		
1983-84[a]	22	18	4	Not controlled			Not controlled		
1984-85	25	14	11	4	0.02	3.98	0.40	0.02	0.38
1985-86	91	34	57	48	0.05	47.95	13.00	0.02	12.98
1986-87[a]	190	22	168	92	0.00	92.00	35.00	0.00	35.00

[a]Drought years
Source: GMB and AMA (various years).

STUDY AREA DESCRIPTION AND DATA COLLECTION METHODS

The study is located in three districts; Mudzi, Mutoko, and Buhera in Natural Regions III, IV and V. Mudzi and Mutoko Districts are about 140 km east of Harare. Mutoko lies in both Natural Region III and IV, but the sample is located only in Natural Region IV. Annual rainfall averages 450-600 mm, with some occurrences of mid-season droughts. Farmers reported that the 1986-87 season was a drought year in that rains came late and/or came in short intense downpours.

Buhera is located in Natural Regions III, IV, and V and lies roughly 260 km southeast of Harare. However, the survey area is all in Natural region V where average annual rainfall is 350-500 mm. However, there is a high incidence of severe mid-season drought, and 1986-87 was a drought year.

The sample was selected in stages, from the natural region level to the household level. First, Mudzi, Mutoko, and Buhera Districts were chose purposely to represent communal areas in natural Regions IV and V, respectively. In addition to having low rainfall, small grains--the subject of this research--are widely grown in these locations. Next, six villages were selected in each natural region where small grains production was a major enterprise; where oilseeds were also grown; and the distance to the nearest GMB depot varied from a short to a long distance (30 km or more). Finally, 30 households were randomly selected from each village.

RESULTS AND DISCUSSION

The preliminary analysis reported in this paper is organised in terms of several questions that complement the research objectives. Future analysis will explore issues not considered in this paper.

What are the characteristics of farmers who market?

Based on survey results, two groups of farmers were identified. The first group included farmers who sold no crops in 1986-87. The second group included farmers who sold at least one crop. This grouping is justifiable in that most farmers sold only one crop.

Table 2 shows some characteristics of the farmers in these two groups. Overall, there appears to be very little difference between the socioeconomic and resource characteristics of households who marketed and those who didn't market crops. While expected differences, such as farmers who market should have more arable land, hold true in one district (Mudzi/Mutoko), there was no difference in Buhera[2].

[2]As subsequent analysis will show, most of the farmers who marketed grain, only sold small amounts. Therefore, it is likely that they are not significantly different than those who do not market any crops.

Table 2. Characteristics of sample farmers, who marketed/did not market grain, Mudzi, Mutoko and Buhera Districts, Zimbabwe.

Characteristic	Mudzi/Mutoko		Buhera	
	None	Marketed	None	Marketed
Social				
Characteristics of HH head				
Male (%)	86	87	30	83
Age (mean years)	51	51	48	44
Education (%)				
none	29	33	22	8
1-5 yrs	29	47	45	58
> 5 yrs	42	20	33	34
Literacy				
Shona and English (%)	30	36	44	51
Non-agricultural job (% yes)[b]	17	24	33	29
Off-farm job (% yes)[c]	30	35	53	51
Characteristics of household				
Family size (mean no.)	9	9	11	9
Resident members (mean no.)[a]	5	6	7	7
Composition (mean no.)				
Preschool	0.72	0.89	1.67	1.17
Primary	1.39	1.42	2.06	2.25
Secondary	0.80	1.20	1.47	1.34
Adults	5.83	5.42	5.72	4.51
Resources				
Total arable land (acres)	2.6	3.1	4.6	4.5
Animal traction status (%)[d]				
Non-equipped	26	11	11	6
Semi or totally equipped	74	89	89	94

[a]Staying at the farm full-time. [b]Handicrafts, blacksmithing. [c]Not on the farm. [d]Non-equipped is without a plough and two draught animals; semi or totally equipped is with at least a plough and two draught animals.
Source: Farmer Survey

What are farmer's objectives in growing each grain crop?
Grain produced by communal farmers in both survey areas is primarily destined for home consumption, but the relative importance of consumption as a primary objective for growing each crop varied by crop (Table 3).

Mudzi/Mutoko District
In 1986-87, the crop that farmers most frequently reported growing only for home consumption was white sorghum (83% of households), followed by red sorghum (78%), bulrush millet (64%), groundnut (59%), finger millet (50%), and maize (39%).

In contrast, 61% of the households reported growing maize for both home consumption and sales, indicating that maize is an important cash crop in the area. Other crops grown for both home consumption and sale are finger millet (43%) and bulrush millet (35%).

Buhera District
Approximately 82% of the households reported they produced maize only for home consumption, followed by white sorghum (79%), red sorghum (58%), finger millet (49%), red sorghum (46%), groundnut (48%), and bulrush millet (32%). In contrast to Mudzi/Mutoko, Buhera farmers prefer to consume the little maize they are able to produce.

In Buhera, bulrush millet is the dominant crop and is regarded as both a food and cash crop, as indicated by the fact that 63% of the respondents reported growing it for both consumption and sale. Other important dual purpose crops are groundnut (47%) and finger millet (38%).

What are the most commonly grown crops?
In order to identify shifts in cropping emphasis, households were asked which crops they grew each year, from 1980-81 to 1986-87[3]

Mudzi/Mutoko District
The most commonly grown crop in 1986-87 was maize (98% of the households), followed by bulrush millet (88%), groundnut (74%), white sorghum (57%), sunflower (47%), finger millet (44%), and red sorghum (26%) as shown in Table 4.

Comparing 1980-81 to 1986-87, the greatest increase in the absolute percentage[4] of farmers growing a crop was for sunflower (+29%), followed by groundnuts (+21%) and maize (+18). For the other crops, the increase in the percentage of growers ranged from 9-14%.

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[3]While information on actual area grown each year would have been a better indicator of changes in cropping emphasis, farmers could not recall area or total production in earlier years.

[4]Calculated as percentage growing in 1986-87 minus percentage growing in 1980-81.

Table 3. Farmers' objectives for growing grain crop (% producers), Mudzi/ Mutoko and Buhera, Zimbabwe, selected years.

Crop	Mudzi/Mutoko[a]			Buhera[a]		
	(N=110)	(N=119)	(N=122)	(N=124)	(N=125)	(N=133)
	1980-81	1985-86	1986-87	1980-81	1985-86	1986-87
Maize						
Consume only	49	6	39	83	84	82
Sell only	1	0	0	1	3	2
Sell and consume	45	64	61	14	12	15
Don't remember	5	0	0	2	1	0
Number[b]	88	112	120	95	115	123
Bulrush millet						
Consume only	69	70	64	24	28	32
Sell only	2	1	1	5	8	5
Sell and consume	25	29	35	68	65	63
Don't remember	5	0	0	3	0	0
Number[b]	88	102	107	107	116	123
Finger millet						
Consume only	54	56	50	46	54	49
Sell only	5	7	7	11	11	13
Sell and consume	29	36	43	31	32	38
Don't remember	12	2	0	11	0	0
Number[b]	41	55	54	35	37	39
Red sorghum						
Consume only	71	66	78	44	46	58
Sell only	7	4	16	19	34	25
Sell and consume	7	10	6	22	17	17
Don't remember	14	0	0	16	3	0
Number[b]	14	29	32	32	35	36
White sorghum						
Consume only	73	86	83	81	78	79
Sell only	2	0	1	2	4	4
Sell and consume	17	14	16	0	11	15
Don't remember	8	0	0	17	7	2
Number[b]	48	70	69	42	46	52
Groundnuts						
Consume only	64	58	59	45	42	48
Sell only	0	0	0	1	2	4
Sell and consume	29	41	41	50	52	47
Don't remember	7	1	0	4	3	1
Number[b]	58	90	90	82	88	98

[a]N = sample size, [b]Number of households growing the crop.
Source: Farm survey, Food Security Research Project.

These results show that maize and bulrush millet are the most commonly grown crops; and that since 1980-81, farmers have diversified their cropping patterns, in terms of the variety of crops grown. Particularly significant is the increase in the percentage of farmers growing sunflower and groundnuts, cash crops well suited for low rainfall areas.

Buhera District

Here, the most commonly grown crops were bulrush millet and maize (92%), followed by groundnut (74%), white sorghum (39%), finger millet (29%), red sorghum (27%), and sunflower (10%) as shown in Table 5.

Comparing 1980-81 to 1986-87, the greatest increases in the absolute percentage of farmers growing a crop was for maize (+16%), groundnut (+10%), bulrush millet (+6%), and white sorghum and sunflower (+5%). For the other crops, farmers reported little or no changes.

These results suggest that maize has become an increasingly important crop in this low rainfall area, even though it is not agronomically suited.

What crops are most often marketed?

While households may intend to grow a crop for a given purpose, the quality of the season--which affects production--may alter his/her intentions.

Mudzi/Mutoko Districts

The most frequently marketed crops in this district (1986-87) were sunflower (41%), maize (26%), bulrush millet (12%), finger millet (11%), and groundnut (10%) as shown in Table 4.

Comparing 1980-81 to 1986-87, the greatest increase in the absolute percentage of farmers marketing a crop was for sunflower (+34%), followed by maize (18%), and bulrush millet (10%). The rest of the crops showed a range of 3-8% increase in the percent of farmers marketing.

Buhera District

Here, the most frequently marketed crop was bulrush millet (52%), followed by groundnut (30%). No other crops were marketed by more than 5% of the households (Table 5).

Comparing 1980-81 to 1986-87, there was a small increase in the absolute percentage of farmers marketing finger millet (+3%), but a decrease in the absolute percentage of farmers marketing maize and red sorghum (-5%) and bulrush millet (-4%). For the other crops, there was little or no change.

How extensive is market participation?

In both survey areas, a relatively small percent of the farmers marketed any crop. In both areas, farming is primarily a subsistence enterprise. Given the poor environment and riskiness of farming, the low level of market participation is not surprising.

Table 4. Percentage of households growing and marketing crops in Mudzi/Mutoko District, Zimbabwe, 1980-81 to 1986-87.

Crop	1980-81	1981-82[a]	1982-83[a]	1983-84[a]	1984-85	1985-86	1986-87[a]
Maize							
Grow[b]	80	81	84	86	92	93	98
Market[c]	8	10	10	15	26	29	26
Bulrush millet							
Grow	80	81	85	82	88	84	88
Market	2	2	4	3	3	7	12
Finger millet							
Grow	37	37	30	41	48	46	44
Market	3	2	3	3	4	5	11
Red sorghum							
Grow	13	10	17	15	18	24	26
Market	0	0	1	2	1	4	3
White sorghum							
Grow	44	46	30	55	56	58	57
Market	1	1	0	1	1	1	4
Sunflower							
Grow	18	20	25	26	32	43	47
Market	7	10	14	18	22	31	41
Groundnuts							
Grow	53	58	65	67	73	74	74
Market	2	3	4	4	7	7	10

[a]Drought years. [b]Grow = percent of farmers growing the crop. [c]Market = percent of farmers marketing the crop. Source: Farmer survey, Food Security Research Project

Table 5. Percentage of households growing and marketing crops in Buhera District, Zimbabwe, 1980-81 to 1986-87.

Crop	1980-81	1981-82[a]	1982-83[a]	1983-84[a]	1984-85	1985-86	1986-87[a]	
Maize								
Grow[b]	77	75	74	78	84	90	92	
Market[c]	10	6	6	9	10	9	5	
Bulrush millet								
Grow	86	86	91	90	91	91	92	
Market	39	31	31	43	53	50	35	
Finger millet								
Grow	28	27	27	28	32	29	29	
Market	2	2	3	4	3	3	5	
Red sorghum								
Grow	26	25	28	25	28	27	27	
Market	8	6	6	8	6	7	3	
White sorghum								
Grow	34	34	37	37	39	36	39	
Market	2	2	2	2	2	4	2	
Sunflower								
Grow	5	5	5	5	6	10	10	
Market	1	1	1	2	2	2	2	
Groundnuts								
Grow	64	67	67	67	70	69	74	
Market	29	24	23	28	34	34	30	

[a]Drought years. [b]Grow = percent of farmers growing the crop. [c]Market = percent of farmers marketing the crop. Source: Farmer survey, Food Security Research Project.

Several additional observations regarding market participation are noted below. First, only one or two crops were marketed to a significant degree (Table 6). Second, of the crops marketed in 1986-87, a very small percentage of the households marketed more than five bags (91 kg/bag). Third, a small proportion of farmers marketed a disproportionate share of the marketed crops. For example, in Mudzi/Mutoko District, 10% of all[5] the households market more than 15 bags of maize and 17% marketed over 15 bags of sunflower. In Buhera District, the distribution was less skewed. For example, only 13% of the households marketing more than five bags of bulrush millet. Other studies that have reported similar results (*i.e.*, a small proportion of farmers doing most of the marketing) include Stanning (1987) and Rohrbach (1987).

When and why do farmers market their crops?

To better understand farmers' marketing behaviour, several questions were directed at identifying factors farmers considered in deciding when to market, where to market, and why they marketed at that facility?

Timing of crop sales

Most farmers sell immediately after harvest, depending on the availability of transport--although a few farmers reported sales in the following rainy season. Since GMB prices are pan-seasonal, there is little incentive to store and sell later. Even if the farmer stores with an intent to sell in the local market later in the season, local prices may not compensate for storage losses (Stanning, 1987).

Reasons for marketing

A need for cash to pay school fees was the most frequently cited reasons for marketing crops soon after harvest. The second most important reason was to purchase consumer goods. Finally, some farmers sold grain to purchase agricultural inputs.

Where do farmers sell their crop and why?

The various channels through which a farmer can sell his produce are shown in Table 7.

Maize

The most important buyers for maize in Mudzi/Mutoko are the GMB (44% of the transactions) and neighbour (37%). In Buhera, farmers reported only six maize sales, 50% to neighbours. For Mudzi/Mutoko, the relative importance of the GMB can be explained by the fact that farmers there produce more maize than in Buhera, roads are good, and the GMB depot is relatively accessible, with average distance

[5]The group with no marketings includes households who did not grow the crop or grew it and didn't market any.

Table 6. Percentage distribution of sales by household in the survey areas, Mudzi/Mutoko and Buhera Districts, Zimbabwe, 1986-87.

Bags	Mudzi/Mutoko (N=122)						Buhera (N=133)					
	MZ	BM	FM	RS	WS	SF	MZ	BM	FM	RS	WS	SF
0[a]	71	87	78	91	91	22	95	63	79	92	92	84
0.1 to 5	13	11	13	6	7	48	4	24	18	8	8	8
5.01 to 10	4	1	7	0	0	9	0	10	0	0	0	8
10.01 to 15	2	0	0	0	0	4	0	2	3	0	0	0
15.01 to 20	1	0	0	0	1	5	1	0	0	0	0	0
20.01 to 25	3	1	0	0	0	3	0	0	0	0	0	0
25.01 to 30	2	0	2	0	0	7	0	0	0	0	0	0
over 30	4	0	0	3	0	2	0	1	0	0	0	0
Grows the crop[b]	120	107	54	32	69	58	123	123	39	36	52	13

[a]0 = did not grow, or grew but did not sell; [b]Growers = number growing the crop; N = sample size; MZ = maize; BM = bulrush millet; FM = finger millet; RS = red sorghum; WS = white sorghum; SF = sunflower;
Source: Farmer Survey, Food Security Project, 1988

Table 7. Percentage of sales by type of buyer in the survey areas, Mudzi/Mutoko and Buhera Districts, Zimbabwe, 1986-87

Crop	Mudzi/Mutoko (N=122)[a]						Buhera (N=133)[a]					
	GMB	APB	NAPB	REL	NEI	No.	GMB	PB	NAPB	REL	NEI	No.
Maize	44	5	10	5	37	33	17	17	17	0	50	6
Bulrush millet	29	0	14	0	57	14	17	15	45	0	19	45
Finger millet	43	0	7	0	50	12	0	50	25	13	13	8
Red sorghum	67	33	0	0	0	3	0	33	33	0	33	3
White sorghum	50	0	0	0	50	6	0	0	50	0	50	4
Sunflower	51	20	4	18	0	46	50	50	0	0	0	2

[a]Number of households who marketed; GMB = Grain Marketing Board; APB = Approved buyer; NAPB = Non-approved buyer; REL = By relative; NEI = Neighbour.
Source: Farmer survey, Food Security Project.

around 60 km to the nearest GMB. In contrast, maize production in Buhera is very low. Therefore, given the small quantities involved, it makes sense to market locally.

Bulrush and finger millet

In Mudzi/Mutoko, bulrush millet and finger millet are disposed of locally, with neighbours (direct sales to consumer) accounting for 57% and 50%, of the transaction. This can be explained by the fact that farmers reported getting higher prices on the local market than at the GMB. For Buhera, approved and non-approved buyers are the most important marketing channels. Approved buyers were involved in 50% of the finger millet sales while the non-approved accounted for 45% of the bulrush millet transactions. Together, these two buyers accounted for 60% of total bulrush millet transactions and 75% of the total finger millet sales. Farmers sell to these two buyers because they offer higher prices than in the local market. Also, since they are the major crop in the are, the local market could not absorb all desired sales. Farmers do not sell to the GMB because access tot he GMB depot is poor, due to poor roads and a sever shortage of transport. Furthermore, approved and non-approved buyers move around the villages buying crops.

Sorghum

In Mudzi and Mutoko, both white and red sorghums are primarily grown for home consumption. Sales are insiginficant.

Sunflower

In both districts, almost all sunflower sales were to the GMB or approved buyers.

Additional considerations

The most frequently cited reasons for selling to the GMB was that the net price is higher than what farmers could obtain from other buyers (Tables 8, 9, and 10). However, farmers still sell to other buyers who pay cash immediately, despite their feeling that their crop was downgraded and underweighed.

It is a generally held view that when farmers are hard pressed for money, they sell most of their crops to the approved and non-approved buyers who provide cash immediately, rather than selling to the GMB. Thus, although farmers can get a better net price by selling to the GMB, they are compelled to sell to the other buyers--even though they may discount their crop on grade and weight. If a farmer sells to the GMB it takes about a month before the cheque arrives and another two weeks for the cheque to be ready at the bank--that is, if the farmer has a bank account at all. If the farmer has to cash the cheque at a local store, he may be asked to buy goods worth anything upwards of 25% of the value of the cheque. Consequently, farmers often sell to buyers who will immediately give badly needed cash. Other reason farmers sell to the other buyers are because many sell only small quantities, or because when they sell to non-GMB channels they are not required to use regulation grain bags, which are usually in short supply or which farmers do not have the money to buy.

Table 8. Reasons for selling maize to different buyers, Mudzi/Mutoko District (% transactions), Zimbabwe, 1986-87[a].

Buyer	Price	Pay cash	No card	AFC loan repayment	No transport	Other
GMB	16	0	0	18	0	8
Approved buyer	0	3	0	0	0	0
Non-approved buyer	0	5	3	0	0	0
Relative	0	0	5	0	0	0
Neighbour	18	13	0	0	6	5

[a]Number of transactions = 37, number of farmers who sold maize = 33.
Source: Farm survey, Food Security Project.

Table 9. Reasons for selling bulrush millet to different buyers, Mudzi/Mutoko District (% transactions), Zimbabwe, 1986-87[a].

Buyer	Price	Pay cash	No card	Buyer collects	No transport	Other
GMB	22	0	0	0	0	7
Approved buyer	0	10	0	0	0	0
Non-approved buyer	0	14	0	0	0	0
Neighbour	14	29	0	14	0	0

[a]Number of transactions = 14, number of farmers who sold = 14.
Source: Farm survey, Food Security Project.

Table 10. Reasons given by farmers for selling bulrush millet to each buyer, Buhera District (% transactions), Zimbabwe, 1986-87[a].

[a]Buyer	Price	Pay cash	No card	Buyer collects	No transport	Other
GMB	12	0	0	0	0	0
Approved buyer	2	10	2	0	0	0
Non-approved buyer	4	18	6	16	4	2
Neighbour	2	14	0	6	2	2

[a]Number of transactions = 52, number of farmers who sold bulrush millet = 52. Source: Farm survey, Food Security Project.

MARKETING PROBLEMS OF FARMERS

This section deals with farmers' perception of the grain marketing system in an effort to identify problems that need solutions.

The GMB

Table 11 shows the most important problems farmers face in dealing with the GMB. For each of these problems, farmers proposed solutions which are discussed below.

Late payment

First, in both Mudzi/Mutoko and Buhera, farmers reported the problem of late payment (45% and 55% of farmers, respectively). The GMB's target is to pay farmers within three weeks. However, due to centralised cheque processing in Harare, cheques often reach the farmer after one or two months. The delay is increased by the fact that the GMB also recovers loans on behalf of the AFC. Therefore, cheques are disbursed only after being checked against AFC loans.

Proposed solution. Most farmers in Mudzi/Mutoko and in Buhera said they want cash on delivery or cheques should be delivered within a short period. This is the most desirable solution, but the GMB also faces numerous constraints. First, the GMB deals with numerous small cheques and does not have the requisite manpower to process them quickly. Second, paying cash on delivery or allowing local depots to handle cheques is constrained by the ability of the GMB to devise a strict accountability system.

Unreliable supply of grain bags

The next most frequently reported problem was an unreliable supply of grain bags. Approximately 9% of Mudzi/Mutoko and 30% of Buhera farmers cited this as a problem. This problem is two-pronged. First, some farmers do not have the money to purchase the bags. Second, bags are often not available on time and in adequate quantities. The first issue is ironical in that farmers want to sell to get money, yet they are first required to have money to purchase the bags. The GMB is reluctant to give farmers grain bags on credit, because farmers owe the Board about Z$2 million in grain bag debts from last year.

Proposed solution. One solution is to allow local businessmen to trade in grain bags. Thirty-nine percent and 7% of farmers in Buhera and Mudzi/Mutoko Districts, respectively, thought the above system could solve their problems.

Unfair grading

Farmers thought that the GMB grading/weighing system was unfair. Fifteen percent of the Mudzi/Mutoko farmers and 10% of the Buhera farmers thought that GMB graded their crops unfairly. Farmers send their crops in one truckload with other farmers. The GMB takes a sample from the truckload and awards the same grade to the whole consignment. This system penalises those farmers with a good grade

crop. This problem is compounded by the fact that some farmers do not understand the grading system.

Proposed solution. The grading problem could be solved by assigning AGRITEX the responsibility of teaching farmers grading procedures during slack periods.

Weight requirement

Farmers identified the problem of variation in the weight of a bag of grain. The GMB accepts anything within the 89-93 kg range. If a grain bag's weight falls outside the above range, the farmer is penalised. For example, if the weight is below the range, the farmer is asked to refill the bag, which takes time. On the other hand, if the weight is above the range, the farmer loses because the GMB does not pay for the extra kilograms. Approximately 11% of farmers in Mudzi/Mutoko do not have access to a scale when packing their grain for the market.

Proposed solution. Farmers proposed that the GMB should pay on a per kilogram basis, as does the Cotton Marketing Board.

Approved and non-approved buyers

The approved and non-approved buyers are a link between the farmer and the GMB. The approved buyer is a legal agent for the GMB, while the non-approved buyer operates informally. Table 12 shows the problems farmers face when dealing with these two types of buyers.

Low prices

The most frequently reported problem with these buyers was that they offer low prices, compared to the GMB. Yet, in both Mudzi/Mutoko and Buhera, many farmers sold crops to approved and non-approved buyers. GMB allows the approved buyer a fixed margin. For a given grade, the buyer cannot directly cheat on prices because the prices given by the GMB are displayed on boards on his buying premises. However, the non-approved buyer is not bound by any law. In Mudzi/Mutoko, 18% and 61% of the farmers were discontented about the prices they received from approved and non-approved buyers, respectively. In Buhera, 31% and 34% of the farmers felt that the approved and non-approved buyers, respectively, gave them low prices.

Proposed solution. Twenty-two percent of the farmers in Mutoko said that non-approved buyers should be prosecuted., In Buhera an equal percentage felt the same action should be taken, for both the approved and non-approved buyers who do not follow the regulations.

Waiting time

Fifty-five percent of the Mutoko farmers reported having to wait in the queue before being served by the approved buyer. For the non-approved buyer, only 11% reported this problem. In Mutoko, there is only one approved buyer at Mutoko Growth Point, who is flooded by farmers who need cash. Some farmers reported waiting up to three days before being served. In Buhera, no one reported this problem.

Proposed solution. Farmers proposed that the government should encourage approved buyers to build more buying stations so that they do not have to waste so much time waiting to be served.

Extra large buckets

Farmers reported that the buyers sometimes use extra large buckets or weights which are intended to underweight their crops. In Buhera, 31% of farmers felt this was a problem with both types of buyers, while in Mudzi/Mutoko, 3% said this was a problem with approved buyer and 11% for the non-approved buyer. Low prices and underweighing are self-reinforcing practices which effectively work against the farmer.

Proposed solution. The farmers recommended that buyers who follow these practices should be prosecuted. Alternatively, the GMB should construct a depot nearby.

Payment in kind and installments

The last important problem is the practice of payment in-kind and/or by installments. In Buhera, about one-quarter of the farmers cited this problem for both types of buyers, while in Mudzi/Mutoko only a few farmers raised this issue. This problem is more prevalent in Buhera because the buyers are mostly small shop owners who are faced with a liquidity problem. As a result, they ask the farmer to take part of their payment in the form of goods and give him only the balance after deducting the value of the goods. Alternatively, some buyers would offer to pay the farmer in two or three installments depending on the number of bags sold.

Proposed solution. Farmers felt buyers who followed this practice should be prosecuted. In addition, farmers felt that the GMB should construct a depot nearby.

Unreliable and inadequate transport

In Mudzi/Mutoko, 50% of the respondents complained about unreliable and inadequate trucks, while in Buhera, 36% reported this problem (Table 13). The problem has two impacts on farmers.

First, farmers are penalised for late delivery of grain to the Boards because this delays payment for their crop. Also, while waiting for transport, the grain deteriorates and is downgraded. The most frequently reported problem was high transport cost. Feeder roads are poor and transport availability is very low. Therefore, costs tend to be high to compensate the transporter for the risk he is taking on his vehicle. Axles can break easily and tyres wear out quickly. Thus, the two problems further reduce margins at the farm level.

Proposed solution. This is a national problem resulting from the severe foreign currency shortages for importing new vehicles or spare parts. Most farmers (72% in Buhera and 32% in Mutoko) felt that the government should provide affordable transport in time. This year, supplemental transport services were provided by government making available District Development Fund and army trucks for hauling communal area crops to the Boards. This assistance should be provided earlier before the crops have lost their grades. The second solution proposed was

Table 11. Percentage of households reporting major problems with the GMB, Mudzi/Mutoko and Buhera Districts, Zimbabwe, 1986-87.

Problem	Mudzi/Mutoko	Buhera
Late payment	46	55
Unreliable grain bag supply	9	30
Unfair grading	15	10
Strict 91 kg weight requirement	11	0

Source: Farmer survey, Food Security Project.

Table 12. Percentage of households reporting problems with the approved and non-approved buyers in Mudzi/Mutoko and Buhera, Zimbabwe, 1986-87.

Problem	Mudzi/Mutoko		Buhera	
	APB	NAPB	APB	NAPB
Low prices/unit	18	61	31	34
Queue too long	55	11	0	0
Extra large buckets	3	11	31	31
Payment in kind/installments	3	6	26	27

Source: Farmer survey, Food Security Project.

Table 13. Major transport problems reported by survey households, Mudzi/Mutoko and Buhera Districts, Zimbabwe, 1986-87.

Problem[a]	Mudzi/Mutoko	Buhera
Inadequate/unreliable transport	56	36
High cost	40	38

Source: Farmer survey, Food Security Project.

group hiring (7% in Buhera and only 3% in Mutoko). The farmers argued that, given the restricted supply of transport, farmers should form groups and negotiate with a transporter, thus utilizing available transport more efficiently.

CONCLUSION AND ISSUES FOR FURTHER RESEARCH

Only a small percentage of the farmers interviewed in the Natural Region IV (Mudzi/Mutoko) and V (Buhera) market crops. Of those who marketed, only a small percentage marketed more than five bags of any crop. These results raise several important questions. First, is price support for small grains an effective way to transfer income to poor households in the communal areas and improve their food security? Second, GMB delays in paying farmers forces them to sell to other buyers, who pay in cash but at a discount. Can changes be introduced that would speed up payments, and/or provide for cash payments? Third, most farmers seem to sell through non-GMB channels which are suited for small throughput, which are characteristic of most communal areas in marginal farming locations. Can the GMB introduce procedures to better serve farmers with small quantities to sell? Fourth, what procedures could be introduced to ensure that farmers' crops are properly graded and paid accordingly? Should traders be prosecuted as proposed by farmers or are there other ways to solve this problem? Finally, is it possible to improve transport services through group marketing and similar mechanisms? These issues will be evaluated in greater detail in the next stage of the study.

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EXPANDED AGRICULTURAL TRADE IN THE SADCC REGION

EXCHANGE RATE OVERVALUATION AND AGRICULTURAL PERFORMANCE IN ZIMBABWE: 1965-1985

Kuphukile Mlambo[1]

INTRODUCTION

In the 1960s and early 1970s, most African countries followed relatively passive exchange rate policies. This was the period when the Bretton Wood System was still in force, and the relative price (exchange rate) stability prevailed in both developed and developing countries. However, in 1972 the Bretton Wood System broke down and a number of developed countries adopted floating exchange rate systems. Most African countries opted not to float their currencies, but instead preferred to peg their currencies to a single currency (*e.g.*, the US dollar) or to a basket of currencies.

With the benefit of hindsight, this appears to have been a mistake, because confronted with the oil crisis, increased inflation, and falling terms of trade, for many countries the exchange rate became overvalued. Prices were slowly getting out of line and export competitiveness was being lost. In the 1970s, no one was alarmed because any disequilibrium in balance of payments was covered by capital inflows from abroad.

In the 1980s all this changed. First, the debt crisis exploded; then capital inflows declined to a trickle; while export earnings continued to decline as developed countries became more protectionist and, in general, the capitalist world experienced a deep-seated recession. At the same time, the disequilibrium in the exchange rate became unsustainable, foreign exchange shortage became a fact of life, and in some countries a parallel market for foreign exchange developed. Clearly something had to be done, and there appears to have been a rush towards a much more active use of the exchange rate. This rush has been of three types:

- Some countries, such as Malawi, have retained a fixed exchange regime, but also uses discrete devaluations to reduce overvaluation.
- Some countries, such as Tanzania, have retained a fixed exchange rate system, but also moved to a crawling peg.
- Some countries, like Zambia and Uganda, opted for a market-determined exchange rate system (*e.g.*, foreign exchange auctions).

These exchange rate adjustments policies are designed to achieve three things:

- to correct balance of payments disequilibrium (more specifically to deal with the current account deficits);
- to restore international export competitiveness caused by decades of currency overvaluation; and
- to switch expenditure away from the tradeable goods sector.

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However, after more than half a decade of exchange rate adjustment, it is still unclear whether these policies have achieved what they were intended to do. At the same time, the discussion has shifted away from the macro level, to study the impact of exchange rate adjustment (or failure to adjust) on inter- and intra-sectoral performance and resource allocation. The International Food Policy Research Institute (IFPRI) has carried out several studies to investigate the effects of exchange rate policies on agriculture. Valdes and Pinckney (1986) argued that the exchange rate is the most influential price affecting incentives for agriculture. This argument was endorsed by the World Bank in 1981 when it declared that trade and exchange rate policies were at the heart of the failure of most African countries to provide adequate incentives for agricultural production and for exports.

The relationship between exchange rate policy and agricultural production is easy to comprehend. Exchange rate adjustment is designed to change the domestic relative prices of tradeables and nontradeables to increase the profitability of producing tradeables. Since the largest contributor to the tradeable goods sectors is agriculture in most developing countries, a policy that affects the profitability of tradeable goods production similarly affects the profitability of agricultural activities.

In the last half of the 1980s, another dimension was added to the debate, the so-called cash crops debate (Maxwell, 1988). It was argued that while exchange rate adjustment may have favoured agricultural export production, it may have dire consequences for food security. If the connection between exchange rate policy and agricultural production is not easy to see, the connection between exchange rate and food security is even more clouded.

In this study, food security is considered as having two aspects: the basic cause (or aspect) of food security; and the secondary aspect (Eicher and Rukuni, 1986). The basic cause of food security is related to an income problem--people are food insecure because of reduced access to an adequate diet of food at all times. The secondary aspect of food security is related to food availability--people suffer from food insecurity because a country is unable to provide its citizens with an adequate diet from domestic production or is unable to increase food imports to meet its food consumption needs.

Exchange rate policy will impact on both aspects of food security. A policy that maintains an overvalued exchange rate would reduce the incentive to produce food crops (as food imports come in) and this will lead to a reduction in the returns to farmers. Since the majority of the farmers in developing countries are peasants who are net consumers, as opposed to net producers, an overvalued exchange rate would worsen their food security situation. It would appear that policies that turn the terms of trade against agriculture are detrimental to food security, since they worsen income and kill incentives to produce. Above all, for most developing countries, poor agricultural performance means poor overall economic growth rates. And unless a country is growing, it cannot guarantee an improvement in incomes, and therefore food security.

AGRICULTURE IN CONTEXT

In analyzing the impact of policy on agriculture in Zimbabwe, bear in mind that agriculture forms the backbone of the economy. Available data shows that in times of agricultural buoyancy, the economy is also buoyant, and vice versa. The years 1980 and 1981 were good agricultural seasons and real gross domestic product (GDP) grew at 11% and 10.7%, respectively. After these two good years, a three-year drought followed, during which GDP actually declined, falling as low as -4% in 1983.

Despite its importance in the economy, agriculture's performance has been unimpressive. Despite remaining the second larger contributor to GDP, its share has been declining (Table 1). Between 1970-74, agriculture's share of GDP was 16.8%, but by 1982-83, it declined to 12.1%. In contrast, manufacturing increased its share from 22.7% in 1970-74 to over 25% in 1982-83. The table also shows that since the 1970-74 period, agricultural employment has been growing at a negative rate, while the agricultural share of total wage employment has been declining. Valdes and Pickney (1986) hypothesized that such a shift of labour from agriculture is "one of the most dramatic manifestations of the strong bias against agriculture resulting from trade and exchange policies". While this statement may appear a generalization and other factors exist to explain this phenomenon, it is possible to argue that during the *Unilateral Declaration of Independence* (1965-79), the development strategy tended to favour the manufacturing sector; and thus, encouraged resources to flow to this sector. Table 1 shows that this may have been the case, since the share of wage

Table 1. Selected sectoral indicators, Zimbabwe, 1965 to 1984 (percent).

Indicator	1965-69	1970-74	1975-79	1980-84	1980-81	1982-83
Increase in ag. employment[a]	0.2	4.1	2.1	4.5	8.4	0.8
Ag. employment share of total employment[a]	37.5	35.3	34.4	27.3	30.4	24.9
Mfg. employment share of total employment[a]	11.6	13.8	14.6	16.5	16.3	17.1
Ag. exports share of total exports[b]	na	na	21.8[c]	28.5	26.8	30.7
Food exports share of ag. exports	na	na	76.5[d]	45.0	32.9	43.7
Ag. output as share of GDP[a]	na	16.8	15.9	13.1	14.9	12.1

Source: [a]Calculated from Zimbabwe (various issues). [b]Calculated from Zimbabwe (1986). [c]Only the years 1977-79 are included. [d]Only the years 1978-79 are included. na = data not available.

employment in manufacturing to total wage employment increased over the same period.

However, to argue that industry has been protected at the expense of agriculture may be an over simplification, since from the 1930s, the state has canvassed policies designed to protect commercial agriculture. For example, in 1931 the Maize Control Board was set up to guarantee white settler farmers high domestic producer prices, high enough to compensate them for low export prices. At independence the government increased the producer price of maize by 41% and improved the access of peasant farmers to institutional credit in a bid to improve their productivity.

In the case of agricultural exports, total agricultural exports as a share of total exports have been increasing since the 1970s, while food exports have been falling (Table 1). These trends explain why, for Zimbabwe food self-sufficiency (as opposed to food security) is not yet an issue, although agricultural production, between 1965-80, grew at about 2% per annum, compared to an annual population growth rate of 3.5% (Green, 1986). A possible food supply crisis appears to have been avoided by a shift in the balance of food/export production. Government has maintained this policy after 1980, where maize exports are only permitted after domestic food requirements have been satisfied. Zimbabwe's major food exports are maize and beef.

Food imports do not constitute a significant proportion of the total import bill. In fact, in some official statistics food imports do not even appear, giving the impression that the gap between domestic food production and food demand is narrower. However, over the years, food imports have been increasing. For maize and other food crops, this is due to weather variability. For example in 1984, it was necessary to import 269,000 mt of maize following a three-year drought.

Food self-sufficiency is still not yet a problem for Zimbabwe, or as Green (1986) puts it, "the food constraint has been somewhat relaxed, or at least postponed, in itself a notable achievement and one demonstrating that political economic priority shifts towards egalitarianism can have distinct positive results" (p.19). However, this does not mean that food security at a national, or even regional level (since for SADCC, Zimbabwe was chosen to coordinate food security) is not going to be a problem. In fact, one observes here a paradox. Here we have a nation that, in good agricultural season, produces surplus food, and as a result maintains a huge and expensive food (grain) stock. Yet, its neighbours are importing food. Such a paradox can only be tackled at a policy and political level, and it appears that exchange rate adjustment could be one such policy.

POLICY ENVIRONMENT 1965-1985

UDI: 1965-1979

After Rhodesia unilaterally declared its independence from Britain in 1965, the United Nations, at the instigation of Britain, imposed trade sanctions, and a shortfall in foreign exchange emerged. In a bid to maintain production, the regime in power instituted an import substitution industrialization strategy, a strategy that requires protectionist policies to succeed. As a result, the UDI period witnessed the

development of a tightly controlled economic system with administrative allocations of foreign currency, price controls, and investment regulations. According to Mabhena (1988), these three instruments formed the main pillars of economic policy during UDI.

Foreign exchange allocation

The system for allocating foreign currency was (and has remained) central to the management of the economy. The actual allocation is largely based on the machinery designed in 1965. As a result, some observers argue that the procedures tended to favour those industries in operation at the time. However, the system did more than just maintain equilibrium in the external accounts or conserve scarce foreign currency--it actually provided sufficient protection for domestic industrial producers. As a result, both the exchange rate and custom duties (trade policy) did not play an important role.

Price controls

Price controls were instituted to keep the basic consumables within reach of the people. This was especially so in the case of basic food stuffs like mealie-meal and bread. For example, the selling price of maize remained Z$4.17/mt between 1965 and 1974, while the producer price of Grade A maize increased from Z$34.00 to Z$ 36.37/mt over the same period. There was therefore a deliberate policy to keep the basic prices of basic food stuffs at affordable levels, while setting producer prices high enough to guarantee food availability.

Investment policy

The investment control policy was also limited to the foreign exchange allocation system in that investment control was instituted to save scarce foreign currency. These controls required that all new investment should save or earn (net) foreign exchange, thus providing further protection to domestic firms. Clearly then, UDI provides an example of instances where controls can work very well.

Assessment of the strategy

The strategy appears to have been successful during the early years of UDI (*i.e.*, up to 1974). Between 1965 to 1974, GDP grew at an annual average rate of above 7% and employment grew at above 3% per annum, while the rate of growth of gross fixed capital formation was 22%. Table 2 shows that Rhodesia managed to maintain a positive balance of trade, and this positive balance increased as a proportion of total exports. At the inception of UDI, imports as a share of national income stood at 45%. By the end of UDI (1980), imports had fallen to 36% of national income. In 1965, imports had fallen to 36% of national income. In 1965, exports were 55% of national income. However, they fell to 37% the following year, and by the end of UDI they were down to 32% of national income. Adding together the ratios of exports and imports to national income provides a basic measure of the degree of openness of the economy (Robinson, 1987). As shown on Table 3, at UDI Rhodesia's indicator of openness was 102%. In the following year it fell to 71%, and

Table 2. Indicators of international trade, Zimbabwe, 1970 to 1985.

	Exports	Imports	Balance of trade	Balance on current a/c	Balance of trade as % of exports	Current account as % of exports
	Million Zimbabwe dollars					
1970	258.7	235.0	23.8	na	9.2	na
1971	290.2	282.5	7.8	na	2.7	na
1972	349.1	274.7	74.4	na	21.3	na
1973	389.1	308.6	80.5	2.6	20.7	na
1974	531.2	438.3	92.8	95.5	17.5	na
1975	531.3	461.9	69.4	106.7	13.1	20.0
1976	557.4	382.7	174.7	9.9	31.3	1.8
1977	550.8	388.1	162.7	19.7	29.5	3.6
1978	609.3	403.7	205.6	13.4	33.7	7.2
1979	715.7	549.3	166.4	73.9	23.2	10.3
1980	909.2	809.4	99.8	156.7	11.0	17.2
1981	971.7	1,017.7	46.0	43.6	4.7	4.5
1982	968.4	1,081.8	113.4	532.9	11.7	55.0
1983	1,150.2	1,061.6	88.6	454.2	7.7	39.5
1984	1,453.0	1,200.7	252.3	101.9	17.4	7.0
1985	1,795.5	1,446.5	349.0	159.2	19.4	8.7

na = data not available
Source: Compiled from CSO (various issues).

Table 3. Exports and imports as a proportion of national income, Zimbabwe, 1965 to 1984.

Year	Exports	Imports	Exports + Imports
1965	55	47	102
1966	37	34	71
1975	31	32	63
1980	32	36	68
1981	28	36	64
1982	25	31	56
1983	26	30	56
1984	30	30	60

Source: Robinson (1987).

by 1980 this indicator was down to 68%, reflecting the development of a tightly-controlled economic policy environment.

However, after 1974 things started going wrong, as shown by Kadhani and Green (1985) and Green's (1986) analysis of the current account deficit (CAD) during this period. After 1974, several factors--like oil price increases, the international recession, the intensification of the liberation war, the effect of economic sanctions, the overheating of the domestic economy, and a highly import intensive expansion of gross fixed capital formation--rendered the CAD unsustainable. According to Green, the "domestic response was in a sense, an ultra orthodox demand-cutting strategy, albeit centered on achieving a visible trade surplus and balance on current account, rather than on domestic demand management per se, and on eschewing use of active interest on exchange rate policies" (p.21).

Thus, even when the development strategy began to run into a crisis, there was little change in the policy stance of the regime. By the end of UDI, there were signs that urgent change was necessary.

Post-independence: continuity in change

The post-independence government has effectively left intact the system of economic controls, but with some modification. In the immediate post-independence period, the government canvassed a strategy that promoted growth with equity. Growth was to be promoted by a dramatic increase in foreign exchange allocation. In the first two years of independence, this appears to have been achieved, as the economy experienced an impressed growth rate of 14%. In agriculture, the government also increased producer prices as follows: maize (40%); wheat (17%); soyabeans (5%); sorghum (31%), and groundnuts (8%). The government also incorporated the peasant sector into the cash economy by making subsidized credit available to them. Equity was to be achieved by expanding such social services as health and education, implementing the resettlement programme, and increasing minimum wages.

Approaching crisis

Towards the end of 1981, the strategy ran into a crisis, due to increased external imbalances, the drought, the international recession, and increased domestic inflation. To deal with these problems, the government introduced a radical programme of external adjustment, including foreign exchange allocation. However, this instrument was complemented by a devaluation of the Zimbabwe dollar and movement to a more flexible, albeit, managed exchange rate policy. At the same time, the government allowed the prices of basic food stuffs and other basic utilities to increase. The selling price of maize rose from Z$89 to Z$137/mt in 1982, while that of wheat rose from Z$109.85/mt in 1982 to Z$139.00/mt in 1983. Wage control was also introduced as an anti-inflation device.

There was, however, the paradox that, in spite of these "radical" policy measures, there was little control on the government budget deficit. While the current account deficit, as a proportion of GDP fell from 12.3% in 1981 to 4.1% in 1985, the budget deficit, as a share of GDP, increased from 9.4% to 18.3% over the same period.

The increase in the budget was due to increases in subsidies paid to parastatals and expenditures on defence, education, and health.

First five-year development plan

In 1986, the government published the country's *First Five Year National Development Plan* (1986-90) which contained government's policy intentions for the coming five years. The government planned to increase investment in the productive spheres of the economy (agriculture, manufacturing, and mining). Second, the government committed itself to reducing the budget deficit, and third, it adopted a policy of export promotion.

At the same time, the government has committed itself to gradual trade liberalization. To achieve this, the government has instituted a trade liberalization study which is expected to spell out the pace and areas of trade liberalization. This trade liberalization study is expected to form an input into an overall adjustment programme intended to achieve sustained growth in the Zimbabwean economy.

THE REAL EXCHANGE RATE (1965-1985)

It has been stated above that the policy environment during UDI became essentially interventionist and restrictionist, and any adjustment in the external account was achieved through administrative allocation of foreign currency. This section, analyses the impact of such a policy environment on the international competitiveness of the country's goods and incentives to produce tradeables.

Categories of exchange rates

According to Valdes and Pinckeney (1986), there are two categories of exchange rates: the nominal exchange rate (NER) and the real exchange rate (RER). They define the NER as an undeflated conversion factor between one currency and another; and the RER as a measure of the terms of trade between the traded and the nontraded goods in the economy. In this study, we have adopted the World Bank approach to exchange rate calculations. The World Bank calculates the exchange rate as "an index of relative domestic and world prices expressed in terms of a common currency (World Bank, 1987, p.101). In other words:

$$R = \frac{(Pq.)\,(Eo)}{Pf}$$

Where:

	R	=	Real exchange rate
	Eo	=	Nominal exchange rate
	Pq	=	Index of the price of home goods
	Pf	=	Index of foreign prices.

As the World Bank mentions, defining R this way has certain advantages, in that if R is increasing, then clearly, the home currency is appreciating, and vice versa.

However, defining the real exchange rate this way raises two problems--one of measurement and the other of meaning. The measurement problem comes in when one wants to talk about the price index of home goods. Others have suggested that the price of home goods can be proxied by the GDP deflator, while others prefer to use the wage rate index. The use of the GDP deflator is problematic in the sense that tradeables are included in the index. Using the wage rate as the deflator "automatically makes the real exchange rate connote a real wage rate index" (Durnbush and Helmers, 1988, p.11). Besides, these problems of defining the appropriate price index for nontradeables, there are also "weighing problems in constructing an index of foreign prices" (World Bank, 1987, p.101). In this study, foreign prices were defined as the average of index prices of exports and imports in foreign currency, while four variables were used to proxy the price index of home goods. These were the building material price index; the food stuffs component in the consumer price index; and the average consumer price index for higher and lower income urban families.

The second problem with the way the real exchange rate is defined, is just what are we trying to show by the index. This is because as an index, the real exchange rate says nothing about whether the currency is over or undervalued. It only tells us how the exchange rate is fluctuating around a certain base period. Thus, what we are assuming is that a particular rate in the past was the correct one, *celeries paribus*; and therefore, it becomes a basis for a target.

Trends in the real exchange rate

In this study, 1980 has been chosen as the basic period. It appears reasonable to do this because some authors like green and Kadhani (1985) have argued that in 1980, there was some relaxation in the economy. Moreover, foreign exchange allocation was increased and almost every sector was booming. Thus, while this study does not answer the question of whether the Z$ is overvalued or not, it does show how its value has been moving since 1980 and before.

Figure 1 shows the trends in Zimbabwe's real exchange rate against the US dollar and the SDR from 1965 to 1985. The table shows that, up to 1970, the real exchange rate was relatively stable, but after this period it began to appreciate. In the early 1970s, there were a number of debates as to whether or not the Rhodesian dollar (R$) was overvalued and therefore should be devalued, especially after the devaluations of the South African Rand the US$ (Girdlestone, 1973). Those producing exportables, like farmers and miners, favoured devaluation while the manufacturing sector was against devaluation. Girdlestone, talking for the majority of the protected manufacturing sector, argued against devaluation, as this would foster GDP disequilibrium rather than correct it. However, after this period, the real exchange rate stabilized again, up to the time of independence.

At independence, there was a slight appreciation of the real exchange rate. However, in 1982 the government devalued the Z$ by 20%. At the same time, the exchange rate went onto a managed float, and thus over the years had depreciated substantially. It is difficult to tell whether this depreciation has been enough due to the difficulty of calculating the degree of overvaluation. Although the excess demand

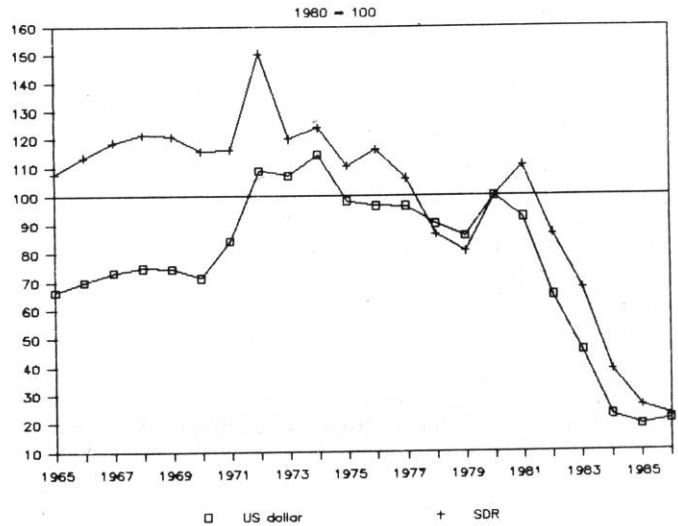

Figure 1. Zimbabwe real exchange rate, 1965 to 1986.

for foreign exchange that exists indicates that he Z$ may still be overvalued; a sounder conclusions would be that the system of foreign exchange allocation has made it possible for Zimbabwe to support an exchange rate at which there is still excess demand for foreign currency.

Relative price trends for home goods and tradeables

Table 4 shows the trends in the relative prices in the economy. Up to about 1980, these prices have tended to remain closer to the prices of home goods. This is one of the interesting developments of the UDI period--even though the country canvassed a protection and interventionist policy environment, the authorities did not allow this to prejudice the price of tradeables. As a result, they allowed the exchange rate to depreciate and did not impose a tax on exports. After independence, the gap between the price of tradeables and certain agricultural exports, on one hand, and the price of home goods has widened. For example, in the case of the relative price of tradeables, the ratio fell from 101.9% tin 1979 to 72% in 1982 and 42% in 1983. This implies that the incentives to produce for tradeables have been declining, and in the case of agriculture, growth has been lower than it should be. The gap also reflects the impact of protectionist commercial policies.

Table 4. Domestic relative prices and the real exchange rate, Zimbabwe, 1965 to 1985.

Year	Relative price of exports		Relative price of imports		Relative price of tradeables		Real exch. rate
	Index[a]	Charge (%)	Index[a]	Charge (%)	Index[a]	Charge (%)	Index[b]
1965	1.39	0.0	0.96	0.0	1.18	0.0	0.662
1966	1.22	12.8	1.01	5.8	1.12	-5.2	0.699
1967	1.15	5.6	0.99	2.8	1.07	-4.4	0.731
1968	1.14	0.7	0.94	4.1	1.04	-2.3	0.747
1969	1.17	2.5	0.93	1.9	1.05	0.5	0.744
1970	1.25	6.7	0.93	0.4	1.09	3.6	0.843
1971	1.13	9.0	0.96	2.8	1.05	-3.5	0.843
1972	0.81	28.6	0.91	5.4	0.86	-18.0	1.089
1973	1.13	39.2	0.87	2.4	1.01	17.2	1.075
1974	1.27	12.6	1.04	15.3	1.15	14.6	1.145
1976	1.12	5.5	1.03	2.6	1.07	-1.8	0.966
1977	1.00	10.8	0.97	5.4	0.99	-8.2	0.964
1978	0.95	5.1	0.99	1.3	0.97	-1.9	0.902
1979	0.91	4.0	1.13	14.3	1.02	5.4	0.858
1980	1.00	9.7	1.00	11.3	1.00	-8.5	1.000
1981	0.88	11.8	0.79	20.6	0.84	-16.2	0.923
1982	0.88	0.1	0.70	12.2	0.73	-13.4	0.648
1983	0.88	0.4	0.70	0.5	1.72	-1.4	0.455
1984	0.85	3.9	0.70	0.0	0.77	8.1	0.228
1985	0.85	0.6	0.69	1.7	0.77	-0.4	0.209

[a]Data rounded to two decimal places. [b]Data rounded to three decimal places.
Source: Compiled from CSO (various issues).

THE INCIDENCE OF TRADE AND EXCHANGE RATE POLICIES

In this section, the impact of trade and exchange rate policies on the level and structure of incentives in the economy is calculated. To do this, a model developed by Dornbush (1974) and Sjaastad (1980) and extensively utilized in many International Food Policy Research Institute (IFPRI) studies is also used here. This is a model of an open economy consisting of three sectors producing exportables, importables, and nontraded goods; and derives the equilibrium price relationships among the three (Dyejide, 1986; Bautista, 1987).

The model

The regression equation of the model is:

$$\log \frac{Ph}{Px} = a + W \ln \frac{(Pm)}{(Px)}$$

Where Ph = price index for nontradeables
Px = price index for exportables
Pm = price index for importables.

In this equation, the interpretation of W, referred to as the incidence parameter, is very important. According to Dyejide, W measures the combined effects of trade and exchange rate policies on relative price changes of the three sectors. A high W means a country's nontradeable goods and importables are close substitutes. Thus, an increase in the relative price of importables to exportables, due to trade and exchange rate policies, would lead to a composite increase in the relative price of nontradeables to exportables. As a result, production for exportables would become unattractive. Since agriculture is the major contributor to the production of exportables, it would absorb most of the burden.

Empirical results

For Zimbabwe, the regression results are shown on Tables 5 and 6. Two variables have been added to the equation since time-series data has been used in the estimation. The Cochrane-Orcutt method was used to correct for first order serial correlation. For all the equations run, the W coefficient was significant, and the R^2 was also reasonable.

Table 5. Regression results for total exports, Zimbabwe, 1965 to 1985.

Independent variables	Dependent variables			
	Log $\frac{Ph1}{Px}$	Log $\frac{Ph2}{Px}$	Log $\frac{Ph3}{Px}$	Log $\frac{Ph4}{Px}$
Constant	0.9000 (2.7168)	-2.6053 (4.1115)	1.8677 (2.4951)	1.1413 (2.4324)
Log (Pm/Px)	0.7980 (0.1425)	0.7857 (0.2777)	0.9952 (0.1701)	0.8667 (0.1559)
Log GDP	-0.0284 (0.3007)	0.3686 (0.5005)	-0.1920 (0.3039)	-0.1050 (0.2950)
Log BOT	-0.0121 0.1165	-0.0099 (0.0215)	0.0044 (0.0013)	-0.0011 (0.0121)
R2	0.6560	0.3209	0.6132	0.6713
DW	1.5370	1.4530	1.4708	1.4292
P	0.9558	0.8024	0.7987	0.8250

Ph1 = building material price index; Ph2 = component of domestic workers wages in CP1; Ph3 = food component of CPI; Ph4 = average CPI. The figures in parentheses are the standard errors.

Results displayed on Table 5 show that for total exports, W is between 0.78 and 0.87. This means that for Zimbabwe, importable goods and nontradeable goods are fairly close substitutes. As a result, we expect that if the relative price of importables increases by 1%, then the relative price of importables increases by 1%, then the relative price of nontradeables to exportables would increase by between 0.78% and 0.87%. Therefore, this result partly explains Table 4 which shows that over time the relative prices of exports have declined under an import substitution industialisation regime supported by such controls as the foreign exchange allocation system, price controls, and investment controls. A fall in the relative prices of tradeables to those of nontradeables, implies a diversion of resources to production for the home market. Therefore, Zimbabwe's trade and exchange rate policies partly explain the performance of agriculture and the consequent decline in employment levels in the sector.

Due to the difficulties of getting time-series data on the price of agricultural exports, it was impossible to calculate the impact of trade and exchange rate policies on the agricultural sectors as a whole. However, estimation on certain agricultural export--three of which are classified as food exports (maize, beef, and coffee) and two cash crops (tobacco and cotton)--was carried out. The overall import price index was used, since none of these goods are normally imported into Zimbabwe. For all the equations, the W coefficient was significant at the 5% level of confidence, and the R^2 was to be quite high (see Table 6).

Table 6. Regression results for agricultural commodities, Zimbabwe.

Independent variable	Dependent variable				
	Coffee	Beef	Maize	Cotton	Tobacco
	Log $\frac{Ph1}{Px\ coffee}$	Log $\frac{Ph1}{Px\ Beef}$	Log $\frac{Ph2}{Px\ Maize}$	Log $\frac{Ph1}{Px\ Cotton}$	Log $\frac{Ph1}{Px\ Tobacco}$
Constant	-11.4340	-8.8859	0.4138	-11.7610	-8.3647
	(1.7285)	(1.8519)	(3.8198)	(1.5177)	(1.9232)
Log Pm/Px1	0.8335	0.8838	0.9673	0.9019	0.7087
	(0.1094)	(0.0507)	(0.0906)	(0.1619)	0.1205)
Log GDP	1.5152	1.1636	-0.0186	1.4068	1.0256
	(0.2247)	(0.2132)	0.4631	(0.1855)	(0.2395)
R^2	0.9463	0.9722	0.9366	0.9090	0.7903
DW	1.9260	1.6564	1.1702	1.7842	1.6920

Ph1 = building material price index; Px1 = the export price index of agricultural commodity 1; Ph2 = food component of the low income consumer price index. The figures in parenthesis are the standard errors.

For all the crops under discussion, the incidence parameter is quite high, between 0.7 and 0.9. The most surprising result is for maize, with an incidence parameter of 0.9. Strictly speaking, for Zimbabwe maize is not really a tradeable good as it is exported only after the domestic market has been satisfied. Moreover, maize has historically been given a higher domestic price compared to the export price. These results show that maize production is sensitive to policy charges. Since the majority of the peasants are involved in maize production, an exchange rate policy that impacts negatively on the incentives to produce maize would lead to a reduction in rural incomes, affecting both peasant farmers and agricultural labour. An export price for maize that is not competitive means that the earnings of the Grain Marketing Board (GMB) will be declining, leading to a deficit. To cover the deficit, government will either increase the subsidy to the GMB (which is becoming unsustainable) or reduce the producer price paid to farmers by the GMB. Both strategies have serious conclusions for food security. Increasing subsidies to the GMB will lead to an increase in the budget deficit, thus leading to inflationary tendencies. Reducing the producer price will kill the incentives for maize production. Clearly then, the GMB requires a competitive export price to remain viable.

Thus, these results explain Table 4 and Figure 1. When the Z$ became seriously overvalued by 1981, the relative price of tradeables started to decline, but after the devaluation in December 1982, and with some lag, it began to improve.

A POLICY PACKAGE FOR ZIMBABWE?

In summary, these results show that trade and exchange rate policies have an adverse impact on the sectors producing tradeables. However, since growth appears to be foreign exchange constrained, some policy changes in favour of promoting exports need to be instituted. Policymakers need to ask a number of questions about the exchange rate, because it is a major component of the structural adjustment programme. The following questions should be asked:

- o Does Zimbabwe need to reform its exchange rate? What form should this take?
- o In a strategy to adjust the exchange rate, what accompanying reforms are necessary in the area of fiscal policy?
- o What reforms need to be made in the present system of foreign exchange allocation?
- o What policies should be introduced to protect the vulnerable groups that will suffer due to exchange rate adjustment?

In Zimbabwe, there appears to be a connection between fiscal reform, exchange rate adjustment, and the foreign exchange allocation system. However, since the exchange rate is central to structural adjustment, we will only discuss here the different options open to Zimbabwe in this area.

In Zimbabwe, the debate on exchange rate adjustment has acquired an ideological flavour, with those in favour of exchange rate adjustment seen as belonging to the right wing camp. This is regrettable, since exchange rate adjustment is an instrument designed largely to improve the competitiveness of a country. As such, it works in

the same way as a subsidy or commercial policy. The advantage of exchange rate adjustment is that it is less powerful than adjustments in other relative prices (*e.g.*, wage adjustments).

Exchange rate adjustment would improve the competitiveness of the agricultural sector because it would force farmers to employ more of the cheaper factor of production, labour. Under the existing system, where there appears to be some currency overvaluation, labour is artificially expensive relative to say capital. However, because of foreign exchange constraints, farmers are forced to utilize the artificially expensive labour. Once the exchange rate is adjusted, labour will become relatively cheaper. as a result, agricultural exports would become more competitive and it is possible to envisage employment in the sector increasing.

In the area of exchange rate adjustment, Zimbabwe has probably two options, either to institute discrete devaluation or adopt a crawling peg. It seems unlikely that Zimbabwe could accept a floating system, even temporarily, because such a system would result in greater volatility in the economy. Moreover, a float is inimical to Zimbabwe's professed policy stance, that of control and intervention in the economy. For Zimbabwe, the crawling peg system appears attractive since it would allow for automatic exchange rate adjustments once a particular, like amount of foreign exchange reserves changes. Moreover, because adjustments are automatic, exchange rate charges need no longer directly excite political emotions.

However, it should be emphasized that exchange rate adjustment will be successful and less painful only if fiscal policy reform is already in place.

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AGRICULTURAL PRICING POLICY AND TRADE IN SEVERAL SADCC COUNTRIES: PRELIMINARY RESULTS

David S. Kingsbury[1]

INTRODUCTION[2]

In recent years, the nine SADCC member states have increasingly voiced an interest in expanded intraregional trade as one strategy towards increased food security within the region. Because six of the nine countries are landlocked, transportation costs to and from European and North American markets are high, and external trade is perceived as risky (especially with South Africa); the desire to pursue such a strategy is understandable.

Levels of official intraregional trade have historically been low. The proportion of recorded intra-SADCC trade in overall official trade is only 4-5% (Chr. Michelsen, 1986). Constraints on expanded intraregional agricultural trade include: food and agricultural pricing policies; shortages and official rationing of foreign exchange; overvalued exchange rates; state monopolies on trading; bureaucratic red-tape; and entrenched trading patterns with former colonial powers.

Intra-SADCC agricultural trade should be considered in the context of macroeconomic and agricultural policies in SADCC nations. Some agricultural marketing and pricing policies are in direct conflict with expanding intraregional trade (price controls, state trading monopolies in staple food commodities, import licensing) because they reduce the incentives to trade by placing restrictions on who can trade, what can be traded at what prices, and when trade is allowed.

This paper focuses on the incentive effects of agricultural pricing and exchange rate policies on intra-SADCC trade in staple food commodities. In the following section, recent intra-SADCC trade patterns in staple food commodities are briefly reviewed. Then, the transportation cost argument for intraregional trade is assessed by examining differences between import and export parity prices for a number of SADCC markets. Import parity prices from various official and parallel market sources are then compared to illustrate the potential incentive effects of agricultural pricing and exchange rate policies on intraregional trade. The paper concludes by advocating the need for more systematic collection of parallel market data as an important input into agricultural policy analysis in SADCC countries.

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POTENTIAL AGRICULTURAL PRICING INCENTIVE EFFECTS ON INTRA-SADCC TRADE IN STAPLE FOOD COMMODITIES

Historical intra-SADCC agricultural trade patterns

In a previous paper, a database was constructed on official SADCC trade of three staple food commodities (maize, wheat, and rice) by destination and source for the years 1970 to 1985 (Kingsbury, Stackhouse, and Rusike, 1988). Maize is the most important of the three commodities in terms of official intraregional trade volumes (Table 1). However, only Zimbabwe and Malawi exported maize to other SADCC countries in the first half of the 1980s. In recent years, Mozambique and Tanzania have been the principal regional importers of SADCC maize. Most of these transactions have been funded by donor organizations as food aid.

Only Malawi has consistently exported rice, but quantities have been small--less than 10,000 mt in most years with Zimbabwe and Zambia the primary customers.

While Zimbabwe has occasionally exported small quantities of wheat, no other SADCC country has ever exported wheat. Moreover, the goal of wheat self-sufficiency remains elusive for Zimbabwe.

Modest volumes of sorghum, millet, pulses, and fish have also been traded intraregionally. For example, Zimbabwe has exported sorghum and millet to Botswana, Mozambique, and a few other countries. Here again, however, annual volumes have been small.

Table 1. Intra-SADCC exports of maize and rice, 1970-85 (mt).

	Maize						Rice			
Year	Angola	Malawi	Tanzania	Zambia	Zimbabwe	TOTAL	Angola	Malawi	Tanzania	TOTAL
1970	17,905	0	20,000	1	87,200	125,106	82	474	202	758
1971	10,176	4,652	26,344	100	92,492	133,764	145	1,174	1,083	2,402
1972	0	12,733	0	0	63,327	76,060	0	1,091	360	1,451
1973	0	1,172	0	0	86	1,258	0	10,741	266	11,007
1974	0	19,660	0	69,133	258	89,051	0	8,053	38	8,091
1975	0	15,962	0	0	20,549	36,511	0	5,941	0	5,941
1976	0	0	0	8,809	18,566	27,375	0	2,026	0	2,026
1977	0	0	0	22,139	0	22,139	0	3,231	0	3,231
1978	0	0	37,120	21,903	0	59,023	0	3,285	60	3,345
1979	0	13,350	0	14,400	5,600	33,350	0	6,287	0	6,287
1980	0	0	17	13	0	30	0	12,613	0	12,613
1981	0	0	0	0	107,184	107,184	0	200	0	200
1982	0	49	0	0	303,585	303,634	4,990	2,371	0	7,361
1983	0	76,342	0	0	220,417	296,759	0	197	0	197
1984	0	152,270	0	0	0	152,270	0	0	0	0
1985	0	57,722	0	0	154,317	212,039	0	5	0	5

Source: Kingsbury, Stackhouse, and Rusike (1988).

Transportation costs and intraregional trade

Previous researchers have posited that high overland transportation costs are an important source of competitive advantage for intraregional trade (Koester, 1986)[3]. To assess the potential transportation cost advantages of intra-SADCC trade, import and export parity prices are calculated and compared.

The import/export parity price represents the opportunity cost of a given country's tradable commodities (Scandizzo and Bruce, 1980). The import parity price is the c.i.f. import price at a country's border, converted using an appropriate exchange rate, and adjusted for transport and handling to a relevant domestic market. If a commodity can be locally produced less expensively than it can be imported, then import substitution may be profitable. The export parity price is the f.o.b. export price, adjusted from a given export market to the appropriate domestic market (or project boundary). If the export parity price is higher than the cost of locally producing a good and transporting it to the relevant domestic market, then that good may be competitive in the export market under consideration.

In the context of assessing intra-SADCC trade potential, examination of import and export parity prices is useful for several reasons. First, the lower the export parity price, the more difficult it will be for a country to profitably export, as high transportation costs outweigh any production cost advantage that the country might enjoy. Second, if import sources are distant, import parity prices will be high because transportation costs make up a large part of the c.i.f. price. This provides greater latitude for import-substituting domestic production. Third the larger the spread between import and export parity prices, the greater the potential to produce locally and export to nearby markets, or alternatively, to import from nearby sources. Large import/export parity price spreads can therefore be used to indicate potential for intraregional trade.

In Table 2, import and export parity prices are calculated using the South African white maize price for 1985-86. The South African white maize price is employed because South Africa has historically been the world's leading exporter, accounting for roughly two-thirds of recorded world exports during the 1975-1983 period (Table 3). Moreover, South Africa has historically dominated the SADCC maize market (Figure 1) with an average market share of 43% over the 1970-1985 period.

For markets relatively close to South Africa (the BLS countries, Zambia, and Zimbabwe), the transportation cost advantage of intra-SADCC trade does not appear to be substantial--as indicated by the relatively low import parity price, high export parity price, and narrow spreads between the two prices. By contrast, the difference between import and export parity prices is still large for a number of SADCC markets. Exporters such as Zimbabwe and Malawi could still expect to have a competitive edge over South Africa in northern SADCC markets. Likewise,

[3] According to Koester, another source of trade potential is related to the fact that regional cereals production variability is less than individual country production variability. This indicates that establishment of a regional food reserve could benefit SADCC food security. In addition, different patterns of production, imports, and exports among the SADCC countries may indicate potential for trade expansion.

Table 2. White maize parity prices for selected SADCC markets, 1985-86 (US $/mt)[a].

Market	Import parity	Export parity	Difference
Gabarone, Botswana	124.50	91.50	33.00
Maseru, Lesotho	127.00	89.00	38.00
Francistown, Botswana	130.50	85.50	45.00
Bulawayo, Zimbabwe	137.50	78.50	59.00
Harare, Zimbabwe	145.50	70.50	75.00
Lusaka, Zambia	164.50	51.50	113.00
Ndola, Zambia	177.50	38.50	139.00
Tete, Mozambique	180.50	35.50	145.00
Blantyre, Malawi	193.50	22.50	171.00
Mbeya, Tanzania	202.00	14.00	188.00
Lilongwe, Malawi	218.50	-2.50	221.00

[a]1985-86 South African white maize price is $108 at Johannesburg (f.a.e.). No overland handling charges have been included.
Sources: For transport, border and port charge data, Louis berger (1986); For the South African price, Maize Board (1986).

Table 3. Estimated world exports of white maize, 1975 to 1983 ('000 mt).

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983
South Africa	1,779	1,1,42	1,096	1,574	971	700	2,060	2,265	400
Zimbabwe	758	297	420	554	265	86	305	492	251
United States	271	213	49	88	111	323	149	170	111
Kenya	121	113	8	23	120	0	5	45	77
Tanzania	0	0	0	37	16	0	0	0	0
Zambia	17	9	26	61	0	0	0	0	0
El Salvador	0	4	1	1	2	20	10	0	0
Malawi	0	0	0	15	15	0	0	90	100
Total exports	2,946	1,778	1,600	2,353	1,500	1,129	2,529	3,062	939
South Africa as % of total[a]	60.4	64.2	68.5	66.9	64.7	62.0	81.5	74.0	42.6

[a]For the period, South African exports accounted for 67.2% of total world exports.
Source: FAO (1984).

maize surplus regions of southern Tanzania (such as Mbeya) would also enjoy a transportation cost advantage to parts of northern Mozambique, northern Zambia, and perhaps northern Malawi if these areas were in a maize deficit position.

Agricultural pricing policies and parallel markets

To this point, discussion has been limited to official trade flows at observable international prices. Such an approach has several limitations:

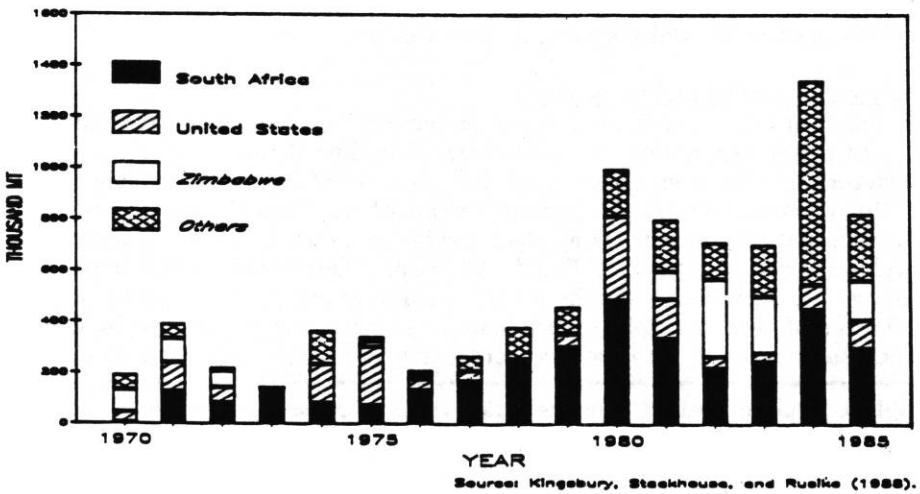

Figure 1. Major maize exporters to SADCC (1970 to 1985).

- o For some SADCC countries, unofficial cross-border trade may be very important--especially for regions that are distant from large urban centers. Zambia's borders with Zaire, Namibia, Malawi, and Tanzania are often mentioned as being particularly porous.[4]
- o From a food security standpoint, official imports may rarely reach isolated provincial centers and villages (Lele and Candler, 1981).
- o Food commodities sold through official channels are usually purchased by marketing boards at fixed producer prices and then sold at fixed wholesale or retail prices. These prices may not accurately reflect the true costs of production, storage, processing, and distribution. This can result in the establishment of parallel markets. In some countries, the domestic parallel market may handle larger volumes than the official market. Therefore, analysis of official flows can give an incomplete picture of the actual structure of trade (Lele and Candler, 1981; Renkow, Leonard, and Franklin, 1983).

It is quite difficult to analyze parallel market activity in Southern Africa because no reliable trade volume data exist. Making matters worse, only two SADCC governments (Tanzania and Malawi) currently collect parallel market price data. As such, it is not possible to provide a comprehensive picture of physical flows and participant behavior for SADCC parallel markets. One must instead begin by

[4] Zairian and donor officials estimate illegal flows of Zambian maize meal into southern Shaba province at 30,000 to 60,000 mt annually (Ariza-Nino and Mueller, 1988).

identifying markets where flows may exist and then proceed to look in greater detail at those markets for which some data are available.

Location of parallel market activities

As stated in the previous section, the closer two regions are to each other, the greater the transportation cost advantage of trading if one region is a surplus producer while the other region is a deficit producer of a given commodity. To aid in the identification of geographical areas where parallel market activity in agricultural staples may be taking place, Table 4 and Figure 2 show adjacent cereals surplus and deficit zones of SADCC[5]. A total of 17 intracountry and 8 intercountry pairings are identified. Of the 17 intracountry pairings, 8 are rather dubious indicators of current surplus/deficit status. This is because some of the data on which surplus/deficit designations were based are out-of-date. For example, it

Table 4. Adjacent SADCC surplus deficit zones in cereals production.

Surplus zone	Deficit zone(s)
Within individual countries	
Luena	Luanda, Nuambo, Monongue
Francistown	Gaborone, Maun
Lilongwe	Blantyre
Lichinga	Nampula, Tete
Tabora	Arusha
Mbeya	Arusha
Dar es Salaam	Arusha
Morogoro	Arusha
Chipata	Kassama
Lusaka	Ndola, Mongu
Across borders	
Luena	Luanda, Nuambo, Monongue
Francistown	Bulawayo
Rumphi	Kassama
Lilongwe	Tete
Mbeya	Kassama
Chipata	Tete
Lusaka	Bulawayo
Harare	Tete

Source: Technosynesis (1984) for designations of surplus/deficit zones.

[5] The zones are roughly homogeneous agroclimatically. Zonal designations are from Technosynesis (1984).

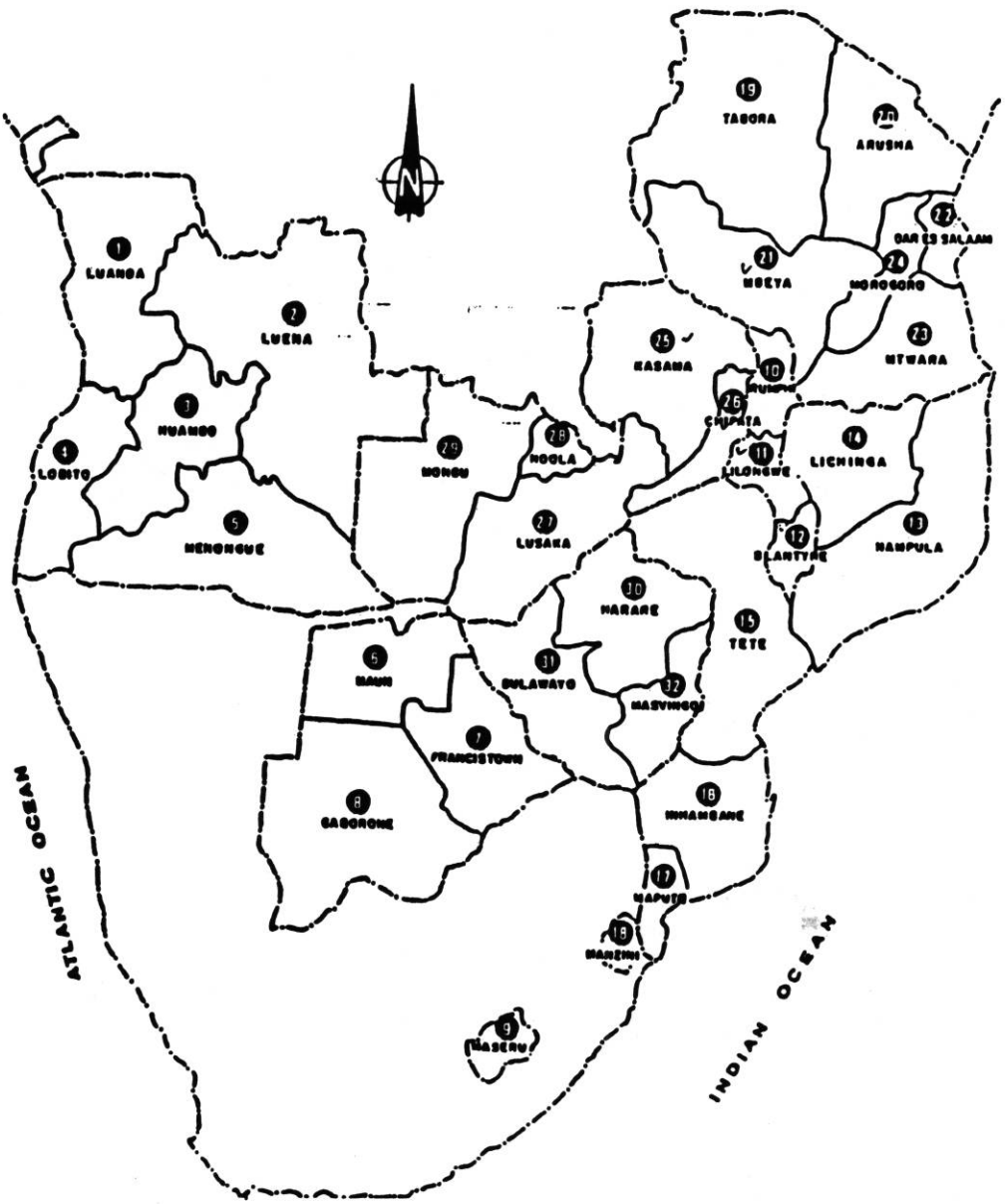

Figure 2. SADCC cereals production zones.

would be hard to believe that any region in Mozambique and Angola is currently in surplus due to war-related disruptions in agricultural production[6]. In addition, the designation of Francistown as a surplus zone is based on data prior to the six-year drought of the 1980s. For similar reasons, two of the eight intercountry pairings are questionable.

Constraints and potentials for expanding trade when parallel markets are considered

Closer examination of one of the intercountry pairings may shed some light on the constraints and potential for expanding intra-SADCC trade when parallel markets are also taken into account. Although Mbeya (southwestern Tanzania) and Kassama (northeastern Zambia) are adjacent, they are dissimilar in a number of ways which could indicate trade potential. While Mbeya typically produces surpluses of maize, rice, millet, sorghum, and beans, Kassama's less favorable soils have made it a historically deficit cereals producer. Leading staples in northern Zambia have traditionally been sorghum, millet, cassava, and rice. However, government subsidies in combination with low official producer prices for traditional crops have encouraged maize production and consumption, despite a comparative disadvantage in maize--relative to more traditional crops and great distances to maize consumption centers such as Lusaka and the Copperbelt (World Bank, 1985). Mbeya and Kassama are also linked by the TAZARA railway and the TANZAM highway so circulation between the two markets may not be as serious a problem as it is for many other regions of SADCC which are located far from national capitals. Moreover, distance from other maize exporting countries such as South Africa and Zimbabwe indicate a potential transportation cost advantage for trade between these two regions.

Table 5 presents the structure of Zambian breakfast and roller meal subsidies in late 1985. Treasury losses per mt were substantial as retail-level consumers paid only about half the costs of milled maize. Because official consumer maize meal prices are pan-seasonal and pan-territorial, this also adds an element of subsidy (which is not quantified here).

In Table 6, import parity prices at Kassama for various official and parallel market sources have been calculated. Among the official sources, Zimbabwe is the least expensive. Zimbabwean maize is less expensive than South African maize because the overland transportation distance is substantially shorter.

Although Tanzanian maize (from Mbeya) enjoys a transportation cost advantage over maize from Zimbabwe (the distance from Mbeya to Kassama is only 300 km while Harare to Kassama is 1,340 km), two factors render Tanzanian maize uncompetitive. First, parastatal handling costs are much higher in Tanzania[7],

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[6] However, if civil order were restored to Mozambique and Angola, these regions could eventually regain their position as net cereals exporters.

[7] The Tanzanian agricultural marketing parastatal for maize and a number of other staple commodities is the National Milling Company (NMC). Its counterpart in Zimbabwe is the Grain Marketing Board (GMB).

Table 5. Structure of official Zambian breakfast and roller meal consumer subsidies, December 1985 (kwacha/mt).

	Breakfast meal	Roller meal
Producer price (mt unmilled)	611.00	611.00
NAMBOARD handling	193.00	193.00
Mt of unmilled maize for 1 mt of meal	1.54	1.11
Cost prior to milling for 1 mt of meal	1,238.16	892.44
Miller and retail margin	198.28	143.20
Full cost at retail level	1,436.44	1,035.64
Official retail price (mt)	746.40	575.40
Government profit loss	-690.04	-460.24
Official retail price as % of cost	52.00	55.60

Source: Snell (1987).

constituting over 30% of the free-on-rail (f.o.r). cost at Mbeya. By contrast, GMB handling costs make up only 12% of the free-on-truck (f.o.t). Harare cost. More importantly, the Tanzanian shilling was substantially overvalued against the Zambian kwacha in December 1985. If parallel market exchange rates are used as a basis for comparison, the shilling was 167% overvalued against the kwacha whereas the Zimbabwe dollar was 12% undervalued against the kwacha[8]. If officially marketed Tanzanian maize were to be exported at parallel market exchange rates, the import parity price of unmilled maize at Kassama would fall from K2877/mt to K1184/mt, making it much more competitive.

Limitation of parallel market rate

The parallel market rate is not an entirely reliable indicator of the exchange rate that would prevail if exchange rates were market-determined. This is because suppliers and demanders of parallel market currencies require a risk premium, due to the possibility of getting caught and punished by the authorities (Roemer, 1984).

However, the goal here is not to indicate the exact magnitude of overvaluation[9]. Rather, it is to demonstrate that in a region where most currencies are overvalued

[8] Calculated as follows:

	Official Exchange Rate (OER)	Parallel Exchange Rate (PER)
Shilling per kwacha	2.89	7.71
Zimbabwe dollar per kwacha	0.345	0.303

Percentage over/undervaluation: (PER/OER - 1) x 100. Overvaluation of the shilling relative to the kwacha = 166.8%. Undervaluation of the Zimbabwe dollar relative to the kwacha = 12.2%.

[9] For the latter half of 1986, Fletcher (1987) categorized the level of overvaluation of the Tanzanian shilling as high, the Zimbabwe dollar as medium, and the Zambian kwacha as low. The Zambian kwacha depreciated significantly in 1986 during the foreign exchange auction. At the point in time observed by Fletcher, it is therefore likely that the Zimbabwe dollar had become overvalued, relative to the Zambian kwacha.

Table 6. Import parity prices for white maize at Kassama, Zambia from various sources.[a]

From various official sources, December 1985:

	Johannesburg	Harare	Mbeya
Export price (free-on-rail)	$US 108.00	Z$ 207.77	TSH 7,702.00
Dry-port charge	$US 8.00	na	na
Transport to border	$US 25.40	Z$ 31.50	TSH 171.97
Border charge	$US 1.00	Z$ 3.30	TSH 16.50
Total	$US 142.40	Z$ 242.57	TSH 7,890.47
Official exchange rate	K/$US1 5.70	K/Z$1 2.90	K/TSH1 0.35
Border price	K 811.68	K 703.45	K 2,761.66
Internal transport	K 237.12	K 192.09	K 31.30
Miller + retail margin	K 128.88	K 128.88	K 128.88
Import parity price	K 1,177.68	K 1,024.42	K 2,921.84
IPP for 1 mt breakfast meal	K 1,813.63	K 1,577.61	K 4,499.64
IPP for 1 mt roller meal	K 1,307.22	K 1,137.11	K 3,243.25

From parallel market sources at Mbeya, Tanzania:

	October 1985	April 1986
Producer price	TSH 3,860.73	TSH 7,360.38
Handling	TSH 493.00	TSH 493.00
Transport to border (by road)	TSH 343.94	TSH 343.94
Total	TSH 4,697.67	TSH 8,197.32
Parallel exchange rate	K/TSH1 0.10	K/TSH 10.13
Border price	K 469.77	K 1,065.65
Internal transport (by road)	K 71.13	K 71.13
Miller + retail margin	K 128.88	K 128.88
Import parity price	K 669.78	K 1,265.66
IPP for 1 mt breakfast meal	K 1,031.46	K 1,949.12
IPP for 1 mt roller meal	K 743.45	K 1,404.88

[a]Unmilled maize is converted to breakfast and roller meal with conversion factors of 1.54 and 1.11 respectively. Transport of Harare maize is by road and rail, Johannesburg maize and official Mbeya maize by rail, while parallel market Mbeya maize is by road. Local currencies are Zambian kwacha (K); Zimbabwe dollar (Z$); and Tanzanian shilling (TSH).

Sources: Transport, border, and port charges from Louis Berger (1986); Breakfast and roller meal conversion factors and miller and retail margins from Snell (1987); Official exchange rates from IMF (various issues); Parallel exchange rates from Cowitt (1986); Tanzanian official and parallel market prices and handling charges from Marketing Development Bureau (1986); South African export price from Maize Board (1986); Zimbabwe export price from Grain Marketing Board (1987).

to some extent, if the magnitude of overvaluation differs significantly among the currencies, this can seriously inhibit trade as countries with relatively more overvalued currencies price themselves out of regional markets. This occurs regardless of whether payments are made in local or convertible currencies (Koester, 1986).

Unlike official prices, parallel market prices include a seasonal element. The October 1985 producer price at Mbeya is only one-half the April 1986 price. While the April Mbeya price is not competitive with the Zimbabwe price, the October Mbeya import parity price is far lower than any of the other parity prices, even though transport charges are calculated using more expensive road rates. The end result is that government-to-government trade may inhibit informal trade as the seasonal element is subsidized in official trade, either by the source government that pays interest and handling charges for storage to make its exports more competitive, or by the importing government through its pan-seasonal producer and consumer pricing policies.

Impact of consumer subsidies on trade

The high level of subsidies to consumers for staple food commodities such as maize meal is a substantial barrier to intra-SADCC trade. Even the extremely inexpensive October 1985 Mbeya maize can not compete with subsidized Zambian maize meal. However, the magnitude of the subsidy encourages over consumption. Zambia's recent history of maize meal shortages (especially in provinces off the line-of-rail) makes it highly unlikely that the official retail price is the actual market price facing consumers in many parts of the country, except perhaps during the period just after harvest when supplies are most plentiful (Borton and Shoham, 1985).

On the other hand, expanded cross-border trade may occur due to subsidy leakages. Although Zaire is not a member state of SADCC, no discussion of SADCC parallel trade would be complete without discussing the extensive smuggling of Zambian maize meal into the southern Shaba Province of Zaire[10]. Maize consumption in Shaba Province is estimated at approximately 470,000 mt annually with local production meeting only about two-thirds of these requirements. The most important Zairian market is Lubumbashi whose 600,000 inhabitants consume roughly, one-half of all maize consumed in Shaba.

As mentioned earlier, Zairian estimates of smuggled Zambian maize meal into Shaba range from 30,000 to 60,000 mt annually. Informal importers generally operate on a small scale, paying lorry owners to transport their bags or alternatively crossing the border by rail with their merchandise. Most consignments are in the 1-2 mt range. At informal depots on the Zairian side of the border, consignments are consolidated for trucking to the major Lubumbashi wholesale market. Despite diseconomies of scale and risks from occasional crackdowns by Zambian officials, informal trade with Shaba is very lucrative (Table 7). While profit margins may not

[10] The following discussion of the Zambia/Zaire maize trade is largely based on Ariza-Nino and Mueller (1988).

provide sufficient inducement for traders to engage in maize meal smuggling into Tanzania, the Zairian margins provide a very powerful incentive to traders.

While such trade can contribute to the food security of recipient country populations, it can hardly be viewed favourably by governments in countries who subsidize the food consumption of neighboring populations. From a political perspective, such smuggling also exacerbates shortages in the subsidizing country which can lead to unrest.

By all accounts, the Zambian maize meal subsidy leakage to Zaire is significant. Using 1985 subsidy figures from Table 5, and assuming that 30,000 mt of maize meal are smuggled annually into Shaba (50% breakfast meal and 50% roller meal), the Zambian maize meal subsidy leakage can be roughly estimated at K17,250,000 or about US$3 million (at the December 1985 exchange rate of K5.7 = US$1). The

Table 7. Illustrative profit margins for subsidized Zambian maize meal in two cross-border parallel markets (per mt)[a]

From Ndola to Lubumbashi, Zaire (December, 1987).

Item	Unit	Breakfast meal	Roller meal
Retail price, Ndola	K	750.00	570.00
Parallel exchange rate	Z/K	18.00	8.00
Zaire border price	Z	6,000.00	4,560.00
Internal transport	Z	6,000.00	3,360.00
Import parity price	Z	48,000.00	46,000.00
Profit margin (%)		412.8	480.8

From Kassama to Mbeya, Tanzania (November, 1985):

		Roller meal
Retail price, Ndola	K	575.00
Transport to border	K	71.13
Total	K	646.53
Parallel exchange rate	TSH/K1	7.69
Tanzania border price	TSH	4,971.82
Internal transport	TSH	343.94
Import parity price	TSH	5,315.76
Actual parallel mkt. price	TSH	10,000.00
Profit margin (%)		88.1

[a]All transport by road; Local currencies are: Zambian kwacha (K); Zairian Zaire (Z); and Tanzanian shilling (TSH).

Sources: Road transport charges from Louis Berger (1986); Zambian breakfast and roller meal retail prices from Zanbian CSO (1988); Parallel exchange rates from Cowitt (1986) and Ariza-Nino and Mueller (1988); Tanzanian parallel market retail maize flour price from Marketing development Buereau (1986). Price is for sembe which is the rough equivalent of roller meal in Tanzania.

current leakage figure may be much higher for two reasons. First, exports may be greater than 30,000 mt. Secondly, the costs of producing, processing, and distributing meal have risen substantially since late 1985, whereas the official nominal retail price in Zambia has remained more or less unchanged. For example, the official preplanting producer price for maize for the upcoming 1988-89 planting season is K1,200/mt, or almost double the nominal 1985-86 producer price. This factor alone greatly widens the gap between the cost price of milled maize and the subsidized consumer price.

Impact of pan-territorial prices

Even if SADCC exchange rates were devalued (or happened to be overvalued at equivalent levels), consumer subsidies were relaxed, official prices were made to more fully take into account the seasonality of supply and demand, and borders were opened to free trade, resulting trade patterns would still not reflect comparative advantage if the policy of pan-territorial pricing was continued. As mentioned earlier, although Zambia's Northern Province is not climatically suited to maize production, pan-territorial pricing and attractive producer prices for maize relative to traditional crops have contributed to making the Northern Province a surplus maize-growing region. Land and labor have been pulled out of sorghum and cassava to produce surpluses for consumption in the distant Copperbelt and Lusaka markets. Because pan-territorial pricing directly implies subsidized transportation, the already over-burdened trucking fleet is further strained. Moreover, trade with nearby cross-border markets is discouraged while trade with far-away domestic urban markets is encouraged.

Impact of price structure on crop production patterns

In a number of SADCC countries, the structure of relative producer prices appears to have discouraged production of traditional drought-resistant crops such as sorghum or crops with high nutritive value such as groundnuts. In Table 8, indices of official producer prices of selected crops relative to maize are presented for several SADCC countries. The structure of relative prices in 1975 serves as the base.

The pricing policies of Zambia, Zimbabwe, and Tanzania have evolved since the 1970s so as to discourage official marketings of sorghum, relative to maize (Jansen, 1982; Jansen, 1986). Zimbabwean and Zambian pricing policies have also discouraged groundnut production while Malawian policy has favored groundnuts. Tanzania appears to have encouraged beans and cassava, relative to maize. However, official producer prices are often not competitive with parallel market prices in Tanzania, so only small volumes pass through official channels (Muir, 1984; Tanzania, 1986).

Impact of biased infrastructural investment

Beyond pricing policy, development of marketing infrastructure and agricultural research policy in most SADCC countries have historically been oriented towards maize and export crops at the expense of drought-resistant crops. While this appears

to be changing in the realm of agricultural research, storage construction, cooperative organization, and rural distribution networks are still largely developed with maize in mind (Lipton, 1986). As a result, the bulk of drought-resistant crop surpluses tend to be marketed through informal channels in a number of SADCC countries.

LIMITATIONS OF THE ANALYSIS

Four caveats are in order in examining the data presented in the previous section:

- o All the import parity prices calculated are "snapshots" and therefore subject to substantial modification over time as interannual and seasonal supply and demand conditions change and exchange rates fluctuate. This detracts somewhat from the robustness of these preliminary findings.
- o Data on parallel market handling costs are unavailable. Instead, the authors used Tanzanian parastatal figures for handling costs, shrinkage, and fumigation. Actual parallel market handling costs could be lower or higher than the figures cited. They would be lower if informal traders were more efficient or offered fewer services than the NMC. On the other hand, procurement, handling, and transportation costs could be higher in the parallel market because informal traders typically deal in small lots. This prevents the achievement of economies of scale.

Table 8. Indices of producer prices for selected crops relative to maize producer prices for four SADCC countries, 1970 to 1986[a].

	Zambia		Zimbabwe		Malawi	Tanzania		
Year	G'nut	Sorghum	G'nut	Sorghum	G'nut	Sorghum	Beans	Cassava
1970	85.71	111.90	na	100.63	100.14	na	na	na
1971	75.00	97.92	64.51	114.83	120.34	na	na	na
1972	69.77	91.09	74.79	143.35	114.92	123.08	na	na
1973	86.18	91.09	62.92	102.39	108.22	161.62	na	187.88
1974	116.28	96.90	70.99	92.25	121.71	117.33	90.67	144.00
1975	100.00	100.00	100.00	10.00	100.00	100.00	100.00	100.00
1976	116.71	79.37	74.14	130.10	106.55	120.00	133.33	125.00
1977	116.71	79.37	78.49	128.47	122.18	125.49	219.61	141.18
1978	123.70	73.53	82.38	126.04	182.49	125.49	219.61	152.94
1979	104.58	55.56	80.73	117.78	143.09	106.67	186.67	130.00
1980	87.98	42.74	62.68	110.03	143.57	106.67	186.67	130.00
1981	93.03	55.56	48.11	85.36	96.02	71.11	124.44	93.33
1982	88.24	46.88	51.80	85.36	142.98	97.52	106.67	102.86
1983	88.40	72.86	55.50	89.07	143.77	96.97	121.21	109.09
1984	85.83	63.44	47.57	89.07	164.58	80.00	106.67	100.00
1985	95.20	79.15	41.11	89.07	177.50	81.27	121.90	114.29
1986	70.24	64.77	61.67	89.07	176.63	na	na	na

[a]Producer price of selected crops relative to maize producer price in 1975 serves as base.
Sources: For Zambian prices, Jansen (1986); for Zimbabwean prices, Morris (1987); for Malawian prices, Lele (1988); for Tanzanian prices, Marketing Development Bureau (1986).

- o No attempt has been made to determine the risk premium necessary to induce traders to participate in illegal cross-border trade. This premium can be quite high if borders are heavily policed or large bribes must be paid to officials to facilitate movement of goods. The risk premium may be even higher if informal trade in commodities also involves illegal trade in currencies to facilitate payment. Because currency convertibility is not an issue in parallel in-country trade, the premium for engaging in illegal cross-border trade may be higher than the premium necessary to induce traders to participate in illegal intra-provincial trade.
- o Transportation costs may be much higher than the figures indicate and availability at any price may be a serious constraint for private traders in a number of SADCC countries where trucking fleets have seriously deteriorated due to spare parts shortages.

Consequently, the analysis is admittedly incomplete. In subsequent research, longer time-series data will be obtained on open-market prices, marketing costs, and parallel and official exchange rates to see how conditions have evolved over time. Historical levels of SADCC currency overvaluation will be calculated and an attempt will be made to assess the relative contributions of overvalued exchange rates, marketing costs, and agricultural subsidies to trading incentives.

PRELIMINARY CONCLUSIONS

While evidence exists that there is a basis for intra-SADCC trade in staple food commodities, there are significant policy-related constraints which are impeding the expansion of official trade. Among the most difficult constraints to overcome are overvalued exchange rates which have the potential to greatly impede intraregional trade if SADCC currencies are greatly overvalued with respect to one another. The structure of current food and agricultural pricing policy is another major barrier to increased official trade. The widespread presence of consumer subsidies and pan-seasonal and pan-territorial prices prevent both the private sector and parastatal bodies from engaging in profit-generating trade. Under the present array of price-related policies, it is hard to see how continued government-to-government trade (much of which is underwritten by food aid donors) can lead to greater SADCC food self-reliance. Such trade is not sustainable if source country governments consistently lose money in the form of export subsidies and importing country governments lose money through consumer subsidies.

However, it must be recognized that SADCC governments often have very compelling reasons for maintaining overvalued exchange rates and intervening extensively in food and agricultural markets. Policymakers often view food self-sufficiency, price stability, affordable food for urban wage earners, and maintenance of farm sector income and employment as far more important objectives than the promotion of allocative efficiency through "getting prices right." If, however, the objective of increasing food security-related intraregional trade is important to SADCC governments, expansion of official trade in commodities which are important to food security can not occur on any meaningfully sustainable scale if

governments do not first deal with these much larger issues of macroeconomic and agricultural policy reform.

Although price barriers have the potential to significantly impede increased intra-SADCC trade, "getting prices right" alone will not automatically lead to its expansion. A number of nonprice barriers which result in high transactions costs may also inhibit trade. Among the most serious of these barriers is shortage of foreign exchange and the operation of foreign exchange rationing systems in a number of SADCC countries. Even if the price is "right" for some agricultural commodity or input, government may prohibit its importation in the quantities and at the time desired because other goods are believed to be of higher priority.

This paper provides preliminary evidence that the incentives for engaging in informal intraregional trade may be far greater than for official trade. Informal trading networks may have the potential to serve remote provincial markets more effectively than official networks, thus improving the food security of those populations. However, at present, we know little about how parallel markets operate in SADCC countries. This holds for domestic as well as cross-border markets. Therefore, it is hard to generate any solid conclusions about the relative efficacy of alternative trading networks or which specific policies need encouragement.

As previously mentioned, only two SADCC governments collect open-market price data. However, numerous studies point out that parallel market activity is widespread in SADCC countries, particularly in rural areas not well served by official markets (Renkow *et al.*, 1983; Child, Muir, and Blackie, 1984; Malambo, 1987). For agricultural policy analysis to be more reliable at the national and regional levels, such data needs to be collected by more SADCC governments. Collection of open-market price data for staple food commodities could be an appropriate activity for the SADCC Regional Early Warning System to promote. Collection and timely analysis of open-market price data can also provide useful information to Early Warning System personnel on the potential vulnerability of populations at risk from drought (Borton and Shoham, 1985).

In addition, more work needs to be done on the structure, conduct, and performance of parallel trading networks. The employment effects of these markets may be important contributors to food security. In addition, if the risk premiums involved in trading are found to be quite high, official encouragement of this trade, or at least acceptance, could lead to a reduction of these premiums, resulting in lower food prices to consumers.

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TRADER PERCEPTIONS OF CONSTRAINTS TO EXPANDING AGRICULTURAL INPUT TRADE AMONG SELECTED SADCC COUNTRIES: PRELIMINARY RESULTS

Joseph Rusike[1]

INTRODUCTION

The Southern African Development Coordination Conference (SADCC) places high priority on intraregional agricultural trade as a means to further national and regional food security. In the 1980 *Lusaka Declaration,* SADCC's founding fathers explicitly identified increasing intraregional trade as one means to reduce external dependence and accelerate economic development in member states (SADCC, 1980). In 1986 SADCC added trade to its programme of action.

Potential impact of increased trade

SADCC countries have a combined market size of 70 million people with a GNP exceeding US$23 billion at 1985 market prices (Elliot Berg Associates, 1987; Taha, 1987). First, such a large market size has a potential to stimulate and support the development of agro-based industries at lower cost, compared to what is attainable if each country remains largely producers for their own markets.

Second, access to an integrated regional market would allow firms to achieve economies of scale in the production, processing, transportation, and distribution of commodities through increased throughput. Also, increased competition in agro-industries may lead to greater efficiency--thereby reducing unit costs of production, distribution margins, and prices to consumers. Moreover, a larger market size can provide greater income-earning opportunities which, if targeted at poor households, will help improve food security.

Third, the national availability of agricultural inputs (seed, fertilisers, agro-chemicals, and agricultural machinery) and staple food fluctuates more at national than regional levels, due to drought and economic factors.[2] Expanded intra-SADCC trade should mitigate these cyclical fluctuations and improve food security through more regular agricultural input supplies.

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[2] See Koester (1986) for a discussion of the production variability of cereals in the region.

Current trade status

Intra-SADCC agricultural trade is poorly developed. Only 5% of SADCC's total trade is intraregional trade (Chr. Michelsen Institute, 1986). Although many observers believe there is potential to expand intra-SADCC agricultural trade, several institutional, price, and nonprice barriers are limiting factors (Koester, 1986).

In the longrun, expanding domestic production in line with a nation's comparative advantage will contribute to improving national and regional food security. This will require the commercialisation of agriculture, particularly among smallholder farmers. As farmers move into commercial production, they will require more off-farm inputs, including certified seeds, fertilisers, agro-chemicals, agricultural machinery and spares, fuel and oil, and packaging materials. Yet, at present, SADCC economies largely import these inputs (or the raw materials to manufacture them) and pay for them in hard currencies. This places a severe strain on SADCC economies which are experiencing heavy debt problems and foreign exchange shortages (*Southern African Economist,* 1988). Thus, foreign exchange shortages, coupled with tight rationing of the limited foreign exchange, are constraining the timely delivery of imported agricultural inputs to farmers in adequate amounts and at reasonable prices.

This paper posits that increased intra-SADCC agricultural trade and cooperation in the production, and distribution of agricultural inputs would save foreign exchange, relax input supply bottlenecks, and lower farm delivery costs.. The net effect of these measures would facilitate increased production and contribute to improved household and regional food security.

RESEARCH APPROACH

Objectives

This paper explores the following three critical questions related to expanding agricultural trade among selected SADCC countries:

- What is the current agricultural trade between selected SADCC countries?
- What are the barriers to increasing intra-SADCC agricultural trade?
- What measures can SADCC governments take to more effectively reduce the barriers, and boost mutually beneficial intraregional agricultural trade?

Data sources

The study draws on primary data obtained from mailed questionnaires and interviews with 85 agricultural commodity import and export firms and parastatals in Botswana, Zambia, and Zimbabwe[3]. The questionnaire elicited traders' perceptions on the potential for and constraints to increasing intra-SADCC agricultural trade. The trader questionnaire and interviews were supplemented with follow-up interviews

[3]Because of budgetary and time constraints, it was only possible to undertake the survey in three countries. Botswana, Zambia, and Zimbabwe were selected because it was felt that these countries are representative of the diversity in the SADCC region.

with officials in the ministries of agriculture, trade, commèrce and industry, finance and economic planning, donor agencies, banks, credit insurance agencies, trade associations, and other key informants.

Description of sample firms

The sample was drawn from each country's importer and exporter directories. To obtain diversity, the sample was selected with the help of officials in the ministries of agriculture, trade, commerce and industry, trade associations, and key informants. The survey included firms involved in formulating, assembling, manufacturing, food handling and processing, brokering, financing, stocking, and distributing farm inputs and products traded within the SADCC region and between the SADCC region and the rest of the world.

Ninety-one percent of the sample firms traded more than one product. The most common agricultural and agro-based commodities handled were seed, fertilisers, agro-chemicals, agricultural tools, implements and machinery, grains and pulses. Others were horticultural produce, dairy products, and processed food. Most firms reported the size of operations, relative to other companies in their lines of businesses, as medium to large. More than 60% of the firms had been operating and importing for more than ten years, but have been exporting for fewer than five years (Tables 1, 2 and 3).

Respondents consistently reported similar opportunities for and constraints to expanding trade. Moreover, in each country we found after completing about ten interviews, additional respondents provided little new information. This indicates that traders faced similar marketing opportunities and problems. Thus, although not randomly selected, the sample generated surprisingly consistent responses. The responses were cross-checked during interviews with officials in the various organisations cited above. These discussions generally supported traders' anecdotal evidence. Some traders supplied documents supporting their opinions.

EXPANDING INTRA-SADCC AGRICULTURAL TRADE: OPINIONS FROM TRADERS

Current SADCC agricultural trade

A country-by-country review of intra-SADCC trade during the years 1982 to 1984 indicated that exports of agro-based commodities were erratic from year-to-year, and were dominated by a few commodities in each country (Chr. Michelsen Institute, 1986). Discussions with sample traders revealed that most intra-SADCC agricultural transactions are *ad hoc* rather than regular, suggesting that many markets are opportunity markets rather than flow markets.

Views about potential for expanding intra-SADCC trade

Traders and parastatal managers were asked to identify agricultural commodities and inputs which they believe had a significant potential for expanded trade between SADCC countries within the next ten years.

Table 1. Distribution of sample firms by years of operation.

Years of operation	Zimbabwe	Zambia	Total
		(Number of firms)	
< 10	13	7	20
11 - 20	4	7	11
21 - 30	9	7	16
> 30	14	3	17
Total	40	24	64

Table 2. Distribution of sample firms by years importing.

Years importing	Zimbabwe	Zambia	Total
		(Number of firms)	
< 10	12	7	19
11 - 20	5	8	13
21 - 30	7	8	14
> 30	12	2	14
Total	36	24	60

Table 3. Distribution of sample firms by years exporting.

Years exporting	Zimbabwe	Zambia	Total
		(Number of firms)	
< 10	19	12	31
11 - 20	8	0	8
21 - 30	3	0	3
> 30	4	0	4
Total	34	12	46

Traders identified the following commodities on the basis of past and current trends: seed; agro-chemicals; fertiliser; agricultural tools, equipment and small machinery; packaging materials; fish; processed meat; maize and maize meal; kola nuts; edible oils; dairy products; fruit and vegetables; and malt and sugar (Table 4). It is useful to look briefly at the respondents perceived notions of trade potential and problems for some agricultural inputs.

Seed

Seed firms were optimistic about opportunities for expanding trade arising from differences across countries in the level of specialisation; sophistication of the seed industry; and differences in production, storage, and marketing capacity. Zimbabwe, Zambia and, to some extent, Malawi have fairly well-developed seed industries with a capacity to meet domestic requirements and export during normal years. In contrast, Angola, Mozambique, and Tanzania are unable to produce sufficient seed to meet their domestic requirements.

Although Zambia and Malawi are normally self-sufficient in seed requirements, they have imported maize seed from Zimbabwe during drought years. Zambian seed companies reported that they have exported mostly open-pollinated maize seed varieties to Mozambique and Angola, even during drought years. Zimbabwean firms attributed their success in developing a viable seedhouse to the country's research capacity, mastery of production techniques, irrigation, payment incentives to farmers, and skills in managing seed reserves. Seed producers in Botswana indicated they could supply drought-resistant cowpeas seed to the region.

Agricultural machinery, tools, and equipment

Traders indicated that SADCC countries are unlikely to establish efficient import-substitution agricultural input industries for large-scale machinery such as tractors, combine harvesters, specialised tillage, and threshing and harvesting equipment. Thus, they will continue to import these from outside the region. They believe there are limited opportunities to expand trade in locally-assembled tractors, harvesters, threshers, and in spare parts. On the other hand, they feel there is a potential to expand trade in locally-adapted small machinery and implements, including hand tools, ploughs, harrows, cultivators, sprayers, irrigation equipment, livestock scales and handling equipment, and grinding mills.

Traders believe that potential for trade in locally-adapted machinery arises from differences between SADCC countries in engineering specialisation and skills. In the SADCC region, Zimbabwe has the greatest engineering capacity and a well-developed steel industry. Respondents argued that access to a regional market would provide a greater incentive for local agricultural machinery industries to adapt small agricultural machinery and equipment to local conditions.

Table 4. Agricultural commodities and inputs that interviewed firms and parastatals identified as having significant potential to expand trade between SADCC countries within the next ten years.

Commodity	Importer	Exporter
Cattle genetic material (semen and embryos)	Rest of SADCC	Zimbabwe
Seed (maize, sorghum, sunflower, soyabean, barley, wheat, vegetable)	Angola, Botswana, Malawi, Mozambique, Swaziland, Zambia,	Botswana, Malawi, Zambia, Zimbabwe
Tropical fruit seedlings	Botswana	Zimbabwe
Agro-chemicals (insecticides, fungicides, herbicides)	Malawi, Zambia	Zimbabwe, Swaziland
Animal health and livestock remedies (dips, vaccines, antibiotics)	Botswana, Malawi, Zambia, Zimbabwe	Botswana, Zimbabwe
Fertiliser and fertiliser raw materials	Zambia, Malawi	Zimbabwe, Zambia
Agricultural tools and implements	Botswana, Lesotho, Mozambique, Swaziland, Zimbabwe, Tanzania	Zimbabwe, Zambia, Swaziland
Agricultural equipment and machinery	Malawi, Mozambique	Zimbabwe
Livestock scales and handling equipment	Malawi, Zambia	Zimbabwe
Agricultural tractor spares	Malawi, Zambia, Zimbabwe	Botswana, Zimbabwe
Locally assembled tractors	Zambia, Malawi	Botswana, Zimbabwe
Packaging materials	Malawi, Zambia	Swaziland, Zimbabwe
Fish and fish products	Botswana, Zambia, Zimbabwe	Malawi, Mozambique
Processed meat	Botswana	Zimbawe
Maize, maize meal and other products	Mozambique, Botswana	Zimbabwe
Pulses	Botswana, Mozambique	Malawi
Processed groundnuts	Botswana	Malawi, Zambia Zimbabwe
Kola nuts	Botswana	Mozambique
Edible oils	Botswana, Mozambique, Zambia	Zimbabwe
Milk and milk-related products	Mozambique, Zambia	Zimbabwe
Fruit and vegetables (fresh, dried, and canned)	Angola, Botswana, Zimbawe Zimbabwe	Botswana, Zambia,
Malt	Botswana, Mozambique, Zambia	Zimbabwe
Sugar	Botswana, Mozambique	Malawi, Zimbabwe

Agricultural chemicals and fertilisers

The manufacturing of agro-chemicals is a complex, sophisticated process, often requiring a multi-purpose plant with only one part of the world supplying several countries. Consequently, agro-chemical firms reported their belief that for most agro-chemicals, there are no opportunities to expand intra-SADCC trade through regional production. On the other hand, traders pointed out that blending is possible within the region, but it still requires high levels of sophistication. Moreover, as the value added by local formulation is small, its benefits are minimal. However, they believed there is potential to expand intra-SADCC trade in animal health and livestock remedies (*e.g.*, antibiotics, vaccines, bull rings, and weaner plates), many of which are presently produced within the region.

A few respondents perceived limited opportunities for expanding trade in herbicides, such as gramoxone and paraquat, and strategic pesticides to fight major pest and disease outbreaks by holding stocks in bond in one country, with trade distributing between countries. Zimbabwe has supplied formulated insecticides to regional markets, mostly Zambia and Malawi. Yet, traders face problems acquiring foreign exchange to import the preformulated chemicals and packaging materials.

Respondents believed that there was significant potential to expand trade in fertilizers. Traders argued that, compared to agro-chemicals, unit costs for manufacturing fertiliser are small. Since fertiliser is bulky and used in large quantities, it makes sense for countries to manufacture fertilizers locally, rather than import from outside the region. Also, fertilizer can be manufactured from some intermediates like air as a source of nitrogen. While Zimbabwe has supplied fertiliser to Zambia, high production costs make Zimbabwe uncompetitive in regional markets, compared to South African fertiliser firms which use more efficient technology. Respondents indicated that refurbishing existing fertiliser plants within SADCC to increase capacity utilization, and phasing out local subsidies on fertiliser manufacture would lead to greater trade.

Competitiveness of goods

Normally, price data could be used to evaluate the competitiveness of products produced in a country--relative to similar products produced in a neighbouring country. Yet, it is difficult to use price data to determine the potential for trading these commodities among SADCC countries for several reasons.

First, when questioned about the competitiveness of the identified commodities, many respondents reported that products originating within SADCC countries were more expensive, compared to the cost of landing similar commodities from non-SADCC sources. Consequently, many SADCC producers must sell some products at cost, or even at a loss, for their exports to be competitive in regional markets. However, producers unanimously reported that SADCC regional export markets were very attractive because firms make up for their losses through export incentives which are part of national export promotion programmes.[4] SADCC governments

[4] Of the three countries surveyed, only Botswana does not have an export promotion programmes.

with export promotion programmes pay firms export incentives in hard currency. Because export incentives are paid in hard currency and are provided outside the conventional recurrent import allocations, firms can use the hard currency to import inputs they are otherwise unable to obtain, due to foreign exchange shortages. Also, SADCC governments increase the recurrent import allocations of firms able to increase their export performance.

Second, some respondents reported that SADCC firms often compete for unprofitable export orders which they normally would avoid because these orders increase their throughput, which in turn lowers production costs.

Third, agricultural machinery firms pointed out that locally produced agricultural equipment is adapted to local conditions. Thus, although locally-produced equipment may be more expensive than overseas equipment, it is cheaper for farmers to maintain because it is more robust. In such cases, it is misleading to assess competitiveness by simply comparing the price of locally-produced equipment with imported equipment.

Fourth, agricultural input firms importing from within SADCC mentioned that less lead-time is required for goods originating within the region. As a result, firms turn over cash more quickly, which reduces financing costs and lowers marketing margins. When the foreign exchange allocating authorities do not release import allocations to firms sufficiently early to land inputs from off-shore sources before the beginning of the cropping season, it is quicker to purchase them from a neighbouring country. Also, firms in Zambia and Zimbabwe importing from within the SADCC region reported that transportation costs for some regional imports were lower than for off-shore imports.

Product similarity

Some respondents argued that there is very little potential for expanded intra-SADCC agricultural trade, given the similar agricultural production patterns, production structures, technologically weak industrial base, and traditional business links with South Africa, Europe, and the United States.

Most of the industrial world produces agricultural technology to meet the needs of their capital-intensive developed country clientele. Thus, a major potential for intraregional trade lies in identifying appropriate technologies, and developing economies of scale in the production of these goods. Trader responses showed that there are many locally-adapted labour-saving and product-saving devices with potential for economies of scale, and hence opportunities to expand intraregional trade. Examples of labour-saving technologies include hand tools, ploughs, harrows, and planters. Examples of product-saving technologies are dehullers and hammer mills with higher rates of recovery, improved crop-drying techniques, locally-adapted spraying equipment, and fumigants that reduce storage losses. In some cases, the technology itself is the commodity that is traded. Hence, the potential for expanded intra-SADCC trade does not rest simply on climatic, soil, and labour differences.

OBSTACLES TO INTRA-SADCC TRADE

Traders were asked to rank factors which they consider most important in reducing potential import and export volume of farm inputs and products marketed by their firms, followed by open-ended questions about the most important constraints.

Traders identified four main categories of constraints on expanding intra-SADCC agricultural trade:

- o high production costs and poor product quality relative to goods from non-SADCC sources;
- o lack of effective demand and limited capacity to supply to meet existing demand;
- o high transactions costs; and
- o policies and practices of SADCC governments--particularly complex administrative controls on foreign exchange, imports, exports, and prices (including exchange rates), and the large public sector involvement.

Lack of effective demand and limited capacity to supply

Traders argued that the major constraint on expanding intra-SADCC agricultural trade is a lack of effective demand; and the mirror issue, a limited capacity to supply products to meet existing demand at competitive prices. This problem manifests itself in two ways: purchasing power is limited at the household level; and at the national level, currencies are nonconvertible and foreign exchange is scarce.

Low purchasing power

Most respondents from private exporting firms reported a lack of effective demand as the most important impediment to their trade. Key informants and traders argued that a very large segment of the population of the region has little purchasing power because they are largely employed in subsistence production.

Many respondents suggested that export firms must invest heavily to develop markets through product research and development, establishing distribution networks, giving discounts and commissions, advertising, or granting credit and finance. However, because the markets are thin and expensive to enter firms may not earn adequate returns. Also, firms may face difficulties selling their products because of uncertainties such as adverse weather, foreign exchange shortages, and political factors.

A few businessmen reported that they could not incur losses while developing markets and some indicated that the prospective market is not worth the cost of serving it. In contrast, they indicated that it is more profitable to target non-SADCC markets, in part because of greater demand. Traders reported that donors finance more than 66% of all intraregional trade in grain, seed, fertiliser, agro-chemicals, agricultural implements, and milk products--indicating the lack of effective demand in SADCC agricultural markets.

Exporters in Zimbabwe and Botswana argued that SADCC firms need access to an integrated regional market to enable them to increase throughput, and thereby reduce unit costs of production. To some extent, the reduction of barriers to intraregional trade would overcome the low purchasing power constraint faced in

producing for national markets. Expanded effective demand would also increase the potential for specialisation and scale economies, and as a result, increase productivity and incomes. Thus, part of the solution to the major limitation to trade is expanded trade. However, some respondents in Zambia argued that because of differences in the levels of industrialisation between member states, expanding trade may lead to resource transfers from the less-industrialised to the more-industrialised member states, resulting in imbalances.

Lack of raw materials

Both export and import firms reported that shortages of raw materials, due to a lack of foreign exchange to import raw materials for producing exportable goods, are a major problem. They had to forego trade opportunities because of shortages of tin plate, aluminium, cellophane, or other packaging materials. Importing firms in Botswana consistently reported that SADCC firms cannot guarantee supplies because they lack foreign exchange, and turn down orders as a result.

While some raw materials can be sourced domestically, they are often more expensive and of inferior quality (*e.g.*, some companies reported that they obtain locally manufactured gears for twice the price of imported gears and the locally produced gears last half as long as the imported gears).

Shortage of modern technology

A final problem that affects firms ability to supply products at competitive prices is a shortage of cost-reducing technology. With the exception of Botswana, the demand for foreign exchange exceeds the supply made available by governments to import sufficient up-to-date machinery and spare parts to replace obsolete equipment, let alone expand the existing capital infrastructure. As a result, many firms reported that they were operating below full capacity.

High transactions costs

Traders elaborated numerous transactions costs that are constraining intra-SADCC agricultural trade, including obtaining market information, travel and follow-up costs, transport costs, insurance charges, and losses incurred due to delayed payment.[5] While a product may be competitively priced ex-factory, high transactions costs may increase the landed price to noncompetitive levels. Some transactions costs are directly imposed by government policy, others arise from different sources. This section discusses the latter.

Access to market information

Traders reported that a lack of market information on available goods, sources of supply, prices, and demand increased trading costs. Poor communications between SADCC countries (*e.g.*, mail, telephones, telex, and mass media) and difficulties in

[5] Transaction costs include all those direct and hidden costs a trader incurs when buying or selling a commodity.

intra-SADCC travel limit contact in the trading community. The availability of market information is perceived to be a severe barrier to determining the potential demand and supply of new products. It includes the following subissues (Table 5).

Domestic markets. Most firms indicated that obtaining market information on domestic demand was not a problem. Traders obtained information on commercial requirements for agricultural inputs through meetings with representatives of farmer organisations and officials in the ministries of agriculture, trade, and commerce. Some firms kept annual sales records for forecasting demand. Additional information sources were distributors and company-funded market research. Some respondents pointed out that due to foreign exchange shortages, market information was not a problem as they could sell whatever commodities they imported.

Importing from outside SADCC. Most importing firms reported few problems obtaining market information on non-SADCC supply sources. Firms gave three explanations for this. First, many firms specialised in buying and selling proprietary quality products and they were constantly in touch with their suppliers. Second, importing firms that represented multinationals or had franchise agreements and

Table 5. Sources of information about trading opportunities.

Information source	Very Important	Somewhat Important	Not Important
		(Percentages)	
Direct communications with potential buyers or sellers	93.7	6.3	0.0
Commodity brokers, chambers of commerce, branch offices, aid donors	52.9	23.5	23.5
Contacts in the international business community	50.0	32.3	17.7
Tenders for bid published in newspapers and/or the government gazette	38.1	23.8	38.1
Contacts in ministries or marketing boards	36.5	38.1	25.4
Communications with trade missions or embassies	35.5	45.2	19.4
Communications with competitors	21.7	35.0	43.3

distributorship ties with international companies had good access to information. Third, firms that had operated for a long time had developed knowledge, skills, and contacts overseas. However, buying from international sources can be a problem, particularly for newly-established firms since the product may be unknown in the local market and it is difficult to ensure that suppliers are selling high quality products.

Exporting to outside SADCC. Firms exporting agricultural produce to non-SADCC destinations reported receiving market information mostly from their agents and the International Trade Centre. One firm reported that delays sometimes occur and that timely information is not always available to enable it to decide in which overseas markets to sell and which markets to avoid.

Intra-SADCC trade. No formal mechanism exists for disseminating market information. Firms indicated that the main mechanism is word of mouth, and is likely to remain so for some time. Extensive state participation in agricultural input markets made it easier for traders to identify markets. Information is often obtained from trade attaches, trader services, and directories. Other reported sources were agencies, branches, sister operating companies, and donors; contacts in the international business community; tenders published in newspapers, government gazettes, and farmer publications; contacts in ministries and marketing boards; trade attaches; and talking to other companies and competitors (*i.e.*, industrial espionage) (Table 5). While, some traders reported that access to market information was a constraint, others argued that it was not.

Travel and follow-up costs

External travel and regular customer calls are necessary to carry out intraregional trade, since customers prefer buying from suppliers who visit regularly. In addition, firms must visit potential markets to inspect food-processing factories; and to supply services such as soil tests, irrigation designs, seed production, pest control, and warranty work. For example, Botswana offers many business opportunities to SADCC suppliers, but these are largely taken by South African businessmen who are able to freely travel into that country to service the market. While some importing firms in Botswana reported they had placed orders with exporters in Zambia, the Zambian traders did not follow-up with personal contacts to finalise the orders.

Some firms reported that they were unable to solidify market contacts, due to a shortage of foreign exchange for business travel within the SADCC region. Additional travel constraints include the lack of travel discounts on national airlines and a shortage of suitable accommodation. For example, the Zimbabwean Government allocates US$53 (Z$100.00) per day for business travel, irrespective of differences in accommodation expenses across countries. Moreover, business travel allocations do not take account of transport expenses and airport departure taxes (which have to be paid in hard currency).

High transport costs

More than 60% of the traders reported a shortage of reliable transport services (including refrigerated air transport) to send goods at economic rates to surrounding markets. Inland transport costs through some SADCC countries are extremely high. For example, one respondent reported transporting containerised cargo from the United Kingdom to Dar es Salaam at a cost of US$80/mt (March 1988), while the cost of transporting the cargo from Dar es Salaam to Lusaka was US$103/mt. While Durban to Lusaka transport costs are marginally higher, the lead-time to ship from Europe via Durban is only six weeks, compared to four months via Dar es Salaam. One respondent indicated that shipping through Beira (Mozambique) cost US$20/mt (December 1987) more than via Durban. Also, the commodities take two days less time to reach Durban, compared to Beira. Agricultural machinery exporting firms in Zimbabwe reported that it costs roughly twice as much to transport agricultural equipment from Zimbabwe to Tanzania compared to transporting agricultural equipment from Brazil or Norway. In addition to high costs, traders face considerable uncertainty since regional transport rates change frequently and it takes two weeks to obtain a quotation.

Additional transport problems identified by traders include quality of services, access to transport, shipping delays, high costs, and government restrictions are as follows:

Access. The main access problem is a shortage of trucks, locomotive power, and wagons to move commodities. The road transport problem is largely due to unavailability of spares, and the railway transport problem is due to shortages of rolling stock, spare parts, and tarpaulins to cover the goods. This situation has numerous impacts on trade.

Quality of services. The most important quality of service constraints cited were transit losses due to mishandling, theft, and pilferage. When asked to identify the biggest risks they face when importing and exporting, 70% of the respondents in Zambia reported reliance on a single port and transit damage, theft, and pilferage as serious problems. Some firms reported that they fly staff to Dar es Salaam to physically monitor the movement of goods at the port. Some respondents indicated that containerising the goods significantly reduces theft and pilferage losses. Difficulties are also encountered with inland transport, since a consignment may change trains several times before reaching its final destination. While a few firms in Zimbabwe reported that they had pilferage and losses on goods transported via Beira and Durban, these were not serious.

Shipping delays. The shortage of transport services results in late delivery of imports and delays in shipping exports, both on long hauls and when moving goods over a relatively short distance such as from Harare to Lusaka. A representative of an agricultural equipment firm in Zambia reported that it took six months to receive implements from a firm in Harare because transport was not available. Sometimes the delays occur at the ports when there is congestion, partly due to poor handling

facilities. Delayed delivery of imports increases the firms' financing costs since they must continue to pay interest on extended capital. Also, shipping delays result in deterioration of perishable exports, such as when airlines fail to leave on schedule, and the produce misses its connecting flights in Europe--resulting in the product being sold on the salvage market or thrown away. Horticultural exporters unanimously reported the lack of cargo space and reliable services as the main constraint to expanding exports.

Geographical isolation. While most SADCC countries are linked by roads, Angola is geographically isolated from regional markets. Thus, it is cheaper for Angola to obtain grain from Argentina than from other SADCC countries. Communication between Angola and other regional partners is made even more difficult because the ships which call at Beira in Mozambique do not call at Luanda in Angola. The only alternative is to airfreight, but this is expensive.

Government restrictions. The flow of trade is affected by national transport policies, including different priorities on moving commodities to and from ports. For example in Zimbabwe, steel and tobacco are granted highest priority for transhipment to Beira port in Mozambique. Maize, which is of lower priority, takes about twice as long as steel and tobacco to move to Beira. In some instances, political considerations restrict access to preferred routes. Several firms in Zambia reported that South African routes are better equipped to bring in large machinery and other commodities which require specialised off-loading facilities. However, it is becoming increasingly difficult to use South African ports. For example, the Zambian government issues import licences to firms prohibiting them from transporting goods through South Africa. Importing firms in Zambia also reported that a significant proportion of their agricultural imports are funded through donor aid which also prohibits companies from transhipping goods through South Africa.

Insurance problems

Some respondents reported that available export credit insurance is inadequate to cover commercial, political and war risks faced when cross-shipping goods, receiving payment, or undertaking long-term production contracts. A few firms indicated that export credit insurance will facilitate trade since all SADCC countries, except Botswana, have payment problems, and the risk of transit losses is still high. On the other hand, some traders argued that regional exporters have little need for export credit insurance because most SADCC governments require exporting firms to be paid in cash before delivery or arrange payments with confirmed irrevocable letters of credit. Also, much regional trade is donor funded and a significant proportion of the transactions are government-to-government. Yet, if the level of private commercial activity increases and the trade environment became freer, exporters would require export credit insurance to insure goods shipped without confirmed irrevocable letters of credit.

Payment problems

Fifty percent of the firms reported difficulties in financing intraregional trade and negotiating payments as important barriers to expanding agricultural trade. Four reasons given were: (1) restrictions on moving currencies between member states; (2) most member countries insist on being paid in hard currencies, even though only Botswana has adequate foreign exchange for settling transactions; (3) delays in payment due to foreign exchange shortages; (4) numerous "brief-case businessmen" operate in the region, making transactions more risky. The following specific payment problems were mentioned:

Payment methods. In the current milieu, the most frequent method of payment for intra-SADCC agricultural is a "confirmed irrevocable letter of credit" (Table 6). The second most frequently used payment method is a " irrevocable letter of credit". Some firms indicated that they prefer exporting on "letters of credit on sight", but governments forbid firms to despatch goods until the firms either receive the money or a "confirmed irrevocable letter of credit", often opened with a European bank--although these regulations do not apply to exports to South Africa or to industrialised countries. This is a barrier to trade when an importer has adequate domestic currency, but insufficient foreign exchange cover.[6] Even with "confirmed irrevocable letters of credit", banks sometimes delay paying exporters because no foreign exchange is available. Even when importers in some SADCC countries (*e.g.*, Zambia and Malawi) arrange to pay on confirmed irrevocable letters of credit, the Reserve Bank may overrule this when foreign exchange is in short supply.

Table 6. Methods of payment by traders.

Methods of payment	Imports from:		Exports to:	
	SADCC	World	SADCC	World
	(Percentage of trader responses)			
Confirmed irrevocable letter of credit	34.0	27.6	26.6	17.3
Irrevocable letter of credit	28.3	20.0	25.0	21.2
Letter of credit	18.9	14.3	14.1	15.4
Cash against documents	9.4	15.2	12.5	0.0
Cash-in-advance	0.0	2.9	10.9	19.2
Bank draft, telegraphic transfer	5.7	4.8	3.1	1.9
Cash on delivery	3.8	2.9	6.3	9.6
Open account	0.0	12.4	1.6	15.4

[6]This would not be a barrier if SADCC countries used national currencies to settle payments.

Credit period. Another critical payment procedures problem is the number of credit days a country gives importers to pay. SADCC countries tend to give fewer credit days to regional importers (*e.g.*, the Government of Zimbabwe gives 90 days but the South African Government gives 120 days, thereby giving better credit terms).

PTA. (Preferential Trade Agreement) Respondents mentioned several problems with the PTA. The PTA has attempted to overcome regional trade payment problems by establishing the PTA Clearing House. This mechanism enables a trader in Malawi--for example, importing goods on the PTA common list from Zimbabwe--to pay for the goods in Malawian kwacha. The Bank of Malawi purchases Zimbabwean dollars and pays the exporter. Every two months, member countries settle balances in hard currency. Because every transaction between countries can be offset by selling, the PTA clearing house facilitates intraregional trade by, in effect, reducing the net balance that member countries pay in convertible currencies. The PTA Clearing House, administered by the Zimbabwe Reserve Bank in Harare, has served to facilitate intraregional trade, but does not fully meet the demand. Approximately US$ 60 million in total (all PTA countries) transactions went through the Clearing House in 1987, which represents only a small proportion (0.01%) of total PTA trade (PTA Clearing House, 1987). Yet, this is a step in the right direction.

Many of the potential benefits of the PTA Clearing House are not achieved for several reasons:

- Since member countries have to ultimately settle their deficit balances in hard currency, they must allocate scarce foreign exchange for this purpose. This has led member countries to restrict imports if the same item is produced domestically--even if it is cheaper to import from neighbouring countries.
- Member states are reluctant to sell hard currency commodities through the PTA. Traders reported that some commodities they would like to import from other PTA countries are often not on the common list.
- Some national-level mechanisms designed to stimulate exports have an adverse effect on intraregional trade. For example, Tanzania, Zambia, and Zimbabwe give export incentives which enable exporters to retain some of their foreign exchange earnings, and to use them to import raw materials. This has led firms to invoice PTA exchanges in hard currency to obtain retentions, although firms can still retain foreign earnings on PTA transactions when they invoice in domestic currencies.
- The PTA rules of origin discriminate against multinationals, making it difficult for them to participate in regional trade.

Barter and countertrade. Barter and countertrade deals can serve to expand trade by addressing problems of unexchangeability of national currencies. The *Open General Import License* between Botswana and Zimbabwe is similar to a barter arrangement, except that the countries barter for money instead of goods. Survey data suggest barter could be expanded if there was an increase in commodities traded and an expansion in participating partners. Yet, since barter and countertrade

deals are an expensive way to conduct business, they are only desirable as a last resort. Most barter and countertrade transactions are large. Since large-scale buyers tend to overlook small-scale suppliers, small-scale firms are at a disadvantage in competing for these opportunities.

Policies and practices of SADCC governments

Traders believe several policies and practices of SADCC governments increase transactions costs, thereby reducing the potential for mutually beneficial trade.

Currently, most SADCC countries face deteriorating export earnings, rising external debt, declining foreign investment, and stagnating real GDP growth. Consequently, they find it necessary to ration foreign exchange and impose import quotas to achieve a balance of payments equilibrium, maximise the productive utilisation of scarce foreign exchange, effect import substitution, generate employment, and arrest capital flight.

Many respondents interviewed in this study acknowledged the need to control imports. However, they believe that government imposes too many restrictions, and importing/exporting procedures substantially increase transactions costs. Moreover, some of the controls protect domestic industries from outside competition. Traders argued that controls hinder technology transfer, competition, foreign investment, and ultimately mutually beneficial intra-SADCC agricultural trade. An overview of regulations in effect in Zimbabwe and Zambia and respondents observations on these follows.

Import controls

Zimbabwe. The import control system in Zimbabwe involves 22 different government bodies (*The Herald*, 13 October, 1988). The Ministry of Trade and Commerce allocates foreign exchange every six months to the public sector (army, airforce, statutory bodies, and parastatals) and to the commercial sector, while the Ministry of Industry and Technology allocates foreign exchange to the manufacturing sector. Also, the Ministry of Lands, Agriculture, and Rural Resettlement and the Ministry of Mines manage the allocation of foreign exchange to the agricultural and mining sectors, respectively. The Confederation of Zimbabwe Industries (CZI) and Zimbabwe National Chamber of Commerce (ZNCC) have trading divisions (the Industrial Import Control and the Commercial Import Control) which administer the recurrent (basic) import allocations to individual firms by tariff code for non-PTA trade. The Ministry of Trade and Commerce directly administers allocations for PTA trade.

Thirty percent of the Zimbabwean respondents argued that the main advantages of the current foreign exchange system is that it channels limited foreign exchange to the most needed imported commodities such as fertiliser and cattle dip chemicals in adequate amounts to meet domestic requirements. Also, the procedures serve to standardise models/brands imported, thereby reducing spare parts and back-up service problems. In general, more established firms were more satisfied with the system than were newer firms.

On the other hand, traders pointed out that the allocation system has several costs.

- o Firms must follow complex, slow, and time-consuming procedures in applying for import allocations. Many firms reported spending much of their management time contacting government departments to sort out problems. Several firms indicated that it now takes twice as long to obtain import allocations as it did five years ago. Even PTA allocations take a minimum of three months for processing. As a result of the delays, traders lose business opportunities.
- o A firm's import allocation will fluctuate, depending on the availability of foreign exchange. Consequently, the uncertainty about how much foreign exchange they will receive makes planning difficult. For example, if foreign currency allocated to a firm is cut during a certain quota period, the firm will have to cancel orders. If the firm's import allocation is increased during the next quota period, the firm has to resubmit its orders to suppliers. In some instances, by the time a firm receives its order, farmers may no longer need the input, and the firm must store the input until the following season.
- o It is difficult for new firms to enter the import business. Firms not registered as "traditional" importers face difficulties acquiring recurrent import allocations, and donor funds. This has particularly affected emergent businesses.[7] Due to initial irregularities involving emergent businesses--arising from a lack of understanding of markets, skills in purchasing, and negotiating overseas contacts--government now requires that firms must have two years of business experience to qualify for an import allocation. In addition, government now requires importing firms to produce balance sheets and employment records, a measure designed to eliminate briefcase businessmen.
- o The allocation system tends to inflate prices of imported goods via several avenues. In recent years, firms with established allocations have had their allocations cut to provide entry to emergent businesses. A few of these firms, who rely on imports to maintain profits, have increased prices to maintain profits. Also, small allocations reduce inventories firms are able to hold. Therefore to respond to customers' needs, they must sometime resort to using expensive air transport to procure supplies quickly.
- o Many people are involved in administering the allocation system. Some are inexperienced and have minimal understanding of the importance of certain inputs in agricultural production. Thus, when allocating authorities have had to cut import allocations, they have made across-the-board reductions. For example, authorities have cut import allocations of firms importing packing materials, resulting in shortages of materials needed to package and can exportable commodities.

Currently, traders can obtain supplemental foreign exchange from the various export revolving funds which exist for the manufacturing, mining, and agricultural

[7]Government's attempt to redress the imbalances inherited at independence (1980) by giving preferential foreign exchange to emergent (mostly black) businessmen.

sectors. A few firms indicated that they would have closed down if they had not had access to foreign exchange through the Export Promotion Programme (EPP). Some firms reported that their basic import allocations only met about 25% of their total foreign exchange requirements, with the rest coming from aid and barter deals. Thus, the EPP, aid, and barter are important mechanisms that allow firms to stay in business.

Zambia. In Zambia, the Foreign Exchange Management Committee (FEMAC) allocates foreign exchange every two weeks to the public sector, commercial, and manufacturing firms for both PTA and non-PTA business. FEMAC allocates foreign exchange depending on availability, grants, and loans. To reduce possible corruption, FEMAC members are anonymous, drawn from the key economic ministries, including finance, agriculture, commerce and industry, the cabinet, customs, and the Bank of Zambia. Importing firms apply to the Bank of Zambia for foreign exchange, through their commercial banks. Applicants are required to submit the kwacha cover, equivalent to the amount of foreign exchange requested. The Reserve Bank submits these applications to the FEMAC secretariat. Compared to Zimbabwe, the Zambian foreign exchange allocating system is more open, allowing individual farmers and cooperatives to apply to FEMAC for foreign exchange, for example, to directly purchase equipment. In some cases, retail firms encourage farmers to directly apply to FEMAC for foreign exchange.

While Zambian respondents indicated that the government gives high priority to agriculture when allocating foreign exchange, its support in coordinating and implementing the policy appears inadequate. For example, there is no system to regularly bring together agricultural input importers, farmer representatives, and officials in the ministries of agriculture and finance regularly to forecast requirements and prioritise imports.

As in Zimbabwe, foreign exchange control in Zambia has several hidden costs.

- The system involves a lot of paper work: tax certificates, import licences, certificates of incorporation, memorandum and articles of association, certificate of incorporation, trading licence, manufacturing licence, excise duty and sales tax clearance certificates, income tax clearance certificates, etc. To minimise capital flight through transfer pricing, FEMAC requires large companies without franchise agreements with suppliers to submit *proforma* invoices from three different suppliers when applying for foreign exchange. Traders reported delays receiving these from suppliers. FEMAC will reject foreign exchange applications to import locally-produced goods. For example, an agricultural machinery dealer in Zambia applied for foreign currency to import hammer mills from Zimbabwe, but FEMAC rejected the application because hammer mills are produced in Zambia.
- The seasonal needs of agriculture are not always met in a timely manner. For example, firms apply for foreign exchange to import agro-chemicals much before the beginning of the rainy season than would seem necessary. This is because if FEMAC rejects their applications, they need sufficient lead-time to apply again. This increases their operating costs (*i.e.,* interest charges) since

importers must deposit kwacha cover when submitting their applications. Also, firms reported delays by the Reserve Bank in transferring import allocations to commercial banks. Consequently, commercial banks cannot confirm importers' letters of credit since the Bank of Zambia must deposit the invoiced amount in a U.S. bank before a confirmed letter of credit can be issued. Further delays occur in processing letters of credit and communicating with suppliers. In the meantime, suppliers may increase prices.

- o As importing firms do not know how much foreign exchange will be available, they cannot plan very far ahead. Respondents suggested that FEMAC favours parastatals and Zambian-owned companies. They discriminate against foreign-owned multinational firms, even if the firms are in priority sectors such as agriculture. Firms reported that they often have to obtain support from parastatal customers or the Commercial Farmers Bureau to convince FEMAC authorities that their application are bona fide.
- o Respondents reported that since considerable donor aid has recently been targeted for importing agricultural inputs, authorities have allocated less foreign exchange to agriculture.

Import licensing

Throughout SADCC, governments use import licenses to manage imports. For example, after having obtained import allocations, Zimbabwean firms must apply for import licences to actually bring in imports. Import licensing provides a check that firms use their allocations to only import commodities for which they received an allocation, and up to the allocated amount. The problem is that the Ministry of Trade and Commerce often delays issuing import licences. Importers in Zimbabwe reported that it presently takes two weeks for firms to obtain import licenses.

Procedures for obtaining import licences can be particularly frustrating when firms are seeking clearance on no currency involved licences (NCI). A representative of an agricultural machinery firm in Zimbabwe reported that even when customers prove to the Reserve Bank that they are using external foreign exchange, they must still obtain an import licence from the Ministry of Trade and Commerce.

Export controls

Because of a lack of creditworthiness in the SADCC region, exporters spend considerable time preparing documents. Seventy percent of the surveyed firms exporting to SADCC markets reported spending a high proportion of their time completing exchange control forms (indicating that payment has been or will be repatriated), bills of entry, export licences, consignment notes, duty drawback applications, packing sheets, declaration of origin forms, commercial invoices, shipping instructions, export incentive applications, and applications for export permits from the ministries of agriculture. A few firms pointed out that the required information could be supplied with less paperwork. Also, if there is a mistake in the paper work, the authorities will not clear the goods for export.

Many firms indicated that government export regulations, especially the requirement that exporters must receive payment through confirmed irrevocable

letters of credit before despatching goods to regional markets, increases the administrative problems exporters face.

Furthermore, obtaining authorisation to export controlled export commodities from ministries of trade, commerce, industry, and agriculture is a slow, time-consuming process. Generally, SADCC governments forbid firms to export controlled export goods until firms prove that they have more than adequate stock to meet domestic requirements. Delays in obtaining government clearance can result in export order losses. Agro-chemical importing firms in Zambia felt that Zimbabwe is the most difficult country to buy agro-chemicals from because of cumbersome government regulations. Furthermore, regulations often change, making it difficult for firms to follow the current regulations.

Border customs procedures

Firms reported that they face widely varying and cumbersome border customs formalities when cross-shipping goods. Usually traded goods cross several borders before reaching their destinations, requiring truck drivers to carry numerous papers for clearing at each border. In addition, SADCC countries continue to require transporters to pay road tolls, tariffs, and duty charges (often in hard currency) before allowing them to proceed. For example, to transport a truck load of goods from Malawi into Tanzania, the shipper must pay a road fee of US$1,700 to transit the country (Commerce, 1987).

Domestic price controls and differing pricing policies

Another obstacle to intra-SADCC trade is the wide variation in national pricing policies. Most SADCC governments control the prices of agricultural inputs and administratively determine the foreign exchange rate.[8]

Administrated prices. Observers have suggested that the system of controlling prices through mark-ups encourages agricultural input firms to be inefficient since firms with high total factory or landed costs make greater profit than lower cost producers (Pakkiri, Stoneman, and Davies, 1982). While several agricultural input firms acknowledged the validity of this argument, they argued that since suppliers import and sell similar inputs, competition serves to keep prices down. Another source of inefficiency resulting from inadequate import allocations is that firms are unable to hold adequate inventories; requiring them to import inputs as demand arises, often using emergency methods. In addition, established agricultural input firms argued that they do not just import and sell, but also provide numerous backup services, including supplying spare parts, repair and maintenance, research and development, extension, and credit. The mark-ups should assure enough profit to enable firms to

[8] Even the Botswana Government controls wholesale and retail prices by setting maximum mark-ups firms can charge, ranging from 7.5% on essential commodities to 30% for nonessentials.

expand and increase services. Yet, most firms indicated that they were operating at a loss on government-controlled mark-ups, and as a result, they were being forced to reduce services.

If administered pricing policies differ substantially between neighbouring countries, incentives are provided which may result in unintended trade. For example, maize is smuggled from Zambia to Zaire and Namibia because traders can obtain better prices in these markets (*Times of Zambia*, 1987). Also, the Zambian Government's fertiliser subsidy policy results in fertiliser being smuggled to Malawi.

Currency overvaluation. Overvalued currencies which affects the price of goods, also affects trade flows. Although most SADCC currencies are overvalued, the degree of overvaluation differs. Countries with currencies which are relatively more overvalued price themselves out of regional markets like Tanzania and Zambia. (Koester, 1986).

Centralised purchasing

The dominance of a few parastatals in regional markets, often purchasing agricultural inputs in bulk, exacerbates problems of limited supply capacity. Few regional suppliers have sufficient capacity to produce for a single large-scale buyer. In a similar vein, agricultural machinery firms in Zimbabwe reported that aid schemes strain firms' cash flow because these transactions involve purchasing a large volume of inputs at one time.

International competition

Many respondents argued that SADCC firms often cannot compete in regional markets because they are high costs producers. For example, Malawi and Zambia can import agricultural implements from Argentina, Brazil, or Kenya at lower prices than from Zimbabwe. Zimbabwean agricultural machinery firms cannot compete because the prices of domestic inputs--steel and labour--are high. This is partly because some raw materials must be imported and the prices of raw materials have increased because the Zimbabwe dollar has depreciated. Also, imported raw materials are subject to various surcharges. Firms can obtain duty drawbacks on imported inputs and export incentives on inputs such as steel after they export products, but these are often cumbersome to obtain. Also, firms still have to outlay the money for paying duty or purchasing steel until an export product is manufactured, sold, and payment is received.

Some firms argued that the inefficiency in SADCC manufacturing industries is partly due to government controls on labour. One agricultural machinery company surveyed in Zimbabwe demonstrated this point by providing computer printout records of the performance of its workers, showing that labour efficiency dropped from 80% to 67%, following the introduction of new labour laws. The reported reason for this decline in productivity was that management now has less control over its labour force.

RECOMMENDATIONS TO FACILITATE SADCC TRADE

The survey identified several barriers to increasing intraregional agricultural trade. Government policies and practices represent especially important opportunity to expand trade because it is within the power of governments to change them. But this is not to imply that these changes will be easy to implement. Yet, the process of incrementally expanding intra-SADCC agricultural trade will increase opportunities for specialisation and scale economies, leading to increased productivity, incomes, and effective demand--and more trade. Thus, increasing intra-SADCC agricultural trade can be viewed as a partial solution to the more difficult problems of high transport costs, lack of effective demand, and limited capacity to supply markets.

Policy options to expand trade

To expand trade, traders believe that governments have to harmonise existing policies and practices, by relaxing the numerous restrictions and removing much of the red tape on imports, exports, and financing intra-SADCC trade; tariffs; travel; and communications. In addition, traders suggest that SADCC governments must give greater incentives to exporters and introduce export credit insurance schemes.

Bilateral reciprocal trade agreements

Traders suggest that one way of achieving multilaterally-balanced intraregional trade is by negotiating bilateral reciprocal trade agreements as an interim measure. Often, only government officials are involved in trade negotiations and traders--with trading knowledge, authority, and funds--are excluded. As a result, little progress is made. Thus, governments must involve the business community in all deliberations and counteractions required to design reciprocal trade agreements.

The history of trade between Botswana and Zimbabwe shows how much can be done to expand trade, under the right environment and policies. In 1986, the total volume of trade between the two countries was Z$73-78 million (*Southern African Economist*, 1988). This is about one-half the total value of all PTA trade going through the PTA clearing house (PTA Clearing House, 1987).[9] Furthermore, the trade is equally balanced with Zimbabwean exports to Botswana, even though Botswana is a small economy. The main mechanism facilitating trade between these countries is the *Open General Import Licence* which allows traders to buy and sell without import licences, and at reduced duty. Botswana imports mostly sugar from Zimbabwe. Zimbabwe imports mostly copper and nickel matte. Traders suggest that opportunities should be explored to use this mechanism to diversify the current narrowly-based trade patterns.

Since most SADCC countries have foreign exchange problems, the limited available foreign exchange must be used efficiently. Because SADCC countries are

[9] In 1986, approximately 60 million UAPTA (Z$141 million) trade was financed through the clearing house.

expensive sources of many imports, expanding intra-SADCC trade will not benefit member states if they have to settle transactions in hard currency. Consequently, respondents believe that mechanisms must be established to promote multilaterally balanced intraregional trade, involving trade in both goods and services. Furthermore, expanding balanced intraregional trade would make more foreign exchange available to member countries enabling them to increase trade in commodities not available within the region.

Simplify administrative procedures

Traders recommend that the first step governments should take to promote intra-SADCC agricultural trade is to simplify import and export procedures by reducing the number of forms firms complete and the number of government agencies that must grant clearance. Also, customs formalities between SADCC member states need to be streamlined. Traders argue that introducing open general import licences within the region would significantly facilitate intra-SADCC trade.

Strengthen local currency-based mechanisms

While potential intra-SADCC trade is restrained by foreign exchange shortages, respondents assert that SADCC governments could do much to increase trade by scrapping quotations and payments in foreign exchange, and working towards using national currencies. Most respondents recommended that SADCC governments need to strengthen the PTA system by providing adequate funding and sending all PTA trade through the Clearing House. Some traders point out that governments, in the long term, need to legalise financing intraregional trade with national currencies obtained at market prices (*i.e.*, national currencies should be freely available in shops within SADCC states). A few respondents recommend using barter and countertrade to ease foreign exchange shortages.

Better terms of credit

Respondents believe that SADCC governments need to remove controls on exporting firms supplying credit facilities to importers. Also, they suggest that SADCC governments need to give each other better credit terms (*i.e.*, low interest and deferred payments).

Reduce tariffs on SADCC commodities

Respondents recommend that governments create incentives for firms to purchase within SADCC by reducing tariffs on commodities available within the region, but which some countries import from external sources; and by increasing tariffs on imports from non-SADCC sources. To make SADCC products more competitive, traders also suggest that SADCC governments need to remove duty and taxes on imported raw materials used for producing exportable goods. However, a few indicated that this may have an adverse effect on government budgets.

Promote intraregional contacts

Traders surveyed indicate that governments must make it easier for SADCC businessmen to travel within the region by allocating more foreign exchange to the business sector; making reciprocal hotel arrangements for traders to pay in local currency, and at reduced rates; removing visa restrictions within SADCC; and including airport departure taxes on the PTA list or allowing businessmen to pay airport tax in national currencies.

Traders suggest that SADCC countries strengthen communication between member states (*i.e.*, telephones, mail, telexes, and mass media). For example, to enable SADCC firms to advertise in other member states, governments should lift restrictions on firms transferring money to fund advertising. Also, that SADCC governments need to develop infrastructure to facilitate the exchange of market information between firms. This could be achieved by encouraging firms to establish a SADCC Chamber of Commerce and SADCC trade journals. Traders also indicate that governments could ease access to market information by promoting an annual SADCC trade fair that moves throughout SADCC, spending about a week in each country. Although the existing PTA trade fair is quite useful, traders reported there was inadequate time to inspect displayed commodities and negotiate transactions.

Give greater export incentives

Exporting firms in Zimbabwe suggest that the government give greater incentives to firms exporting to regional markets by allowing a percentage of export earnings to directly accrue to exporters in foreign exchange, after deducting the present export incentive. Exporting firms in Botswana argue that the government needs to introduce an export incentive scheme because, although Botswana currently has adequate foreign exchange, in the future it may face shortages.

Introduce export credit insurance

Respondents believe that SADCC governments need to investigate the potential benefits of introducing export credit insurance schemes, since most SADCC countries have payment problems. For example, an exporting firm in Botswana indicated that it would substantially increase its exports if the Botswana Government guarantees, for example, 90% of the value of exports at affordable rates in the event of an importer defaults.

Perceived obstacles to government actions to expand trade

According to firms interviewed, there are four principal obstacles facing SADCC governments in promoting intraregional agricultural input trade.

- Each country aspires to be self-sufficient. For example, most SADCC member states want to have their own agricultural machinery, fertiliser, seed, agro-chemical, and food-processing industries.
- All SADCC governments are trying to put their economic houses in order, and appear to be more concerned with national rather than regional development. Expanding domestic production is seen as a way to increase employment and stimulate development.

- o Traders suggest that differences in the levels of industrialisation between member states will result in imbalances if intra-SADCC trade were liberalised, leading to resource transfers from the less-industrialised to the more-industrialised member states. Respondents consistently assert that Zimbabwe is likely to benefit most, compared to its regional trade partners. Yet, respondents believe that the Zimbabwean Government is reluctant to reciprocate (*i.e.*, wants to only export and not import from SADCC countries).
- o A few traders argue that expanding intra-SADCC agricultural trade will reduce employment in some member countries. Yet, many respondents point out that this is not necessarily so. The people who were formerly employed in industries that existed under a policy of impeded trade could be employed in industries that would expand under a freer trade regime. Thus, the view is clearly that although the most important interests for anyone are vested in one's country, SADCC governments will have to adopt more of a regional perspective if trade is to be expanded.

CONCLUSION

Many analysts have argued that potential for expanding intra-SADCC agricultural trade is limited. This is mostly because they have conceptualised intra-SADCC trade in a static, rather than a dynamic context. There are significant differences between the static notion of comparative advantage--that differences in comparative costs of production among people, firms, areas, and countries at any one point in time determine trade--and the dynamic notion, where the process of trading itself will create more trade as different groups take advantage of specialisation and thereby increase their capacity to produce products. More important, in the dynamic context, effective demand grows and production changes over time. However, high transactions costs, government policies and practices, and the lower cost of goods originating outside SADCC reduce the potential for starting a more dynamic trade process.

Firms interviewed in this study report a wide range of farm inputs and products with significant potential to expand intra-SADCC trade--particularly in products based on appropriate technology. The industrial world has little interest in developing appropriate technology for the SADCC region. Thus, firms interviewed believe that the potential for expanding intraregional trade lies in identifying what technology is appropriate, and developing economies of scale in the production of these goods. Agricultural input trade is especially important--both because of its potential to increase on-farm production (including reducing food losses) and as a way to increase off-farm employment. Long-run food security will be achieved through a combination of both increasing productivity in farming and from expanding off-farm employment.

Some of the trader-identified barriers to increasing intraregional agricultural trade such as policies and practices of SADCC governments and high transactions costs, appear to be easier to deal with in the short-run than problems of lack of effective demand and limited capacity to supply markets. Governmental policies and practices

represent especially important opportunities to expand trade because governments have the power to change them. Promoting intra-SADCC agricultural trade by reducing constraints arising from government policies and practices will increase opportunities for specialisation and scale economies, leading to increased productivity, higher incomes and effective demand, and more trade.

Respondents indicate that the history of trade between Botswana and Zimbabwe shows how much trade can be increased when the appropriate environment is created and incentive policies are implemented. Many respondents recommend that as most SADCC countries have foreign exchange problems, they must use the limited available foreign exchange much more efficiently.

Because SADCC countries are expensive sources of imports, expanded SADCC trade will only benefit member states if they can settle transactions in national currencies. Thus, respondents believe that mechanisms must be established to promote multilaterally-balanced intraregional trade. This will have to involve trade in a broader sense, including services. Traders suggest that the greater use of bilateral agreements represents one practical, interim measure to stimulate reciprocal trade. Traders believe that for this to succeed, governments must involve the business community in all deliberations.

Finally, firms interviewed argued that to expand trade, governments will have to better harmonise existing policies and practices by relaxing the numerous restrictions and removing much of the red tape involved in importing, exporting, and financing intra-SADCC trade; remove tariff barriers; ease travel regulations; and promote greater communications between SADCC coutries. In addition, the firms suggested that SADCC governments should provide greater export incentives to exporting firms; and introduce export credit insurance schemes.

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NUTRITION AND FOOD TRANSFERS

EXPERIENCES IN INCREASING FOOD ACCESS AND NUTRITION IN ZIMBABWE

Julia Tagwireyi[1]

INTRODUCTION

Factors which determine individual household access to food and adequate nutrition include the agro-ecological, economic, political, socio-cultural, and health factors; as well as natural and man-made disasters. At independence in 1980, the majority of Zimbabweans in both rural and urban areas had limited access to food. The war of liberation had disrupted food production and marketing activities. The land tenure system had allocated land to the rural peasant on the least productive soils. In addition, the peasant farmer had limited access to credit to improve crop yield and ensure adequate food security throughout the year. Access to agricultural extension services was also limited. Rural incomes were insufficient to purchase food, particularly where remittances from wage earners in the family were unavailable. In addition, the retail prices of food in the rural areas are much higher. Hence, large segments of the rural population had limited purchasing power to meet basic needs.

Subsistence farming suffered the heaviest blow with the onset of colonialism. When the rural areas became a pool for cheap labour for the urban areas, mines, and commercial farms, agricultural activities were disrupted. The ability of rural households to produce enough food to meet their needs became limited. In most cases, the burden of food production fell on women who already were burdened with other chores. The logical way to cope with this additional burden was to focus more attention on the less labour intensive crops such as maize, at the expense of the more nutritious sorghums and millets. Unfortunately, because women had limited access to agricultural extension services, coupled with high levels of illiteracy, they were not able to take advantage of any new developments in food production techniques.

Studies in 1980 indicated that at least 25% of the communal farmers did not produce enough food to last until the next harvest. In the urban areas, high unemployment coupled with low wages created severe hardships for the low income groups whose purchasing power was limited, but also had to provide for members of the family who had run away from the war in the rural areas.

Limited access to health care for rural Zimbabweans must have also taken its toll on agricultural production, thus limiting access to food. Poor health reduces productivity and many diseases create a nutritional drain on the individual; thereby reducing the ability of the individual to utilise food consumed and possibly leading to malnutrition.

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[1]The Director of Nutrition, Ministry of Health, Zimbabwe.

Surveys taken soon after independence indicated high levels of protein-energy malnutrition, particularly among children under five years. The incidence of malnutrition ranged from 30-60%. This high level of malnutrition in combination with the poor health status of the population contributed to the high infant mortality rate 120 per 1,000 live births in 1980.

Since independence, Zimbabwe has made tremendous efforts to produce enough food for its people. The country produces the variety of foods needed to enable us to obtain all the essential elements of a balanced diet. While we can boast of overflowing maize barns, many urban and rural households cannot boast of adequate food security and nutrition--even during a good harvest. Zimbabwe still has unacceptably high levels of protein-energy malnutrition among young children under five years of age for a country which is a net exporter of food. Studies show that groups most affected (in order of magnitude) are children of commercial farm workers, communal farmers, families in resettlement areas, and domestic workers.

CONSEQUENCES OF LIMITED ACCESS TO FOOD AT THE HOUSEHOLD LEVEL

Lack of access to adequate food often contributes to unnecessary and untimely loss of lives. It has been estimated that one-quarter of the African children do not reach their fifth birthday. Lack of access to adequate food is often implicated in this unnecessary and untimely loss of lives. Those who survive may not realise their full physical and mental potential because of malnutrition. Thus, they are unable to fully contribute to the work-force.

Finally, the rate of absenteeism, due to ill-health, is high in communities with limited access to food. No country in this region can afford this loss in its precious human resources.

IMPROVING ACCESS TO FOOD AND NUTRITION

One of the guiding principles behind efforts to improve access to food has been the government's commitment to the well being of the people. Both Zimbabwe's *Transitional and First Five-Year Development Plan* have clearly stated goals with regards to food security and adequate nutrition. While food security has been allocated to the agricultural sector, the task of articulating programmes to address malnutrition has been assigned to the Ministry of Health. However, this division of labour has led to a fragmented approach towards eliminating malnutrition.

Efforts to increase access to food and adequate nutrition can largely be categorised into:

- activities implemented in response to emergencies such as drought and/or rehabilitation soon after the war of independence; and
- strategies to improve the welfare of the people by facilitating access to food and adequate nutrition.

Emergency assistance

At independence, many rural families were displaced because they had abandoned their land for the safety of the towns, or had been confined in camps. The new government, with assistance from national and international agencies, mounted a *National Food Relief Programme* to provide a food ration to many families without access to food. A *Child Supplementary Scheme* was instituted to ensure that the special needs of the vulnerable 0-5 year old group were met. In addition to food handouts, seed and fertilizer were distributed to help families resume farming. Incentives were also offered for growing maize, our major staple. Access to credit to purchase inputs and favourable terms of repayment contributed to a record bumper harvest in 1981.

The interministerial and interagency machinery which had been in operation during the post-independence period of national reconstruction and rehabilitation was revived to manage the drought of 1982-83, under the chairmanship of the Ministry of Labour and Social Services, including representation from the Ministries of Agriculture, Local Government, Health, National Supplies, and Finance and Economic Planning.

The main objective of the *Drought Relief Programme* was to minimise the impact of drought on the population by providing food relief to affected families, as well as a supplementary meal to children under five years. Able-bodied men and women were given the opportunity to work on selected development projects in their communities in exchange for food and a daily wage of Z$2.00. The wage minimized the danger of creating a dependency on food handouts and the scheme assisted the communities to develop by building bridges and roads.

The major feature of the *Food Relief Programme* was that it utilised foods normally grown and consumed in Zimbabwe (*i.e.*, maize-meal, beans, and groundnuts). This helped to reinforce the view that our foods are capable of supporting adequate nutrition. A major problem was the lack of adequate data for planning and rationalizing the *Food Relief Programme*. However in spite of these difficulties, the overall goal of minimising suffering and loss of life through lack of access to food was achieved.

Long-term efforts to improve access

In the majority of cases, poverty is essentially the root cause of the lack of adequate access to food. Eventually, improvements in overall socio-economic development will overcome these problems. This is a long process, but the majority of people cannot afford to wait that long. Although the government has tried to redress this situation, unfortunately, these measures have not managed to keep abreast with the rapidly rising cost of living. The economic situation has not permitted government to continue some of the consumer food subsidies. Gradual removal of food subsidies, and because the lower income group continue to pay more for their food, has limited their access to food. The current poverty datum line is over Z$250 per month, yet the minimum wage of Z$100 per month falls below this level (US$ 1.00 = Z$ 1.90).

The land question, which was a burning issue in our fight for independence, remains a thorn in the flesh. Government has had limited success in resettling

families on good land purchased in commercial farming areas. Funds to continue purchasing the farms are very limited and it will be a long time before the land issue is settled. In the meantime, government has focussed attention on making the communal farming areas which are mainly in low-rainfall Natural Regions IV and V more productive by:

- o providing more agricultural extension services to assist communal farmers to improve their farming methods;
- o providing small farmers with access to credit to buy agricultural inputs through the Agricultural Finance Corporation (AFC);
- o promoting cooperatives to provide communities with access to credit and inputs at lower unit cost through bulk purchases, enabling families to purchase inputs who would otherwise not have access to cheaper inputs;
- o introducing favourable agricultural pricing policy which had provided incentives to the farmers to produce surpluses--particularly our staple crop maize, to the extent that over 60% of the maize crop is now produced by communal farmers. There is a need, however, for the pricing policy to address the food requirements and needs of the people.

These measures have made food security at the national level a reality. However, the security at the household level has not been adequately addressed. This explains the contradiction of over-flowing maize silos and malnutrition. Our food balance sheets indicate sufficient food for everyone. Unfortunately, for many people access to this food is limited, particularly those in the low income groups.

IMPROVEMENT IN THE STATUS OF WOMEN

Women in Zimbabwe, like other countries in Africa, are the main producers of food in the rural areas. Any improvement in their status will benefit food production. Government has initiated some policies which have facilitated the contribution of women to the development process and enhanced their role as farmers.

The *Age of Majority Act* has allowed women to be adults and, in theory, gives them access to credit in their own right. The literacy programme has opened up new avenues of information for women farmers. For example, they can read the instructions on how to use fertilizers, pesticides, etc., and benefit from written extension information. Eventually, as more rural women have access to education, they will take advantage of the incentives offered for agricultural production.

Particularly in the rural areas, the pre-school programme has in addition to providing the child with stimulation and an early start in the education process, freed women to participate in developmental activities in their communities with the assurance that the young toddler is being looked after.

The excessive workload which is the heritage of most rural women has been markedly reduced in some cases because of government policy to provide basic amenities such as water, health care facilities, etc. within reasonable distance.

With independence, more women entered the formal employment sectors as new opportunities for employment opened up. This development has improved food access in families where both spouses are employed. Studies also indicate that food

access is greatly improved when the woman has adequate access to the financial resources of the families.

IMPROVEMENT IN HEALTH CARE DELIVERY

At independence, Zimbabwe inherited a health system which was heavily skewed towards expensive curative services for urban areas with limited services in rural areas. Zimbabwe, together with the rest of the developing world, has disease patterns associated with poor socioeconomic development. Communicable diseases, conditions related to pregnancy, child birth and the new-born period, and nutritional disorders are the predominant health problems.

These health problems tend to be interrelated and malnutrition is often implicated in the seriousness of the disease or its onset. For example, malnutrition increases the frequency and severity of infections such as measles and is itself aggregated by infections.

The interrelated nature of these health problems and their origins in socio-economic underdevelopment and poverty are the basis for the government's decision to adopt primary health care (PHC) as the strategy to provide health care to its people. The priority for the government was to ensure equitable distribution of health services. Although the resources needed for this enormous task were considerable, the PHC strategy was the logical choice since it enlists the resources of all ministries and agencies striving for the well-being of the nation.

The *Alma Ata Declaration of 1978* defined primary health care as "essential Health Care based on practical, scientifically, and socially acceptable methods and technologies made universally accessible to individuals and families in the community and at a cost that the country can afford".

Therefore, PHC addresses health problems by providing promotive, preventive, curative, and rehabilitative services. The following elements are essential to the successful implementation of PHC:

- o education;
- o communicable disease control;
- o immunization;
- o maternal and child health and family planning;
- o provision of essential drugs;
- o provision of adequate food supply and nutrition
- o treatment and prevention of minor ailments; and
- o provision of safe water and sanitation.

The government formulated a new health policy in 1980 which had primary health care as its cornerstone. Recent evaluation of PHC in Zimbabwe indicate that some progress has been made in improving the health status of the Zimbabwe people as Table 1 illustrates.

Specific food and nutrition activity

Activities which have been implemented within the PHC strategy and may have contributed to an improvement in nutritional status are discussed below.

Table 1. Some indicators to illustrate the improvement in health and nutrition status, Zimbabwe, selected years.

Indicator	1982	1984	1987	1988
Children fully immunized (%)	27	42	67	85
Children under the age of 5-years with a child health card (%)	99	79.3	90	na
Nutritional status of children under 5-years (weight for age)[a]	25-42	23.5	17	na
Infant mortality rate (per 1,000 births)	100-120	85	60	na

[a] Percentage less than 80% normal weight for age.
na = data not available
Source: Ministry of Health.

Growth monitoring and nutrition surveillance

Growth in young children is a good indicator of adequate diet and good health status. At clinics throughout the country, young children under five have their weights taken regularly on a home-made card. These sessions offer the health worker an excellent opportunity for individual counselling with the parents or guardian on nutrition. This information on weights and ages of children attending clinics is now being analyzed regularly. This information helps identify areas with high levels of malnutrition and in need of interventions.

Nutrition education through formal and the non-formal systems

Our main focus has largely been to standardize the concepts being promoted through formal training programmes, largely within the health and education sectors.

Food safety

The *Food and Food Standards Act* falls under the Ministry of Health. We have been concerned about our antiquated food regulations and have been trying to improve food safety standards to safeguard the health of our people and ensure a safe food industry.

Coordination

We have established interministerial Food and Nutrition Committees at the national, provincial, district, ward, and village levels to identify food and nutrition problems and propose community-based projects to address the problems. We have now created a basis for integrating nutrition into development activities at the various levels.

SUMMARY AND CONCLUSIONS

Zimbabwe has reason to be proud of its efforts to improve food access and nutrition. However, we should not be complacent. Much remains to be done. It is unlikely that improvement in the nutrition situation will be realized unless and until there is coordinated multi-sectoral planning and action taken to improve food access and ensure an adequate nutrition for the population. The factors which contribute to poor access to food and nutrition cannot be adequately addressed by one sector.

While government has acknowledged the need to improve food access and nutrition, there is no clearly defined national policy on food and nutrition and no mechanism established to coordinate this. As a result, we have uncoordinated programmes implemented by different sectors. In some cases, the activities of the different sectors may even be in direct conflict with each other. The multi-dimensional nature of the problem of nutrition is often not fully appreciated by policymakers and researchers.

Nutrition is regarded as a health problem whose solution lies mainly within the health sectors. This view has tended to limit the scope of research undertaken on food security issues and also the interventions implemented. To what extent does agricultural research or policy planning consider the nutrition objective? And yet, we all have the same basic goal--that of improving the quality of life of our people.

The Ministry of Health's concern about the need for intersectoral action has led to the establishment of Food and Nutrition Committees at the national, provincial and district levels under the chairmanship of AGRITEX. The national committee which has representatives from the Ministries of Finance and Economic Planning, Community Development, Local Government, Rural and Urban Planning, Education, and Water Development has started some work towards sensitizing policymakers on the need for a comprehensive national food and nutrition policy. An issues paper on food and nutrition has been prepared and will soon be circulated to the key sectors for comment and discussion. Hopefully, this paper will initiate dialogue and lead to the development of an integrated food and nutrition policy.

Applied food security research offers some answers to many questions of nutritionists. We need to maintain the dialogue between nutrition and agriculture and collaborate in applied research activities. The potential for meaningful collaboration exits. Often the nutrition departments in many developing countries are ill-equipped to undertake applied research, but often have access to food research funds. The universities, on the other hand, have the research skills to obtain the data required for food and nutrition planning. Surely we have the ingredients for a happy union which will result in the improvement of food access and nutrition for our people in the region.

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NUTRITION AND AGRICULTURAL POLICY ISSUES: CURRENT EVIDENCE AND RESEARCH AGENDA[1]

Catherine Siandwazi[2]

INTRODUCTION

Accelerating agricultural production by shifting from subsistence or semi-subsistence food production to the production of cash crops is the cornerstone of economic development. But, agricultural policies to increase agricultural production may have a negative or less than expected impact on the nutritional status of any given population. The determinants of nutritional status include the availability of food, the ability of the household to acquire available food, the desire to obtain food to which the households have access, and intrahousehold food distribution.

Various field studies have shown that poverty is a central cause of malnutrition in both rural and urban areas. The determinants of rural poverty are closely related to land tenure and the characteristics of agricultural production--including the type of production technology and the availability of credit, extension services, infrastructure, agricultural services, and market opportunities.

In many African countries, the expected improvements in nutrition have failed to materialize from expanded food and agricultural production. In some cases, the transition from subsistence to cash agriculture has had a negative effect on staple food production and, consequently, on household food security and nutrition. It is, therefore, essential to examine the causes of malnutrition through expanded research on the production and consumption linkages of rural families.

The purpose of this paper is to assemble current evidence derived from past research and use this information to discuss some relevant nutritional and agricultural issues in our region and to identify areas for further research.

AGRICULTURAL POLICIES AND NUTRITION LINKAGES

The link between household nutritional status and agricultural policies or strategies is not well established. Conventional discussions tend to assume that increased crop yields and gross income will improve nutrition.

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[1]The author has benefitted from comments by Nancy Verlade of ARPT (Adaptive Research Planning Team, Ministry of Agriculture and Cooperatives); and colleagues at RDSB (Rural Development Studies Bureau, University of Zambia); and the ZNCB (Zambia National Commercial Bank).

[2]National Food and Nutrition Commission Lusaka, Zambia.

From a nutrition point of view, it is clearly insufficient to use an increase in production as an indicator of the nutritional impact of agricultural policies because the potential benefits may be negated by other factors. Malnutrition is a reasonably sensitive indicator of socioeconomic deprivation. When the nutritional status of the rural farm households does not improve, there is good reason to believe that the economic situation of the poor is also not improving.

Figure 1 shows some of the linkages between nutrition and agriculture. Agricultural policies influence nutrition through their effects on:

- the food production systems of subsistence farm households and cash cropping in semi-subsistence farm households;
- fluctuations in food availability and access (storage facilities, food prices, environment, and the social network);
- adoption of technology such as improved seeds, fertilizer, and the use of oxen;
- farm household income, its composition, and intrahousehold income allocation;
- household labour and time allocation; particularly women's time allocation; and,
- infectious diseases.

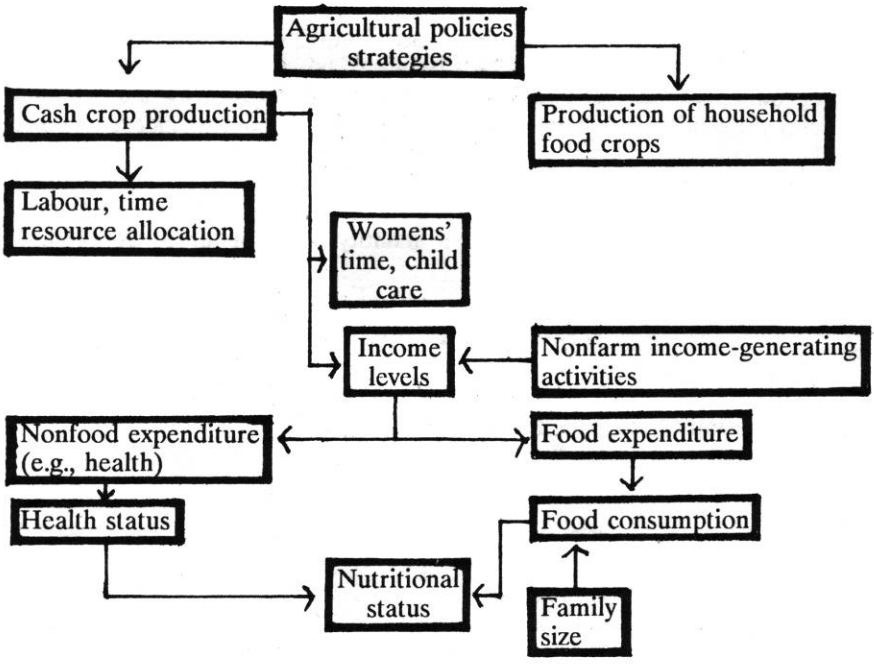

Figure 1. Some nutrition and agriculture linkages.

Any significant changes in these factors is likely to influence food consumption of household members, especially those malnourished or at risk of becoming malnourished. Therefore, using an increase in production as a proxy to measure nutritional effects is likely to be misleading.

NUTRITIONAL EFFECTS OF FOOD PRODUCTION

The ability of farm households to acquire food is influenced through changes in food availability, rural incomes, and food prices. Changes in the cropping systems may influence the amount and types of food produced and, consequently, the level of fluctuation in availability of food during the year.

Seasonal fluctuations in food availability are particularly relevant in the SADCC region because of the heavy reliance on a single annual crop cycle. Since irrigation facilities are not widespread outside the commercial farming sector, a single crop harvest must provide sufficient food for the whole year. Also, storage facilities, which are inadequate at the farm level, allow for huge losses.

A seasonal decline in food consumption during severe stock draw-down is linked to nutrition requirements, labour input, and morbidity patterns. In some countries with a unimodal rainfall pattern, food consumption declines during the heavy planting season. Furthermore, increased incidence of diseases during the rainy season can adversely affect the nutritional status of the household members. For example, seasonal nutritional stress associated with increased incidences of debilitating diseases, such as malaria and diarrhoea, has been observed in working adult populations during the heavy planting seasons (IFPRI, RDSB, and NFNC, 1985; Milimo and Siandwazi, 1988). Table 1 indicates that in Eastern Zambia adults suffer most from nutritional stress during the late planting and heavy weeding period. As indicated earlier, this is also when grain stocks are low, labour demands are greatest, and there is a high incidence of malaria and diarrhoea.

The incidence of debilitating diseases, coinciding with heavy work periods and food stock depletion, have serious labour implications for the year-to-year fluctuations in agricultural production and the prospects for long-term production. Food scarcity can influence food production through its impact on both the quantity and quality of labour input.

Spurr (1984) found that malnutrition among adult workers reduces work capacity. In the initial stages, it is a direct result of weight loss. But after a 10% body weight reduction from normal levels, additional factors such as cardiovascular inefficiency and anaemia may play a role in reducing work capacity. Strauss (1986) found that increasing caloric intake leads to an increase in farm output. An IFPRI/RDSB/NFNC (1985) study found a positive correlation between food consumption and total area. Households planted twice as much area if hybrid maize for home consumption lasted beyond January, the traditional hungry period.

Table 1. Percentages of adult respondents with low weight/height ratios by agricultural season, Eastern Province, Zambia, 1981-82.

Period in the agricultural calendar	Males (N=155) Less than 29[a]	Females (N=155) Less than 29[a]
Postharvest (September 1981)	57.4	41.3
Rainy season (January 1982)	62.6	49.0
Preharvest (May 1982)	66.5	47.7

[a]Weight/height ratios of less than 29 denote severe malnutrition.
Source: Kumar (1987).

NUTRITIONAL EFFECTS OF CASH CROPPING

Protein-energy malnutrition, particularly among the rural farm households, is often a result of seasonal fluctuations in food availability, food prices, and income. Depending on the nature of the agricultural policies, they may alleviate or increase the incidence of malnutrition. Agricultural policies that encourage farmers to shift from a diversified cropping system to cash crop production may have a negative effect on nutrition, particularly where cash crops are promoted at the expense of mixed food crops traditionally produced for home consumption.

Existing evidence on nutritional effects of agricultural commercialisation among the small-scale farmers suggest both negative and positive effects. The net effects depend on whether cash cropping is promoted parallel to the subsistence staple crops, or as a substitute for them. Changes in the cropping systems that influence the amount and type of food produced and fluctuations in food availability during the year are more likely to have important nutritional effects (Pinstrup-Andersen, 1987).

Current evidence suggests that cash crops reduce the subsistence food crops area by physically displacing food crops, and thereby reduce the availability of food to the household. Also, increased prevalences of malnutrition have been associated with cash crop production. As subsistence farmers become more commercially oriented, the nutritional status of their children under the age of 5 years declines. Childhood malnutrition was found to be more prevalent among small-scale farmers who adopted hybrid maize for sale than those who also grew other crops for home consumption such as millet and sorghum (Table 2).

This suggests that agricultural research should focus on developing both appropriate cash and subsistence crops to meet nutritional needs of the households (Holdsworth, *et al.*, 1986; Siandwazi, 1988). While considerable agricultural research is devoted to cash crops, until recently, little attention has been paid to household food crops. Alleviation of the nutrition problem would be greatly enhanced if agricultural research put greater emphasis on improving the household food and storage systems, and developing improved varieties of staple food crops.

Table 2. Indicators of nutritional status as percent Z-scores[a] for malnourished pre-schoolers (≤ 10 years) by ecological zone and hybrid maize adoption by survey round, Eastern Province, Zambia, 1986.

							Hybrid maize adoption					
	Project area[b]		Plateau		Valley		Plateau				Valley	
	%	N	%	N	%	N	Low	N	High	N	Low	N
Round 1 (N=758)												
Weight-for-age	26	79	28	76	9	3	27	38	38	38	9	3
Height-for-age	56	170	57	156	42	14	54	77	61	79	42	14
Weight-for-height	5	16	6	15	3	1	6	9	5	3	3	1
Round 2 (N=927)												
Weight-for-age	13	54	13	43	18	11	9	17	17	26	18	11
Height-for-age	48	194	50	171	37	23	43	79	58	92	37	23
Weight-for-height	3	10	2	8	3	2	2	4	3	4	3	2
Round 3 (N=800+)												
Weight-for-age	15	63	50	49	19	14	9	15	20	34	19	14
Height-for-age	41	169	42	142	37	27	41	69	43	73	37	27
Weight-for-height	2	6	1	4	3	2	1	2	1	2	3	2
Round 4 (N=938)												
Weight-for-age	16	58	17	49	11	9	15	21	19	28	11	9
Height-for-age	40	145	43	121	29	24	43	59	43	62	27	24
Weight-for-height	3	10	1	4	7	6	1	1	2	3	7	6

[a]The U.S. NCHS are used as reference Z-scores for nutritional indicators. Z-score values below -2 denote malnutrition. Note the absence of high technology adoption in the valley. Both valley areas have been categorized as low technology adopters.
[b]Project area consists of valley and plateau areas which are geographically different. Households in these areas were categorised into low hybrid maize adopters and high hybrid maize adopters.
N indicates sample size.
Source: IFPRI/RDSB/EPADP/NFNC (1986).

EFFECTS OF CASH CROPPING ON WOMEN'S TIME AND RESOURCE ALLOCATION

The increased emphasis on cash cropping, a characteristic of agricultural policies in Southern Africa, affect nutrition through its impact on women's time constraints and its impact on household income allocation. The pressure to grow more cash crops reduces the availability of household labour to grow household food crops. First, since women have traditionally been responsible for assuring the household food supply, the loss in household food production--as a result of cash crops production--may not be compensated for by increased income from cash crops (Pinstrup-Andersen, 1987).

Second, women are compelled to work on cash crops, which are still largely controlled by men, in addition to working on their own food crops. The increased time constraints experienced by these women have a direct effect on nutrition through changes in child care, breast-feeding, food preparation, and food acquisition behaviour.

Third, since cash crops are labour-intensive and there is lack of sufficient labour-saving devices for women, the amount of time spent working is often increased. Increased labour demand leads to harder work which in turn increases nutritional requirements. If the nutritional requirements are not met by increased food intake, these activities could worsen the nutritional situation of those working women, or of their children, through their effect on time allocation and intrahousehold food distribution.

NUTRITIONAL EFFECTS OF FARM INCOME

Cash crop production can greatly contribute towards increased rural income generation and employment. Cash crops need not have negative effects on nutrition, since acquired income from cash crops can be used to offset the decrease in the availability of household food crops through purchases to meet family nutritional needs. However, household food expenditures and food consumption patterns depend on who in the household controls the income and who decides how the income is spent. Since the production of food for home consumption rests largely with women and the male-controlled cash crops often reduces the production of these crops, then women's control of real income--in terms of food from own production--also decreases. The loss from production of these food crops may not be matched by increased food purchases.

In addition to the control of income, the source and type of household income may also influence consumption patterns and nutrition (Pinstrup-Andersen, 1987). There is strong evidence to suggest that real income, in the form of food from own production (home gardens and household food crops), contribute more to food consumption than an equal amount of cash income (Kumar, 1978). This is because household food crops and cash from home gardening and livestock provide a constant flow of income. In contrast, income from cash crops commonly comes in single, large lumps. As a result, it is not usually spent evenly throughout the year.

Because of the increasing number of female-headed households in rural areas, researchers have begun to recognise the importance of intrahousehold decision making and how this may influence both production behaviour and nutrition. It is well known that female-headed households have less access to male income and may find themselves at a further disadvantage in satisfying labour requirements for certain agricultural tasks. In addition, there is evidence that female-headed households receive fewer agricultural services such as credit and extension support. Since female-headed households are often among the poorest households in the society, they are also the most vulnerable groups to nutritional stress. However, evidence suggests that, in spite of their economic status, female-headed households are often capable of meeting the nutritional requirements of their family members

(Table 3). Women are able to target a large portion of their resources and income towards improving the general welfare in their households (Kumar, 1978). Under these circumstances, it may be possible to improve household nutrition and household welfare if policies are developed which target women's income and production activities--since women are mainly responsible for providing household food.

RESEARCH AGENDA

Current evidence indicates that agricultural policies are strongly biased towards cash crops and the expected gains of this bias, through increased food consumption and improved nutritional status, have often failed to materialise. In order to understand why the socioeconomic status has not improved among the small-scale farmers, there is a need to:

- o identify measures to alleviate seasonal declines in food consumption and nutritional stress;
- o expand research on household (traditional) staple crops and relish food crops, and make these priority areas of future research;
- o develop the capacity to transfer household food crop technology from the research to extension and from extension to farmers;
- o identify the reasons for the existence of malnutrition in hybrid maize surplus areas;

Table 3. Nutritional status (height for age) of children by sex of the household head in hybrid maize adoption areas, Round 1, Eastern Province, Zambia[a].

N = 758	Plateau hybrid maize adoption[a]				Valley hybrid maize adoption	
	Low[b]		High[b]		Low[b]	
	%	No.	%	No.	%	No.
Height for age						
Male-headed households						
≤ 36 months	60	24	54	21	63	5
37-60 months	42	10	65	15	60	6
61-120 months	73	29	71	27	43	6
Female-headed households						
≤ 36 months	39	5	40	4	0	0
37-60 months	43	3	88	7	0	0
61-120 months	33	na	42	na	0	0

[a]Z-scores (Std. deviation) ≤ -2 denote malnutrition. The U.S. NCHS reference standards have been adopted. The data indicates the percentage and number of malnourished children. [b]Households in plateau and valley areas were categorised as low hybrid maize adopters and high hybrid maize adopters. Source: IFPRI/RDSB/EPADP/NFNC (1986).

- o assess the impact of cash crop policies on technology adoption, household income generation, and expenditure and determine how these affect levels of food consumption, nutrition, and health; and
- o develop appropriate technology to relieve women from labour-intensive chores that hinder household level food production.

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THE IMPACT OF BOTSWANA'S PULA FOR WORK PROGRAMME ON FOOD ACCESS: PRELIMINARY FINDINGS

Sisay Asefa, Agyapong Gyeke and Happy Siphambe[1]

BACKGROUND

During the past seven years, Botswana has suffered from a continuous drought which had adversely affected its rural economy. In response, the government initiated the National Drought Relief Programme which has four components: human relief (supplementary feeding), agricultural relief and recovery, rural public works or pula[2] for work, (also known as labour-based relief), and a water supply programme.

The National Drought Relief Programme is coordinated by an Inter-Ministerial Drought Committee (IMDC) that comprises representatives from five key government ministries (Finance and Development Planning, Agriculture, Local Government and Lands, Education, and Health). The overall programme is linked to the national planning process by the National Food Strategy (NFS) that was prepared by the Government of Botswana in 1985. Two of the major goals of the NFS are to ensure a minimum acceptable diet for all of the population and to build a national capacity to contain the adverse effects of the recurrent drought (Botswana, 1985).

The focus of this study is on the pula for work component of the Drought Relief Programme, which originated in 1982 and is currently administered by the Food Resource Department in the Ministry of Local Government and Lands (MLGL). This single largest component of the National Drought Relief Programme has been allocated about P18 million (US$11 million) since its inception.

This paper presents some preliminary results and draws some implications from a village-level case study of the impact of the pula for work programme conducted by the authors in the South East District of Botswana during the spring of 1988. The purpose of the broader study is to investigate Botswana's experience with the programme in relation to:

- the magnitude and distribution of programme costs and benefits;
- the impact of the programme on the welfare of participating households;
- the significance of the programme in building social and physical infrastructure;
- the potential targeting or leakage problem in the programme; and

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[2]Pula is a the currency unit of Botswana. The exchange rate is approximately P1.00 = US$ 0.60.

- o the constraints and opportunities for improving programme effectiveness, including its potential in contributing to employment and income generation.

This paper reviews preliminary results, focusing on two of the critical issues of the pula for work programme, namely :

- o the targeting or leakage problem which is concerned with whether the criteria used in participant selection is adequately enforced; and
- o the impact of the programme on providing access to food for the participating households (*i.e.*, whether income received from the programme has increased food consumption).

The next section of the paper briefly summarizes the preliminary findings of the survey. The final section draws some implications about the impact of the programme on increasing access to food for participating households.

SUMMARY OF PRELIMINARY FINDINGS

The preliminary findings are based on analysis of data from a survey of 70 households in Ramotswa Village in the South East District of Botswana. The sample is stratified into 40 participants (30 regular participants and 10 supervisors) and 30 nonparticipants. This section compares participants and nonparticipants in the programme.

Demographic characteristics

The results show that the proportion of women in the participating group (59% females, and 41% male) is greater than the nonparticipating group (43% female and 57% male). The mean household size for the participants (9.4 persons) is larger than the nonparticipants mean household (6.5 persons). Of the participating households, 65% were engaged in agriculture, 10% in domestic service, 20% were unemployed, and 5% were engaged in some other work prior to joining the pula for work programme.

Income from government agricultural subsidy and drought relief assistance

A large proportion of participants indicated that they receive assistance from two of the government agricultural subsidy programmes, namely the Arable Lands Development Programme (ALDEP) and the Accelerated Rainfall Arable Programme (ARAP). None of the nonparticipating households indicated they receive assistance from ALDEP or ARAP.

Ownership of major assets

A greater number of participants than nonparticipants indicated that they own assets such as cattle, small stock, and a house.

Participation in pula for work activities

The six projects in the survey village, according to the participation rate, is as follows: dam construction (56.7%), rural road construction (26.7%), road

maintenance (16.7%), sorghum hand stamping (16.7%), village road construction (13.3%), and brick moulding (6.7%).

Programme personnel

In order to complement the detailed village-level case study, a survey of programme officials from 15 districts and sub-districts of Botswana was conducted. The following four categories of personnel were interviewed to gain insights about various drought relief programmes:

- Drought Relief Technical Officers (DRTOs);
- Drought Relief Coordinators (DRCs);
- District Development Officers (DDOs); and
- Council Planning Officers (CPOs).

Of the above categories, the DRTOs are the ones most directly engaged in the management of the pula for work programme at the district and sub-district level. The survey was conducted during March 2-4, 1988, at the Labour Based Relief Programme's annual workshop conducted in Gaborone which was attended by the researchers. Eighteen questions (13 closed and 5 open-ended) were included in the questionnaire. The main findings are as follows:

- Thirty-two (80%) of the 40 workshop participants completed our questionnaire, including nine DRTOs, thirteen DRCs, two DDOs, five CPOs and three others.
- When asked about who sets the criteria of participation, 56.3% answered the Village Development Council (VDC) and district administration, 22% answered the VDC, and the rest answered district administration, LBRP supervisors, or others.
- On the question of what they think about the impact of the programme on food consumption and nutrition, 55% said it has a positive effect, 23% said it has a very significant positive effect, and 16% said it has a minor effect.
- When asked about the impact of pula for work income on investment, 48.4% said that it has no impact because participants are too poor to invest, although they invest in education, and 25% answered participants invest on agricultural assets, livestock or some other form of investment.
- On the question of what they thought about the effect of the pula for work projects on village or community welfare, 81 percent of the respondents said that projects have a moderate to substantial impact, while 19% said the projects have no impact on the social welfare of the village.
- When asked about how useful is the infrastructure (dams, roads, etc.) directly created by the programme, 18% said that it is moderately to very useful, and 18% answered it is somewhat, or not useful.
- On the question of who selects projects at the village level, 59.4% answered it is the VDC, while 25% answered it is the VDCs and DRTOs in cooperation, and 15.6% said projects are selected by some other party.
- When asked if the selection criteria should be changed, 55% answered no, and 45% answered yes.

- When asked about their recommendations for the future of the programme, 88% said it should be converted into a long-term programme and 9% said it should be modified and continued in its current form.
- On the question of whether the programme creates any dependency of participants on government, 88% said it does, and 12% said it does not.

SUMMARY AND IMPLICATIONS

In recent years, Botswana has implemented one of the most ambitious famine management and prevention programmes in Africa. These efforts have been judged to be quite successful (Holm and Morgan, 1985, and Holm and Cohen, 1986). Botswana's success in preventing famine in spite of persistent drought is partially due to its ability to finance a large famine prevention or drought relief programme by its diamond-based rapidly growing economy.

Two critical policy questions for Botswana's economic future, are: how long should it sustain this short-run drought relief programme, and how can it create a self-reliant, employment and income-generating rural economy that does not require continued government subsidies?

Our research from a village case study of the pula for work programme shows that the majority of the participants in the study sample are female-headed households with larger than average family size, compared to nonparticipants. Both participants and nonparticipants expressed the same degree of desire for future participation in the programme. The survey revealed that there is potential targeting inefficiency in the programme (*i.e.* people who should be participating, but are not participating). The problem of targeting inefficiency can be overcome through better project management and enforcement of participation criteria. More importantly, the programme can be made more efficient if it is converted and/or integrated into a long-term rural employment and income-generating rural development programme directly focused on the rural poor.

Programmes such as draft power assistance and ALDEP are components of the government's long-run agricultural development programmes that compete for labour with the pula for work programme. We believe Botswana needs to integrate the currently short-run focused pula for work programme into other government agricultural support programmes such as ALDEP in order to create a coherent long-term agricultural development and rural employment programme.

Our findings also show that participation in the pula for work programme is an important tool for preventing famine and providing food access for participants. On the other hand, income earned from the programme is too meagre to have any significant effect on nonfood expenditure and investment.

In summary, Botswana's pula for work programme is quite effective as a short-run mechanism for helping prevent famine and providing access to food during the drought period. However, the critical policy issues and problems of long-run income and employment generation necessary for winning the battle for achieving long-run food security and poverty reduction for all Botswana are yet to be tackled. Future policy-oriented research should focus on this critical question.

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CONTRIBUTION OF SMALL-SCALE RURAL ENTERPRISES TO EMPLOYMENT GENERATION AND FOOD SECURITY

NONFARM INCOME AND FOOD SECURITY: LESSONS FROM RWANDA

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INTRODUCTION

Among households most at risk, in terms of household food security in Southern Africa, a significant proportion face serious constraints in the area of agriculture. Often these are households with small farms, sometimes with poor soils and/or poor climatic conditions. For many such households, it seems unrealistic to think that they could attain satisfactory levels of income, and therefore of food, solely on the basis of their own agricultural production. Income and food security for many of these will require that crop and livestock production from their own farms be supplemented by alternative employment activities: either working for others in agriculture or in nonagricultural pursuits.

If this is true for the most disadvantaged households in the SADCC region, it is true to an even greater extent in densely populated countries like Rwanda, where most farms are already very small and high population growth rates impose continuing pressures for further land subdivision. In such circumstances, the challenge to find alternative sources of income and employment is particularly urgent. The present paper reviews information from Rwanda to explore the question whether it is realistic to think that nonfarm activities can provide answers to these pressures in that very heavily populated country.

The paper first provides a brief overview of the nature of nonagricultural employment sources in Rwanda: what are people currently doing? Secondly, it explores some of the characteristics of these enterprises, particularly the small nonfarm enterprises in rural areas, examining the prospects that they can help create new income-earning opportunities for rural farm households. Third, the paper reviews the policy context in which these enterprises operate, to determine the extent to which the policy environment currently hinders the growth of employment among these enterprises and to suggest areas needing change in this regard. The paper ends with a brief discussion of needed modifications in research design in the analysis of rural nonfarm enterprises to make this research more responsive to the needs of analysts in the area of food security.

ALTERNATIVE EMPLOYMENT OPPORTUNITIES

Productive activities in an economy can be categorized according to two different criteria: the location of the activity and the economic sector in which it takes place. This separation gives rise to the following classification (Table 1).

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Table 1. Typology of the location of economic activities.

		Location of economic activity	
		On-farm	Off-farm
Sector of economic activity	Farm	1	2
	Nonfarm	3	4

Table 2. Level of employment in principle economic activities, Rwanda, 1985.

Activity	People employed
Family agriculture (approximate)[a]	2,600,000
Wage labour in agriculture[b]	55,000
Non farm activities[c]	
Mining	10,000
Manufacturing	127,000
Electricity, water	1,200
Construction	32,000
Commerce, transport, finance	33,000
Government and personal services	76,000
Total nonfarm employment	279,000
Total economically active population	2,934,000

[a]Quadrant 1 in Table 1.
[b]Quadrant 2 in Table 1.
[c]Both on- and off-farm; quadrant 3 and 4 in Table 1.
Source: Khiem, (1987)

Piecing together information from a variety of partial sources, the level of employment by principal economic activity in Rwanda in 1985 (Table 2).

Food security analysts will need to supplement their primary focus on quadrant 1 in Table 1 with an appraisal of the contributions to the farm household derived from income and employment in quadrants 2, 3 and 4. This paper limits its attention to nonfarm activities (quadrants 3 and 4).

The data in Table 2 reports only on principal economic activities, whereas people may in fact be engaged in multiple pursuits. Those who regard themselves as being primarily in family agriculture, for example, may be engaged in other activities for part of the year. With that caveat, the figures suggest that only about 11% of the

labour force was engaged in economic activities outside of family agriculture. Of this total, 38% was in manufacturing, 23% in governmental and personal services while nearly 20% worked as wage labour in agriculture. Of those engaged in manufactur-ing, over 90% were in small, informal establishments. The overwhelming majority of these are in rural areas of the country. The major activities of this type include brewing traditional beer, making bricks, tiles and pottery, tailoring and embroidery, basketry, and carpentry.

The magnitude of the employment challenge facing the country is made clear if one recognizes that the economically active population of the country is currently increasing at a rate of about 90,000 persons per year. With little potential for increasing productive employment in traditional agriculture, the need for new jobs in other sectors of the economy is overwhelming.

CHARACTERISTICS OF RURAL SMALL ENTERPRISES

An examination of the characteristics and potential for growth among small rural manufacturing enterprises reveals a number of common features:

- Most are producing for highly localized markets. The overwhelming characteristic of these markets is their very small size. The average rural household in Rwanda has total consumption of about US$725 per year[2]. Of that amount, only about US$270 was in cash (the rest being consumption of food produced on one's own farm). Cash expenditures on nonfood products amounted to only about US$135 per household per year (just over US$10 per household per month). Even with a million rural households in the country, the local markets for products of small industries are very limited. For virtually all small producers, demand constraints arising from limited markets constitute their most serious problem.
- Most of these enterprises produce simple and standardized products using simple technologies, with low levels of skills and small amounts of capital.
- The great majority of workers in small manufacturing enterprises are in family establishments, operated with no hired labour. This means that most income-earning opportunities of this type involve working for oneself or one's family, not hiring out as a paid labourer for others. But studies in other countries suggest that enterprises organized as purely family undertakings seem to have the least favourable prospects in terms of productivity, sustainability, and growth.
- A basic characteristic of many (though not all) activities in this segment of the economy is that of minimal barriers to entry. Requirements in terms of managerial or technical skills or capital are minimal, while government controls and regulations are virtually nonexistent. With large numbers of people under

[2]54,000 francs, at US$1 = FRw 75. These figures and those that follow in this paragraph are taken from Rwanda Government, (1988).

economy expanding too slowly to absorb all the new entrants to the labor force, the number of people seeking to work in these activities continues to expand at rates which exert a continuous downward pressure on returns (prices of goods and services produced as well as returns per week or per year through ensuing underemployment).

- With low levels of technical and managerial skills, these small producers have only rarely succeeded in effecting a transformation whereby they could become modern small- or medium-sized producers. Most of the modern manufacturing firms in Rwanda were started as larger-scale enterprises, rather than evolving out of cottage or artisanal production. Research under way in a number of countries suggests that this is a common feature of African manufacturing enterprises.

This review suggests that the potential for productive growth in employment and income among rural nonagricultural enterprises is likely to be selective. There are a number of product lines where there are good opportunities for expansion, modernization, and growth of employment and income. But there are also substantial areas where employment is likely to continue to increase, but only because people cannot find jobs elsewhere. These can provide some income supplement, but very little prospects for signficantly productive employment.

THE POLICY ENVIRONMENT

The question arises as to the extent to which this conclusion is a result of an unfavorable policy environment. With changes in the policy context, would it be possible to establish a more dynamic growth in employment among rural nonfarm enterprises? Analysis suggests that there are a number of areas of policy which currently discourage the modernization and growth of such enterprises.

Taxation policy

In the area of taxation, very small enterprises are generally not recognized by the government and pay virtually no taxes. But if a firm seeks to modernize and expand, it is subject to a variety of fees and charges which are disproportionate to its sales or profits. While there are now procedures which would permit such firms to gain exemption from such levies through the tax holidays permitted by the investment code, the procedures are complicated and have not yet been effective in helping such firms overcome the serious fiscal hurdles associated with this transition.

Credit policy

In the credit area, while most large firms say they are well served by the country's financial system, most small producers complain vigorously about their inability to obtain credit. Yet, the financial institutions insist that they are ready and anxious to make funds available to small borrowers who have financially viable projects. Extensive discussions are under way seeking to join these two positions. At least three dimensions are involved.

- o On the collateral question, there are a number of special guarantee funds designed to provide loan guarantees in cases where the borrower has inadequate resources. These help, although they have been of assistance to only a small fraction of those seeking loans.
- o There is talk of introducing alternative loan approval procedures: character-based (rather than project-based) evaluations, repeat lending starting with small amounts and short repayment periods but with opportunities for expansion, and lending to individuals in the context of a group, with group responsabilities for repayment.
- o It is recognized that small producers have an urgent need for direct assistance in developing viable investment projects.

In general, limitations in the credit area do not appear to be the binding constraint limiting the growth of small rural enterprises. Yet, a more effective credit system clearly could provide some encouragement to such producers.

Protection

The most powerful instrument of industrial promotion in Rwanda, as elsewhere in the third world, is that of protection. This protection is provided through a combination of tariffs, licences, and the exchange rate. In the Rwandan context, protection is effected primarily through import licensing, issued (or not issued) by officials of the National Bank in consultation with the Ministry of Finance and Economy, based on their appraisal of the country's needs as well as the capacity of local producers to supply those needs. When combined with the ready availability of imported inputs purchased on favourable terms as a result of a somewhat overvalued exchange rate, high levels of protection are afforded particularly for activities involving the transformation of imported inputs, often with only low levels of value added in world prices. The discretionary nature of this system of protection means that it works most powerfully for the benefit of large-scale producers; small enterprises have benefited only to a smaller extent.

Need for more effective assistance

While a number of changes have been made to reduce its discriminatory impacts, the policy context in Rwanda continues to be significantly more favourable to large enterprises than to small producers. A more size-neutral policy environment would remove some of the obstacles which still hinder this transition. Yet, a close examination of the problems facing small producers indicates that even a size-neutral policy environment would leave in place many obstacles to enterprise growth whose removal requires the provision of direct assistance to small producers. There is a need for more effective assistance in three areas:

- o technical: dissemination of information about alternative technologies, about appropriate machinery and equipment, as well as advising on a continuing basis on the use of such technologies;
- o economic: dissemination of information about products and product modifications which enterprises might introduce and markets which they might

seek to enter, based on a more comprehensive study of local, national, and regional markets in particular subsectors; and

- improvements in enterprise management, in all of its dimensions.

Such interventions can be thought of as the rural nonfarm counterpart of agricultural research and extension. Both are equally justified and necessary for the promotion of a dynamic rural economy. In Rwanda, such project initiatives are urgently needed to help create an environment in which increasing numbers of small producers can escape the trap in which many of them are currently caught, where there are too many producers selling too limited a range of products in too restricted a market.

RESEARCH ISSUES

Much has been learned over the past decade in research on rural small enterprises. To address the needs of food security research, a number of additional issues need to be introduced into that analysis.

The locational dimension of rural enterprises

Small enterprise research has paid little attention to detailed locational issues within the rural sector. Food security research suggests that the greatest needs for income from off-farm and nonfarm activities may be in locations where agricultural conditions are particularly unfavourable. Yet, if small rural producers sell primarly in local markets and the limited size of such markets constitute the principle constraint on their growth, then the locations most in need of help from such nonagricultural employment may be precisely those areas where it is most difficult for nonfarm activities to expand. This type of linkage issue has not been addressed in the nonfarm enterprise research to date.

Timing issues

Rural markets are highly seasonal in terms of labour requirements, input supply needs, and product demands. A key issue relates to the ways in which nonagricultural activities can be made complementary rather than competitive with this inherent agricultural seasonality. One advantage often claimed for rural small enterprises is their ability to operate in ways which offset the seasonality of the agricultural cycle. Yet, limited evidence suggests that nonfarm enterprises which are run on such a counter-seasonal basis are poorly equipped to provide more than minimal returns to those who engage in them. Again, this is an issue which has received little attention in the rural nonfarm enterprise research, but which could be important in terms of its potential contribution to household food security.

Commerce, services, etc.

The primary focus of research on rural nonfarm enterprises in Rwanda, as in most other countries, has been on manufacturing enterprises (including, to be sure, enterprises of all sizes). Yet, studies in Rwanda indicate clearly the importance of construction, commerce, and repair services in rural labour use. A study of the

construction sector, for example, makes clear that as rural incomes rise, one of the first uses of additional income is in improving one's house, (Khiem, 1988). In the same vein, a study of the garment industry shows that a significant part of the employment in the subsector came from repairing, pressing, and selling used clothing (Haggblade, 1986). Limited information from other parts of Africa indicates that expenditure elasticities for services are substantially higher among rural African consumers than for nonfood manufactured goods (Haggblade, Hazell, and Brown, 1987). Commercial activities and other similar services must be produced locally since they cannot be imported. Furthermore, they often have a high labor content. Merchants can also play a significant role in opening up new markets for isolated producers, in supplying information about buyers' preferences, new products which could find markets, etc. The comparative neglect of such service activities in previous research needs to be rectified.

CONCLUSION

To date, research on food security and on rural nonfarm enterprises has run along two parallel, if generally separate, tracks:

Food security research, with the farm household as its unit of analysis and a primary focus on agricultural activities, has regularly documented the importance of off-farm employment and nonfarm income sources in the farm household. Yet, it has generally not set out to explore the prospects for expanding employment and income from these sources.

Small enterprise research, by contrast, with the rural nonfarm enterprise as its central focus of analysis, has frequently been concerned precisely with examining the prospects for growth of such enterprises, and with policies needed to promote such growth. While the approach has taken account of a variety of links with agriculture, it has not focused on the ability of nonfarm enterprises to provide income and employment to particular groups of households unable to provide acceptable levels of food security through their own on-farm agricultural production. Nor has it explored the nature of rural labor markets which determine the extent to which expanding nonfarm employment opportunities in one region will spread to other less-favoured locations. These are the challenges which face those who would seek to explore the ability of off-farm employment and nonfarm enterprises to contribute to the resolution of the food security problem.

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SMALL ENTERPRISE DEVELOPMENT IN RURAL SWAZILAND: CURRENT STATUS AND RESEARCH NEEDS

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INTRODUCTION

There is increasing international concern over the shortfall in food production in Africa. However, there is another issue that has yet not been fully explored--the issue of access to food. A critical question is the role of rural small enterprises in generating rural employment and income as a means of increasing access to food. The tie between rural enterprise development and food production in Swaziland has been examined by Magagula (1980), de Vletter (1984), Carloni (1982), McCann (1981,) and Neocosmos (1985).

The government of Swaziland is promoting small rural enterprises because of the realization that only a fraction of the annual additions to the labour force can be productively employed in urban areas and farming because of the large numbers of business that are owned by expatriates.

This paper explores and describes existing small rural enterprises in Swaziland. The definition of a small rural enterprise usually includes capital levels, labour and employment levels, ratio of capital to labour, ownership structure, control and responsibility, and legality. Brown (1987) defines a small enterprise as an inseparable entity from the individual.

COMMERCIALIZATION IN RURAL SWAZILAND

Despite its small size, Swaziland is a country of great diversity. For example, the country is characterized by a dual system of traditional and modern ministries.[2] The second contrast is found in the dual form of land tenure. The Swazi Nation Land (SNL)[3] comprises 57% of the total land and Individual Tenure Farms (ITF) comprise 43%. There are about 850 ITFs, ranging from family units of 20-40 hectares to large agro-industrial estates of 15,000 hectares and more.

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[2]The Supreme Head of the Swazi Nation is the King, who exercises authority in the modern government through a Council of Ministers and in the traditional government through the Swazi National Council (SNC).

[3]Swazi Nation Land falls under the control of the SNC and it is land vested in the King in trust for the Swazi Nation. This land cannot be individually owned, *i.e.*, all citizens are entitled to a piece which is allocated by chiefs governing the communal land tenure system.

Nonagricultural enterprises

Swazi Nation Land supports about 2,000 Swazi nonagricultural enterprises which have been established primarily without any outside assistance. About 80% of these are small retail traders. The remainder are almost entirely small transport operators, or small service enterprises such as shoe repairers, carpenters, casual builders, beer brewing, and craftsmen.

Promotion of small enterprises

The government is well aware of the need to develop small enterprises. New sections have been set up in the Ministry of Commerce, Industry, and Tourism to promote small enterprises. These sections are the Small Enterprises Development Company (SEDCO) and the Swazi Craft Limited--both of which were set up in 1970 with the aid of UNDP technical assistance. The third is the Swaziland Industrial Development Company which assists small and large businesses.

In promoting handicrafts, SEDCO assists firms by:

- o creating jobs within small-scale industries;
- o setting up a market to assist small-scale industrialists;
- o assisting small-scale industries with loans and investigating ways of obtaining raw materials; and
- o guiding and assisting small entrepreneurs and handicraft producers to prepare and submit applications for financial assistance from SEDCO.

Swazi Crafts Limited, on the other hand, purchases handicrafts from rural areas such as Swazi rugs (commonly called Swazi mats, made from flexible grass which grows on mountains), table mats, necklaces, and many other products. Since Swazi Crafts is a non-profitmaking organization, the women are thus encouraged to produce more goods and improve the quality of their produce. Swazi Crafts Limited has also set up depots throughout the country which are used by the women for storage.

Handicrafts production is important because it provides employment for men, women, and girls in the rural areas. In fact, as far as the employment situation is concerned, it is common for people to rely on their handicrafts to make ends meet, even while they are in the process of seeking other employment. Once employment is found, these people will still employ their leisure time on handwork.

Role of nonfarm activities

Many small farmers and unemployed individuals depend on nonfarm activities to subsist. Nonfarm activities are also important in rural development. For example, agricultural products are traded, transformed, and transported. Tools and light equipment have to be repaired and roads, dams, dykes, storage, and houses have to be constructed. All these activities help the rural population to improve their level of income. These activities are also more labour-intensive than comparable activities in the urban areas. In addition, they also produce more employment per unit of capital. Liedholm and Chuta (1976) concluded that there is an economic justification

to promote nonfarm activities because they will increase rural incomes and help diminish migration towards urban centres.

Sources of rural income

A survey by Russel (1986) identified six sources of income for people living in rural areas (Table 1).

The main sources were farming, employment and nonfarming enterprises. Russel also found that over one-half of the land owners had nonagricultural enterprises on their land. Most of these enterprises were run by the landowners themselves, using hired and family workers (Table 2).

The final subset of the population is defined as the investors. These are classified on the basis of the homestead head being a professional or a skilled technician. From national surveys, 30 homesteads were classified as investors.

ASSISTING RURAL ENTERPRISES

Table 1. Sources of income to landowners, Swaziland, 1986.

Source	Percentage
Farming only	7
Farming with nonfarming enterprises	42
Farming, with employment	10
Farming, with employment and non-farming enterprises	24
Employment only	14
Nonfarming enterprises only	3

Source: Russel (1986) p. 28.

Table 2. Enterprises established on rural holdings, Swaziland, 1986.

	General dealer	Butchery	Bottle store	Specialised wholesaler	Other	Total
Own Enterprise	5	2	0	2	3	12
Premises rented out	3	1	2	0	2	8
Total	8	3	2	2	5	20

na = data not available.
Source: Russell (1986) p. 31

Small rural enterprises have started mushrooming in many rural areas of Swaziland. The common feature of most of the smallholder enterprises is the control which business and agribusiness wields over the conditions of smallholder production through the monopoly which it holds over markets. In order to promote this kind of enterprise, it would appear imperative for the government to pay special attention to this group of people and to devote larger portions of the remaining land still awaiting to be purchased to smallholders.

It has also been noted that small-scale nonfarm activities have tended to support the major rural activity, farming. Lack of government support for these enterprises has posed serious unemployment problems in the rural areas. Marketing constraints for small rural enterprises has also discouraged potential small businesses. The government has a tendency of buying from foreign and larger companies products and services that could be provided by local small businesses.

The author commends the growing practice of involving women in farming and nonfarm activities. The most obvious contribution by the youth is at learning institutions, mostly organized by church missions, such as the Mdzimba Young Farmers Training Scheme, St. Mary's School of Appropriate Farming Technology and the Usuthu Mission Young Farmers Cooperative. Training in nonfarm activities is provided at several centres such as the St. Phillips Knitting School, Entonjeni Women Centre, Kadvokolwako Centre, the Manzini Institute of Technology (MITC) for both farming and nonfarm activities, the Vocational College at Matsapha (VOCTIM), and the Swaziland College of Technology (SCOT).

Emphatic action is needed to formulate a land policy which would encourage the schemes described in this paper. Various land tenure studies in Swaziland have generally addressed the question of whether or not the existing form of customary tenure provides a sound legal environment for intensive agricultural advancement by smallholder producers. Some of the studies concluded that the present approach is conducive enough. However, the author believes there is a need to overhaul the tenure system or a need for innovation and variation in the production structure on Swazi Nation Land.

The government should also make special efforts in directing institutional procurement towards small rural enterprise, developing industrial estates--especially those which stress linkages between small and large enterprises--cautiously encouraging sub-contracting by large schemes to small enterprises, improving access to credit facilities, and devising methods of improving the managerial skill of small rural enterprises.

RESEARCH NEEDS

Swaziland is experiencing a difficult economic situation that is compounded by drought and floods, reduced investment, and depressed world markets. Although Swaziland has one of the highest ratios of paid employment to the working age population in Sub-Saharan Africa (29% in 1982), the growth in paid employment has not kept pace with the growth in the working age population. This trend of increasing unemployment will likely continue, due to the high population growth rate

formal and nonformal sector jobs are needed. Making small rural enterprises viable could be an important, effective component of the overall governmental strategy.

Recent studies of small rural enterprises have failed to identify many of the constraining factors because most have been too descriptive in nature. There has been little rigorous analysis of the sources and magnitudes of food insecurity in Swaziland. A detailed investigation into this problem is long overdue.

There is a need for a survey of small-scale enterprises to determine production capabilities, profitability levels, and the social aspects of these small enterprises. Research should also explore the extent of processing and manufacturing in the sampled areas. Specific enterprises that need to be investigated include cottage industries and arts such as beer brewing; bricks construction and the construction industry as a whole; pottery; tailoring; carpentry; and all kinds of handicrafts goods. The other aspect of this study should focus on the service sector such as shoe repairs, vegetable traders, government personnel services, and transport.

In summary, research should focus at the household level where there is a need to examine both farm and nonfarm activities. Second, there is a need to explore the dynamics of the small enterprise sector to better understand its growth potential and transformation during the course of development.

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SMALL-SCALE RURAL ENTERPRISE DEVELOPMENT IN TANZANIA: CURRENT STATUS AND RESEARCH NEEDS

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INTRODUCTION

Given the population growth rate of about 3.4% and the seasonality of agricultural production, particularly in areas where irrigation water is not available, it is unrealistic to expect agriculture to effectively employ the total rural population. Due to national budget constraints, the educational system cannot absorb a significant proportion of the primary school leavers into higher education. Given their youth and lack of capital and skill, they cannot immediately be absorbed in agriculture, even if cultivatable land is available. Thus, the introduction and development of small-scale enterprises alongside farming is a promising strategy for increasing employment and incomes of the rural population.

A nationally-accepted definition of small-scale enterprise (SSE) does not exist. However, this study describes a SSE as an activity performed by a person or a group of people in a rural or urban area characterized by a low degree of organizational skill and a relatively low level of capital--compared to labour--in producing the final product. Part of this description is shared by the Small-Scale Industries Organization (SIDO). The National Bank of Commerce (NBC) uses a financial definition to classify small and large enterprise. According to the bank, a SSE is one which uses US$300,000 or less for its establishment.

SSE can be classified into urban and rural. Each of the classes can again be divided into formal and informal categories. Although many definitions of urban exists, this paper considers a locality administratively carrying the classification of city, municipality, town, or minor settlement to be urban and the rest to be rural[2], The informal sector refers to firms that fall outside the system of government benefits and regulations (ILO, 1972).

The Small-Scale Industries Organization (SIDO)[3] was established by *Act of Parliament No. 28 of 1973*, following the *Party Policy Guidelines on Small-Scale Industries* issued in 1973 (SIDO, 1984), and the organization started functioning in the first half of 1974. The act stipulates, among many functions, the following:

- o to promote the development of small-scale industries;

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[2]For an alternative definition of urban, see Liedholm and Mead (1987).

[3]In this paper, small-scale enterprise and small-scale industry are used interchangeably, although the latter implies some manufacturing.

- o to plan and coordinate activities of small-scale industries;
- o to carry out market research in goods manufactured by small-scale industries;
- o to provide services necessary for, or incidental to, proper development to small-scale industries, parastatal organizations, and other persons engaged in small-scale enterprises; and
- o to carry out research in the development of small-industries and the marketing of their products, including the standard and quality of such products.

SIDCO has been performing its functions largely through a network of regional extension offices throughout the country.

The foregoing discussion indicates that government has recognized the role of small-scale enterprise in Tanzania for some time. However, although SIDO has been in existence for roughly 15 years, careful observation reveals that SIDO deals largely with formal sector firms, in both the urban and rural areas. SIDO assistance tends to support urban factory type enterprises (Table 1 and 2). For example, between 1973 and 1983 SIDO invested T.Shs 103 million (US$18 million at the 1973 exchange rate) in these industries which employed 21,528 people, and produced goods worth T.Shs. 237.5 million (US$38 million) (SIDO, 1984).

Table 1. Hire-purchase loans (million T.Shs.) for SIDO in rural and urban areas, Tanzania, 1973 to 1983.

Category	1973-74	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82	1982 83
Urban	0.000	0.0	2.9	1.7	21.7	40.7	44.3	49.6	52.5	44.70
Rural	0.025	1.3	2.3	1.3	3.5	5.8	9.2	5.9	4.8	9.83
Total	0.025	1.3	5.2	3.0	25.2	45.9	53.5	55.5	57.8	54.53

Source: Adapted from SIDO (1984), Table IV, p.17.

Table 2. Number of industries and structure supported by SIDO, Tanzania, 1973 to 1983.

Type of Industry	Number of projects
Food and food-based	289
Agro-based	139
Clothing and apparel, footwear	261
Building materials	242
Household items	198
Transport and related	35
Hospital/health	12
Educational requirements	52
Total	1,228

Source: Adapted from SIDO (1984).

The informal sector in both the urban and rural areas continues to escape the net of SIDO. These informal enterprises are the very small, invisible, fugitive, sometimes household enterprises. Their products may appear trivial when compared to those from the large-scale manufacturing, but they are important when their employment and income to the individual households is considered.

CURRENT STATUS OF RURAL SMALL-SCALE ENTERPRISES IN TANZANIA

Enterprise types

This paper chiefly addresses small-scale rural enterprises (SSRE). This category, includes the formal type--which, to a large extent, has been dealt with by SIDO--and the informal type, which so far still remains independent.

Various classifications of the existing rural enterprises are possible. The classification could be on the basis of size (number of people or capital investment), type of management, value of output per unit of time, etc. The classification used in this study is based on the nature of the final product. Admittedly, the list, number, or types of small-scale rural enterprises is endless. However, it can be classified into wood processing, clothing, weaving, brewing, and food processing. Other groups are forest-related activities, leather craft, earthworks (brick making, etc.), small retailing, and ivory craft (see Table 3 for detailed product description).

An outstanding feature of these industries is a regional variation, largely because these enterprises use locally available materials. Wood-processing firms, as well as charcoal production, are mostly located where wood is relatively plentiful. Earthworks and weaving are also location specific, being determined by the type of soil and the right vegetation, respectively. With regard to brewing, the type of liquor produced (sorghum, maize, coconut or pineapple) is also a function of the location.

Table 3. Main small-scale rural enterprises, Tanzania.

Group	Activity type	Activity coverage description
I	Wood processing	Carpentry: doors, chairs, stools, tables beds, windows and cupboards.
II	Clothing	Cloth tailoring and garment repair.
III	Weaving	Basket, mats, brooms, hats, handloom weaving, twines from natural fibres (e.g., sisal).
IV	Brewing	Brewing of sorghum, maize, coconut, and pineapple beer.
V	Food processing	Bun, bread, samoosa, grinding grain.
VI	Forest related activities	Charcoal production, fuelwood production, pitsawing.
VII	Leather craft	Belts, shoes, cowhide drums, leather bags.
VIII	Ivory/horn crafts	Bangles, etc.
IX	Earthworks	Pottery and ceramics, brick making.
X	Glassbead crafts	Beads for neck, wrist, and waist.
XI	Small retailing	Small stalls by roadsides selling, salt, dried beans, fruits and vegetables, sardines, and soft drinks.

Thus, the natural environment is critical in determining the kind of small-scale enterprise in a given area.

Characteristics of small-scale rural enterprises

These enterprises are characterized by low use of capital. Most of the labour used in these enterprises comes from the household pool and labour is rarely hired. The enterprises may employ only one member of the household (as in charcoal production), a husband and wife (as in weaving), or a set of family members (as in brewing). Some enterprises are gender specific, while others are performed by both men and women. Charcoal production, wood processing and ivory/horn craft are basically male enterprise. Weaving, brewing, food processing, and small retailing are performed by both men and women, but the degree of involvement of either gender depends on location. Variation in culture and its associated norms and beliefs across the country also has an impact on the division of enterprises between men and women. However, women are generally most active in weaving, pottery brewing, and food-processing activities.

Ownership of SSRE is essentially private (*i.e.*, individual or household owned). Production under cooperative arrangement is looked at by farmers as attracting government action with its attached legislation, taxation, and control. However, operating cooperatively would attract credit from the rural financial markets because of its political appeal.

Evidence from previous research (Minde, 1985) suggests that some of these rural enterprises are being performed by less-advantaged groups, in terms of special skills, education, and age. The more educated will not be found in weaving, producing charcoal, or small-retailing of rural-produced goods. Likewise, particular enterprises seem to be associated with the old, such as brewing, weaving, and pottery making, although exceptions exist.

Capital acts as a barrier to entry in some of the enterprises, such as brewing, food and wood processing, and clothing. One needs sufficient capital to purchase items like sugar for brewing and food processing. Carpentry also demands a high initial capital investment to acquire tools like planes, hammers, bits, etc.

The SSRE products are marketed through three major channels. The first source of demand is rural households for items such as brewed liquor, apparel, foods, and processed wood and woven products. Some are for immediate consumption while others are used as source of inputs. Second, urban demand exists for products from villages close to urban areas, as few products are transported to more distant towns. Some products, like charcoal, serve a very important role in urban areas. For example, available evidence indicates that 95% of the urban families in Tanzania use charcoal as an energy source. There exist no contractual arrangements for marketing, with the exception of a few high cost items, such as beds, chairs, and cupboards. Contracting for these items is necessary because the operators have little capital and if the little capital is locked up in slow-moving items, it may endanger the sustainability of the business. The third channel for these products is tourist demand. Products are sold in markets, ranging from those that are informally organized by individual households on roadsides to those that filter into the Tanzania

Handicraft Marketing Corporation (HANDICO). HANDICO was established in 1977 as a subsidiary of SIDO with the objectives of marketing handicraft products, both domestically and internationally (SIDCO, 1988).

Agriculture and nonfarm activities interface

Several researchers have concluded that the primary objective of farming for smallholders is to obtain sufficient food to carry the family through the year (CIMMYT, 1977; Kanga, 1977). However, farming does not take place every month. Due to the seasonal variation in farming, about 50% of the available family labour is not used in farming and is therefore potentially available for nonfarm jobs. Evidence has also shown that some nonfarm activities are more rewarding than farming (Minde, 1985). But since there is generally a lack of trust in the efficiency and reliability of the food market operations, there is a tendency for every family to grow its own food, particularly grain. Generally, farming operations alternate with nonfarming operations, but this does not necessarily imply that an activity is completely put aside at any particular time. For example, a farmer who is also a carpenter will make less furniture during the peak agricultural season than in the agriculturally trough season.

Although weaving is most intensive in the off-season, it is also pursued as a resting activity at the homestead in the afternoon and evening hours. For some households, farm and nonfarm activities are carried out on a rather equal basis because of the need for money to purchase essential goods and services that are not produced by the household. This is particularly the case for very poor households, who are in greatest need of cash during weeding and near harvest. The support and stability that nonagricultural jobs provide the farming community are important because, short of this, farmers would move to the towns during the off-season to look for jobs which may not be available, resulting in more urban unemployment and consequent instability in farm output.

The policy environment

The government has been promoting SSRE through the founding of SIDO 15 years ago; and subsidiary organizations such as HANDICO and the Small Industries Consultancy and Training Assistance (SICATA).

Numerous policies have been adopted to promote small-scale industries, including (SIDO, 1988):

- Exemption from income tax, sales tax, and customs duties for industries established in the villages. These exemptions run for two years. However, in practice, the exemptions are limited to village-government administered projects.
- Exemptions from customs and sales tax of machinery and start-up materials ordered on behalf of SIDO under SIDA, Dutch, and UN agencies assistance programmes. Although it covers a considerable part of the needs of small-scale industries, it does not provide blanket cover to all small-scale industries or SIDO imports.

- The Bank of Tanzania (Central Bank), when it revised its interest rate in 1978, established an interest rate of 7.5% for rural small-scale industries and 8% for urban small-scale industries. These rates are far below the normal commercial rates of about 30-40%.
- In 1988, the National Bank of Commerce (NBC) endorsed a "liberalized lending policy to the rural sector (small-scale farmers)". Under this circular, the bank extends financial assistance to firms, not exceeding 85% of the total project investment costs. The other 15% is equity contribution of the borrower (National Bank of Commerce, 1987).
- The construction of industrial estates in 17 of the 20 regions of the mainland has provided incentives for the establishment of industries. Allocation of shades on a normal rental basis reduces the cost of buildings for the enterprises.
- SIDO provides various free or subsidized services, such as conducting feasibility studies, assisting in project preparation, helping to obtain finance, and the purchase of raw materials and with training.
- A hire-purchase scheme, run by SIDO for urban and rural clients, provides funds to purchase machinery with a 10% down payment and 3-7 years repayment period with concessional rate of interest.

Although these efforts appear very impressive, there is a need to look into the kinds of groups that are actually benefiting from these incentives, the bureaucratic elements involved in acquiring the loans, rebates, and services, and to identify ways to minimize these constraints.

CONTRIBUTION OF SMALL-SCALE ENTERPRISES TO FOOD SECURITY

SSRE contributes to improving food security through its impact on the demand side of the food security equation. Food security is broadly a function of food production, availability, accessibility, and utilization within the household. The third factor--access--is a function of income, which determines the effective demand for food by urban and rural households. SSRE have the potential of creating employment, output, and therefore, income.

Formal sector employment and income generation

Small-scale industries covered by the formal sector which, to a large extent, fall under the SIDO programme, include:

- craft-based units like pottery and ceramics, wood processing, textile, blacksmithy, fibre processing, and carvings. These are either one-person operations, group efforts or artisan cooperatives.
- very small industries employing less than 10 persons, but not related to crafts, including flour mills, repair workshops; and
- factory type of industries, employing more than 10 persons and often using power.

Based on SIDO (1988) records, a national census conducted in the end of 1978 revealed that there were 3,978 small-scale industries in Tanzania of which 782 were the factory types. They produced goods worth T.Shs.832 million (US$1 = T.Shs. 8.2) and employed 52,284 persons. This does not include the handcraft subsector. A subsequent census conducted in June 1981 revealed a total of 4,893 industries of which 1,193 were factory types. Their total production was valued at T.Shs.1,854 million and they employed 103,728 persons. This included 35,000 artisans who produced an estimated T.Shs.165 million of goods. Assuming the same rate of growth, the number of persons employed today can be estimated at 500,000. When part of this value of production is translated into earnings, it is evident that the sector's contribution to effective demand, particularly for food, is significant.

Informal sector employment and income generation

Data on informal sector employment and income are not readily available. In fact, one of the characteristics of the informal sectors is the inadequacy of data. The farm and nonfarm employment study completed in 1985 revealed that in one of the villages, while the available family labour fluctuated from 71-80 mandays per month, labour solely used for nonfarm activities (excluding social aspects) ranged from two mandays in the busiest agricultural months to 15 mandays in the slack agricultural seasons (Minde, 1985). About 20% of the family labour is therefore used in the production of cash-earning nonfarm enterprises in the slack season. Translating this employment into income (Table 4) indicates that average household annual income (enterprisewise) varied from T.Shs.88 for baskets in Kingolwira to T.Shs.7,840 for charcoal production. Average household annual income from nonfarm activities ranged from T.Shs.514 in Doma Village to T.Shs.10,894 in Mangae village.

The importance of family cash income from nonfarm enterprises is also demonstrated when the actual receipts from crop sales are compared with the cash receipts from the nonfarm products (Tables 4 and 5). For example, in Mangae Village cash earned from crop sales equalled only 10% of cash from nonfarm products. Due to the locational specificity of these enterprises, one finds that the trend is reversed in Doma Village, where average household income from nonfarm products is about 30% of receipts from crop sales.

Although most of these families attempt to grow their own food, households need to purchase some of the food items like protein products, cooking oil, and other ingredients from other households and urban areas to supplement the home-produced food. Apart from creating employment, particularly in the off-season, these enterprises are important in their contribution to food security through the income generated from product sales.

CONSTRAINTS ON THE EXPANSION OF SMALL RURAL ENTERPRISES

There are numerous constraints that limit the expansion of small rural enterprises in Tanzania.

Table 4. Average nonfarm income per sample[a] household involved by source and location (T.Shs.), Tanzania.

Village:	Kingolwira		Fulwe		Doma		Melela		Mangae	
Source	No. of household	Average income	No. of household	Average income	No. of household	Average income	No. of household	Average income	No. of household	Average income
Mats	2	144	0	0	6	287	8	1,500	9	2,020
Brewing	1	2,450	5	352	1	4,550	5	3,000	4	6,634
Charcoal	1	1,040	1	6,500	0	0	1	7,840	0	0
Baskets	0	88	0	0	6	277	9	1,929	11	2,240
Carpentry	0	0	1	3,400	0	0	0	0	0	0
Total	4	3,722	7	10,252	13	5,114	23	14,269	24	10,894

[a]The sample size per village was 15.
Source: Adapted from Minde (1985), p.77

Table 5. Average income per household from crop production, Tanzania.

	Village					
Type	Kingolwira	Fulwe	Doma	Langali	Melela	Mangai
Total[a] gross margin	9,596	28,349	7,315	5,664	7,052	2,759
Actual[b] receipts	1,744	3,834	1,519	352	1,457	1,085

[a]Yield/ha (kg) times price minus variable costs (including hired labour, tractor hire, etc.)
[b]Quantity sold times price per kg.

Financial assistance

National financial institutions which extend credit to the small-scale sector are mainly the NBC and the Cooperative and Rural Development Bank (CRDB). Yet, the credit supply remains small because of:

- o a lack of information to the needy about the existence of these facilities;
- o bureaucratic channels that applicants must follow, including the money and time required to push papers through various town-based offices;
- o traditional attitude of bankers which are guided primarily by the consideration of security, rather than by the eligibility of the project; and
- o a lack of adequate necessary technical expertise to prepare loan documents.

Shortage of tools
Hand tools are now produced in machine tool production centres in the country which are under the National Development Corporation (NDC). However, production is far behind the demand. In addition, these tools are not simple enough to meet the requirements of the very small rural enterprises, as the firms mainly produce tools to meet the needs of factory type enterprises.

Shortage of skilled technicians
Training of trainers is necessary to promote small-scale enterprises. A great number of technicians of various job descriptions are needed to meet the demand in both urban and rural areas. Product designers are particularly crucial in the area of product differentiation, which is necessary so small-scale products can compete with those from the large-scale manufacturing sector.

Inadequate infrastructure
Inadequate water supplies, electricity supplies, and roads limit the growth and development of these enterprises. It is partly because of infrastructural underdevelopment that SIDO concentrates its activities in terms of total investment in the urban and peri-urban areas.

Foreign exchange
Although this problem is common to many sectors of the economy, small-scale industries are hit relatively harder because the shortage limits the possibility of importing industrial machinery, spares, and raw materials needed to increase production.

Lack of clear policy on assisting the very small producers
The small-farmer, who does farm work for a few months of the year and later engages in small-scale enterprises--producing baskets, mats, carpentry items, etc.--is not yet effectively reached by the services of formal organs such as SIDO.

Demand for the products
The demand for products produced by small-scale rural enterprises is limited to the rural and the immediate urban areas. For high income groups, these products are out competed by products produced by large-scale manufacturing firms. The main reason for this is because consumers perceive SSRE products to be of poor quality, compared to similar products from the large-scale manufacturing sector. SIDO is often used these days in the business language as a nickname for an inferior product.

RESEARCH AGENDA

Current research
Currently, SIDO is undertaking inadequate research to identify how better management can solve the capacity underutilization problems that affect many of its holdings. SIDO is currently embarking on mapping out the rural sector for rural

industrialization. Apart from these efforts, there are sporadic, one shot, small-scale research projects conducted by staff and students of the two universities--Dar es Salaam and Sokoine--on specific areas of interest, lasting from a few weeks to three months (see for example Bagachwa, 1982). However, these research projects, so far, tend to have an urban bias.

Future research agenda

Given the constraints that now prevail in the rural industry sector and the importance of the sector in providing employment and income to the farm and nonfarm population, a full-scale research agenda to identify areas of improvement for the expansion of the sector is necessary. There exists a need to carry out research along the following lines:

- Map out the nature and type of SSRE in the regions and attempt to classify them. In doing so, it may be necessary to sample regions because of resource limitations. However, based on previous studies, SSRE are location, gender and even educational-level specific. Therefore, it may be necessary to catch these parameters in the sample.
- Quantify the importance of these enterprises in terms of the employment and income they generate directly; and the forward and backward linkages that exist between them and other sectors.
- Identify and characterize enterprises that produce products which have special characteristics and tastes that will make it possible for them to compete favourably with similar products from the large-scale manufacturing sector. This is in recognition of the fact that great room for improvement in diversity exists, particularly in the form of design and embroidery.
- Identify cost-effective methods to reach the very small enterprise owners so they have direct access to the information about the assistance that is available from SIDO and other government agencies; and assist them to increase their bargaining power in terms of prices and marketing strategies, but at the same time guarding against adverse government intervention. This is in recognition of the fact that despite SIDO's role in assisting rural industrialization, they largely serve the urban and the peri-urban population. The very small farmers are still bypassed.

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IMPACT OF IRRIGATION ON FOOD SECURITY

IRRIGATION RESEARCH PRIORITIES FOR SOUTHERN AFRICA

Mandivamba Rukuni[1]

INTRODUCTION

Irrigation is a major force in world agricultural development. For instance, 20% of the world's agricultural land is irrigated and it produces 40% of the world's agricultural output (Kouda, 1977). India, China, Mexico, Sudan, Egypt, and many other countries are using irrigation as the engine of agricultural production and production stability. The World Bank, the Food and Agriculture Organization (FAO), and many other international organisations regard irrigation as an important means of increasing food and agricultural production. But so far, SADCC states have been slow in developing irrigation. For example, Southern Africa has an estimated 2% of its cropped land under irrigation--compared with 5% in Sub-Saharan Africa and 35% in India. SADCC's Food Security Programme has launched Project Number 12 to improve irrigation management and development in the region; but the knowledge base on the technical, social, economic, and environmental issues surrounding irrigation in Southern Africa is woefully inadequate. For each type of system, Project 12 needs updated records of areas, crops grown, yields, and irrigation potential.

This paper primarily calls for expanded applied research on irrigation and food security in the SADCC region. If irrigation is to play an increasing role in family and national food security, then research has to indicate what needs to be done to facilitate cost-effective irrigation development.

OVERVIEW OF IRRIGATION IN SADCC STATES

Before I turn to an overview of irrigation in individual SADCC countries, I would like to draw attention to a recent FAO (1986) study of irrigation in Africa. The study reviewed food production in eight countries: Senegal, Burkina Faso, Niger, Mauritania, Mali, Somalia, Botswana, and Kenya; and reported that irrigation is an essential element of future food production in both the short and medium term. The study concluded that in the remaining countries on the continent, at least one-half have some of their land in drought-risk zones where small scale irrigation based mainly on small dams and groundwater could do much to reduce rural hardship and the need for costly disaster relief.

I would now like to turn to irrigation in the SADCC region and begin by commenting on the difficulty in determining how much land is potentially available for irrigation.

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Botswana

Botswana currently has an estimated 1,500 ha under irrigation while the World Bank (Olivares, 1987) estimates the national potential at around 57,000 ha. But the FAO (1986) has estimated that Botswana has a potential of 100,000 ha that can be brought under irrigation--a figure that is 94% higher than the World Bank's estimate. The FAO estimates are based mainly on water availability, but when other factors are taken into consideration such as suitable soils, present and potential technologies, and the cost of developing irrigation, the irrigation potential falls sharply.

Howard Sigwele (1989) has noted the difficulty in measuring irrigation potential in the Okavango Delta, one of two large sources of surface water in Botswana. The Okavango River enters Botswana from Angola in the north-west and flows into the Okavango Delta, a 1 million ha terminal swamp/floodplain. The Okavango Delta is rich in wildlife, but the soils are of unknown cropping quality. Both agricultural and environmental concerns are of strategic importance in deciding on what public action to take on this potential 1 million ha scheme.

Mali's experience with a similar scheme is instructive. In 1929, the French proposed to develop a 1 million ha irrigation scheme. Although they had predetermined that cotton was the most profitable crop, because of unforseen soil problems, rice turned out to be a more profitable crop. Nevertheless, the scheme has failed to attract settlers and after 60 years, only 40,000 ha are under irrigation.

Zambia

Zambia has a large potential for both rainfed and irrigated production. The government and commercial farmers feel that part of the answer to recurring drought lies in irrigation. An estimated 6,000 ha are under irrigation in Zambia, compared with the World Bank's (1987) estimate of 423,000 ha and the FAO's (1986) estimates of 3.5 million ha of irrigation potential. A large number of irrigation projects are in various stages of preparation, but detailed plans for development have not been drawn up. Action-oriented research on soil and water relationships is needed to further project-level planning.

Recently attention has been focused on the "draw-down" areas of Lake Kariba and the need to improve the livelihood of about 36,000 people who were displaced when the dam was constructed at Kariba. Rainfall is unreliable in the Kariba Basin and people regularly run short of food. Policy guidelines for smallholder irrigation surrounding Lake Kariba include the use of simple irrigation methods, usually matched with low capital costs. Self-help by the local population is encouraged in allocating public funds.

Malawi

Malawi has an estimated 20,000 ha of developed irrigation, of which about 80% is large-scale private and estate schemes, 15% government, and 5% self-help (Hunting Technical Services, 1981). Between 1968 and 1979, an estimated 3,200 ha was developed for irrigated rice by smallholder farmers in 16 schemes around Lake Malawi, Lake Chirwa, the Phalombe Plain, and the Shire Valley (Makato, 1984). These self-help schemes were characterized by Stoutjesdirk (1984) as farmer-initiated

diversion schemes to supplement dry season production. Summer rice, vegetables, and pulses are grown during dry spells and the vegetables are consumed locally. The impact of such schemes on nutrition and household food security is still to be quantified.

Tanzania

Tanzania is probably the only SADCC country where traditional irrigation was practiced in pre-colonial days (Hekstra, 1983) on the lower slopes of Mount Kilimanjaro, the Kilombero Valley, Sukumaland, and Tukuya. Large-scale schemes was initiated by the government in the 1950s at Kalenga, Mlali, Kitivo, Ikona Utengule, and Uru-Chivi. The government subsequently stopped constructing these schemes because of their poor performance. In 1974, the government adopted a policy of investing in schemes for smallholders.

The FAO (1986) recently estimated that there are 140,000 ha of irrigation in Tanzania, which represent about 6% of potential and about 3% of total cultivated area (Mgonja, 1983). About 80% of all irrigation is farmed by smallholders (Mrema, 1984) and/or small groups commanding areas rarely exceeding 5 ha. These schemes use water from rivers, springs, and flood plains.

Zimbabwe

Zimbabwe has an estimated 150,000 ha under irrigation, 30% of the estimated potential of 500,000 ha. Virtually all wheat and sugarcane, about 70% of all coffee and tea, and 45% of cotton are grown under irrigation. Sizeable areas of citrus, other fruit, maize, and soyabeans are also grown under large-scale private irrigation.

A World Bank (1987) study concludes that small projects are generally more profitable, because they contribute more to the permanent employment of rural people. Zimbabwe, for instance, has a backlog of identified schemes where water and soil potential has been surveyed for smallholder development. Yet, development has been slow because of a variety of policy reasons, some common in other SADCC countries as we shall discuss later.

POLICY ISSUES

The Development of irrigation potential

SADCC states have exploited a small amount of the existing potential (Table 1). Water is probably the most limiting factor on irrigation development. Most SADCC states have not assessed the soil potential adequately and the extent to which soils curtail water potential is largely unknown. The costs of irrigation development are rising and now range from US$4,000 to US$8,000 per ha (Table 2). Despite the increasing cost of development, irrigation can still achieve over 10% economic return to investment (Table 3).

Type of systems

With the exception of Tanzania, most of the irrigated area in SADCC is in large-scale, private schemes. Smallholders farm a small portion of the total land under

Table 1. Current irrigated area and potential of nine SADCC states.

Country	Current irrigated area ('000 ha)	FAO estimate of irrigation potential ('000 ha)	Potential developed (%)	World Bank's estimate of potential ('000 ha)
Angola	10	6,700	< 1	na
Botswana	12	100	12	57
Lesotho	1	8	13	na
Malawi	20	290	7	na
Mozambique	70	2,400	3	na
Swaziland	60	7	< 1	na
Tanzania	140	2,300	6	na
Zambia	16	3,500	< 1	523
Zimbabwe	130	280	46	460

na indicates no estimate available.
Sources: FAO (1986); Olivares (1987).

Table 2. Cost per hectare[a] of irrigation development in selected SADCC countries, 1985.

	Botswana US$/ha	Zambia US$/ha	Zimbabwe US$/ha
All projects analysed	5,886	2,032	9,460
Projects with[b]:			
IRR > 20%	916	1,840	3,957
IRR 10% - 20%	4,869	2,640	9,908
IRR < 10%	11,964	8,808	9,483
Area analysed (10^3 ha)	35	13	63
Percent of potential	60	3	14

[a]Exchange rates per US$ are Pu 2; Zk 11 and Z$1.59.
[b]IRR = internal rate of return.
Source: Olivares (1987)

irrigation. Much of the smallholder irrigation was developed in arid areas during colonial periods. More recent developments concentrate on large schemes.

Smallholder schemes tend to grow a wider range of food crops, including cereals and vegetables. Women are more involved in smallholder irrigation than large-scale schemes. Siakantu (1988) reports that, following the rehabilitation of smallholder irrigation in a dry zone in Zambia, women made up 44% of farmers irrigating small plots of 0.1 to 0.2 ha. A similar trend was recorded in Zimbabwe where women are more actively involved in "comma-hectare" schemes, tilling 0.1 to 0.3 ha of irrigated vegetables (Rukuni, 1984).

Table 3. Profitability of irrigation in selected SADCC countries.

Internal rate of return (IRR)	Botswana	Zambia	Zimbabwe
20% or greater			
% of projects	27	65	40
% of irrigable area	15	89	7
10% to 20%:			
% of projects	15	13	33
% of irrigable area	54	10	89
Less than 10%:			
% of projects	58	22	27
% of irrigable area	31	1	4

Source: Olivares (1987)

A recent World Bank (1987) study of irrigation concludes that small-scale schemes in Africa have higher economic returns than large-scale schemes and generate more employment per hectare than large schemes. But both SADCC governments and donors have great difficulty in conceptualizing, designing, and implementing schemes that benefit a large number of small farmers. Research is urgently needed on the technical, economic, social, and environmental impacts of proposed small, medium, and large schemes.

Complementarity of rainfed and irrigated agriculture

The traditional view of irrigation as a separate farming system is compatible with large-scale but not small-scale, irrigation. The literature shows that smallholder (small-scale) irrigation is often more profitable when it is integrated with rainfed farming. Conflict and/or competition, especially for family labour, usually leads to poor returns from irrigation. Small farmers tend to plan and use rainfed and irrigated land conjointly, as a total production system, using common family resources to achieve common objectives. Food availability for the family, day in day out, is usually the top family priority.

The issues of complementarity and conflict have not been well addressed by researchers in Africa. For example, few studies of smallholder irrigation generate information on both rainfed and irrigated production. Both issues can be addressed at the national, as well as the household levels, through properly designed research studies.

SADCC states should take the lead in studying and debating the proper role of irrigation in agricultural and national development plans. Many of the current debates on irrigation in the SADCC region are unencumbered by facts and figures. For example, we know that the cost of irrigation per hectare is several times higher in Africa than in Asia. But to date, economists have proposed few concrete ideas on how to drive down the cost of bringing land under irrigation in Africa. For arid countries such as Botswana, and arid parts of SADCC states, the question is more

pressing since there are no foreseeable promises of rainfed technologies that will raise family incomes and food production.

Farmer and government institutions

Commentators from inside and outside SADCC identify weak irrigation institutions as a major obstacle to further development. The common situation at the national level is the absence of a central authority responsible for planning and executing further development. The tasks are usually split between separate ministries of water and agriculture. And within those ministries, irrigation is usually located in the departments with primary responsibility to another agency, such as extension and water supply. These sections are often poorly staffed; SADCC states are acutely short of people with the technical, professional, and managerial skills required to make irrigation successful. One university in SADCC has recently started training agricultural engineers. Botswana, with ambitious plans for irrigation development, has only one trained national with post-graduate training in irrigation.

If smallholder farmers were to improve their technical and managerial skills, then the pay-off to irrigation investment would rise substantially. Most of the literature already cited concludes that, after switching from rainfed to irrigated farming, it takes a long time, maybe a whole generation, for farmers to adjust to new work routines, increased risk, and technical requirements. Presently, there is almost no on-going research on the sociological and managerial issues in farmer irrigation associations. There is a need for several universities in the SADCC region to set up multi-disciplinary research groups to bring together national researchers to carry out research on the tough institutional problems surrounding smallholder irrigation.

Micro-irrigation

Irrigated gardening, or what is commonly known as micro-irrigation, is a promising but uncharted type of irrigation. (Lambert and Hotchkiss, 1987). The use of shallow groundwater represents a widespread form of irrigation by small farmers. These treeless wetlands are also termed *dambo* in Zambia and Malawi, and *vlei* or *bani* in Zimbabwe. Dambos usually have dark soils and are found at headwaters of river systems and also in alluvial river beds.[2] Alluvium extends over several million hectares. Alluvial aquifers recharge on a continuous basis, even when no rain occurs. Work in Botswana shows that even when no surface flow occurs, the aquifer is largely recharged (Nord, 1985)

Watermeyer (1987) describes Zimbabwe's experiences with water abstraction from sands. Typical of most of Africa, environmental degradation has led to siltation of rivers and dams. But river sands are capable of holding up to 40% of their volume in water. Such water is being used for irrigation in drier parts of Zimbabwe. To be able to abstract the water, a rock bar is used to impede the slow but steady movement of water held in the sand. Watermeyer concludes that it is regrettable

[2]In Zimbabwe, *dambos* cover an estimated 1.28 million ha, with more than a quarter of a million hectares in communal areas (Whitlow, 1984).

that this great water potential is not being exploited. After all, the loss of such water through evaporation is minimal.

The main attraction of micro-irrigation is that the water source can be sited in or near the irrigated plot. This obviates the need for expensive pumping, and legal problems of obtaining water rights. But the development of micro-irrigation is still fraught with problems. Since the 1930s, farmers in Zimbabwe have been forbidden by law to cultivate *dambos* because of fear of soil erosion and depletion of water tables which maintain river flows in dry seasons. Farmers were encouraged to graze these areas. This conventional wisdom has been challenged over the decades with research results showing that crop cultivation can be carried out safely on these *dambos* and, in fact, that grazing may pose a greater risk (Rattray *et al.*, 1953; Thiessen, 1972). Current research by the Faculty of Engineering, University of Zimbabwe (in collaboration with Loughborough University) indicates that the threat from crop cultivation has been overstated and with proper safeguards, the exploitation of *dambos* for micro-irrigation is compatible with good environmental management.

The lack of energy sources for pumping is another problem. There is a limit for hand-pumping and there are no existing pumping technologies suitable for such small-scale irrigation in SADCC states. The Department of Civil Engineering, University of Zimbabwe, is working on an animal-driven pump which can produce two to three litres per second which is adequate to irrigate up to two hectares. It will take time to develop a prototype that can be mass-produced or made available to smallholder farmers at affordable prices.

NEED RESEARCH IN SADCC STATES

The inventory of needed research on irrigation is considerable. Research is needed on surface water potential, soil analysis, potential for shallow groundwater-based micro-irrigation, pumping techniques, water-use efficiency, and the effectiveness of government and farmer institutions. I would like to propose a general conceptual framework to assist SADCC states identify priorities for research and development. SADCC nations need to analyze the appropriate role of irrigation in enhancing national and family food security. The key question is: what are cost-effective irrigation systems to complement rainfed food production? And, given the irrigation potential, what are the options and priorities in developing irrigation to fulfil national and household food security goals in SADCC States? These questions have to be addressed at national as well as family levels.

Irrigation and national food security

Although irrigation is a permanent feature of the strategic plans of all SADCC countries, most countries have great difficulty in drawing up policies and investment guidelines. Answers to some of these questions can be found by examining the experience of existing schemes. But recent World Bank and FAO studies in Africa have shown that returns to rehabilitating poorly designed schemes are not necessarily higher than new investments. So research has to focus on the economics of

rehabilitating existing schemes and the cost of opening new schemes. I consider this research to be of top priority for countries with arid zones and smallholder farmers.

Since governments are still the main facilitators of smallholder irrigation, the analysis will largely be within the realm of public investment appraisal. Irrigation for food security is therefore not a simple question of investment to make financial profits, but a hard question of determining whether irrigation schemes are more cost-effective for famine relief than, say, food for work and other food transfer programmes.

Household food security

To understand how families secure their food needs, research has to focus on the rural household as a production and consumption system. In some schemes, researchers should examine how the household uses both rainfed and irrigated lands. But the analysis has to go beyond local activities and examine regional and international market potential. For example, what are the opportunities for horticultural and other high-value crops for regional and international markets? A better understanding of irrigation for casual work, food for work and other employment opportunities should shed light on the food security impact of irrigation schemes on surrounding areas.

At the rural household level, there is also a need to analyze the productivity of inputs, crop diversification, and the cultivation of high-value crops. Parallel to production analysis is a need to study consumption patterns and the nutritional status of irrigators and nonirrigators to understand family strategies for coping with food insecurity, including the sale of family labour in off-farm employment.

Researchers should also try and understand the impact of irrigation on the rural economy. By studying the market relationships between irrigation schemes and surrounding areas, we may understand the multiplier effects of irrigation.

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IRRIGATION AND FOOD SECURITY IN SWAZILAND: CURRENT STATUS AND RESEARCH PRIORITIES

Vincent M. Sithole and Jan Testerink[1]

INTRODUCTION

Swaziland is a small, landlocked country bordering the Republic of South Africa in the north, west and south, and Mozambique in the east. The country has four distinctive ecological zones, ranging for the wet highveld in the west with an elevation of over 2,000 metres to the dry lowveld in the east, with an average altitude of 100 metres. The population is currently about 676,000, growing at a high rate of 3.2% annually.

Agriculture is the main economic activity, providing a livelihood for more than 50,000 rural homesteads and serving as the basis for agro industries. The striking characteristic of the rural economy is the division of land, where freehold tenure in the form of Title Deed Land (TDL) and communal tenure on Swazi Nation Land (SNL) exist side by side. The latter, about 60% of the total land, is held by the King in trust for the Swazi Nation, and provides a living for some 80% of the total population.

Some 850 farms and estates on TDL, with an average of about 800 ha, are technologically advanced, with about 60% of the arable land under irrigation. The main crops in this fully-commercialized sector are citrus fruits, sugarcane, cotton, and pineapples. By contrast, holdings on SNL which average less than 2 ha, employ a low level of technology and produce mainly maize. The contribution to the Gross Domestic Product (1981-1985) of crop production on TDL amounted to 14.6%; the contribution of SNL crop production was only 3.4% over the same period (Swaziland Government, 1988, p.6).

This paper deals with the contribution of irrigation to food security in Swaziland, defined in terms of both food availability and the ability to acquire food. Irrigation will thus be looked at in the light of food production, as well as providing employment to enable access to food. Finally, areas for further research will be identified.

STATUS OF IRRIGATION IN SWAZILAND

Organizational structure

The structure of irrigated farm operations largely follows the duality of the land tenure system in Swaziland, *viz.* those farms operating on Title Deed Land and those operating on Swazi Nation Land. For our purpose, we utilize the main subdivision

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in terms of the legal status of the land. We then include a third category, *viz.* repurchased Title Deed Land, now formally classified as SNL, but in practice these farms are managed and often operated by Tibiyo and/or Tisuka companies, and the holdings may be alienated, sold, or leased like TDL.

Much of the large-scale irrigation takes place on large TDL company estates, as well as on private TDL farms. SNL irrigation is generally small scale and often takes the form of a scheme, either cooperative or government run, or is run privately. The following subdivision can thus be made:

- o Title Deed Land involving companies and private irrigators;
- o Tibiyo/Tisuka Land; and
- o Swazi Nation Land involving government schemes, cooperative schemes, and private irrigators.

After briefly looking at each of these categories, the remainder of the paper will mainly deal with the third category, Swazi Nation Land.

Title Deed Land: companies and private irrigators

Company interest in establishing irrigation schemes dates back to the 1950s with the Commonwealth Development Corporation (CDC) setting up the Swaziland Irrigation Scheme in the northern part of the lowveld, with the main aim of producing sugar. CDC was followed by other multinational companies and a second large sugar irrigation scheme was set up in Big Bend with major involvement of Lonrho. Since the mid-1970s local capital was invested by Tibiyo, together with the Government of Swaziland and a "variety of overseas investors" (Swaziland Government, 1985, p.145). This resulted in the establishment of the Simunye Irrigation Scheme, again with the main focus on sugar, but also cotton is grown there under irrigation. About 80% of irrigated TDL are large estate farms--sugarcane and citrus being the predominant crops. Sugarcane is irrigated by means of overhead sprinklers, whereas flood, furrow, or trickle irrigation is applied to citrus.

It is not clear from national statistics how many private irrigators there are on TDL, but the literature clearly points at a substantial involvement of TDL farmers in irrigation, growing sugarcane, cotton, citrus, maize, and vegetables.

Tibiyo land

The main irrigation scheme on Tibiyo land is the Vuvulane Irrigated Farms (VIF) scheme. This scheme was set up in 1962 by the CDC as the smallholder component of the Inyoni Yami Swaziland Irrigation Scheme. The land, owned by the CDC, was leased to 263 farmers with plots ranging from 8-16 acres. The VIF was set up as a contract farming scheme, where the CDC provided overall management. The farmers receive credit and inputs and in return, they are obliged to keep at least 70% of their land under sugarcane. The remainder is mainly planted with vegetables. In 1983, the CDC formally handed over the VIF to the Swazi Nation, thus effectively changing the title to Swazi Nation Land.

Swazi Nation Land

In the documentation on irrigation in Swaziland, little detail is available on the distinction between government and cooperative irrigation schemes. However, in the *Agricultural Census* (1983-84) the distinction is made (Table 1). Comparing these figures with the 1978-79 growing season, it is clear that the number of homesteads with irrigation has grown considerably, from 3,895 in 1979 to 4,692 in 1984, or from 7.2% of all SNL homesteads to 8.9%. However, for 1979 no distinction was made between private and scheme irrigators. The majority of irrigators (90% in 1984) irrigate in their private capacity, whereas 3% of the irrigators are in government schemes and 7% are in cooperative schemes.

Government schemes. These schemes were designed and implemented by the government, free of charge to the farmers. Farmers were selected by the local chiefs, but no attempt was made to gauge interest or ability. This, according to Dunn (1984, p. 59), is the main reason these schemes are the least efficient.

According to Funnell (1984, p. 2), there are nine of these purely government operations within Rural Development Areas, and an additional three are donor assisted. The schemes range in size from 2.4 to 100 ha with a mean size of 18 ha; and they have an average of 20-24 farmers. These figures relate to the late 1970s and early 1980s. The *Agricultural Census 1983-84* found a total of only 142 farmers on eight government schemes (de Vletter, 1987 p. 4). Therefore, it appears that the number of participants per scheme has declined, which tallies with the observations made by Dunn (1984, p. 60) that "Absentee farmers are a serious problem on these schemes". However, De Vletter (1987, p. 4) reports from a survey carried out among a total of 22 irrigation schemes in operation in Swaziland (excluding the Vuvulane Irrigated Farms scheme) with a total of 558 members. As the total number of scheme farmers reported by the *Agricultural Census* was 470, the latter is probably underreporting.

Table 1. Irrigation on Swazi Nation Land, Swaziland, 1983-84 and 1978-79.

	1983-84		1978-79	
	Frequency	%	Frequency	%
Government schemes	142	0.3	na	na
Cooperative schemes	328	0.6	na	na
Private irrigators	4,222	8.0	na	na
Total irrigators	4,692	8.9	3,895	7.2
No irrigation	48,414	91.2	50,178	92.8
Total SNL homesteads	53,106	100.0	54,073	100.0

Source: 1980; CSO (1986).
na = data not available

Cooperative schemes. These schemes are initiated by interested farmers with partial funding, design, and development assistance from the government and sometimes from donor agencies. Management, labour, and most of the funding is provided by the farmers themselves through an association or cooperative.

On these schemes, crops are generally grown on individual plots and the individual farmer decides on the type of crop. Marketing of the output is also dealt with individually, but maintenance work on furrows, dams, sheds, etc. is done by work groups arranged by the scheme committee. Inputs like pesticides and fertilizers are often purchased in bulk by the cooperative. According to Dunn (1984, p. 60), the upkeep of this type of irrigation scheme is generally much better than on government schemes.

At present, there are 14 of these irrigation schemes (Vletter, 1987, p. 13). When we apply his figures to the Census figure of a total of 328 farmers in cooperative schemes, this means an average of about 23 members, a mean also mentioned by Funnell (1984, p. 2). According to the *Fourth National Development Plan 1983-84 to 1987-88 (p. 387),* these schemes cover a total area of 444 ha, but it is not indicated to which year this figure refers.

Private irrigators. Individually operated schemes are usually entirely financed and managed by the individual farmer. Therefore, farmer commitment and involvement is very good. Some of the farms get technical advice from the Ministry of Agriculture and Cooperatives' Irrigation Division, but these usually are the larger farms. According to the census figures, there is a total of 4,222 private irrigators, or almost 9% of all SNL homesteads.

Type of irrigation

From here on in this paper, it will not be possible to distinguish between different types of schemes. Data on the method of irrigation are scarce and the source used here is the Central Statistical Office's *Agricultural Census 1983-84,* which does not consistently make the distinction.

Table 2 gives details on irrigation methods. Forty percent of all irrigators use furrow irrigation, but this percentage is significantly higher among scheme irrigators (79%) than among private irrigators (36%). Sprinkler irrigation is more popular with scheme irrigators (7.7%); only 3.1% of the private irrigators use sprinklers. The majority of the private irrigators use buckets (57%).

Some socio-economic characteristics of irrigators

To put the role of irrigation in its proper socioeconomic context, it is useful to compare irrigators with nonirrigators and all Swazi Nation Land homesteads. Some socioeconomic data are available from the *1983-84 Agricultural Census.*

Irrigators have significantly more residents on the homestead than nonirrigators (9.4 vs 7.8 on average). Therefore, irrigators have more labour available than they can utilise for often labour-intensive irrigation practices.

Both scheme and private irrigators seem to be considerably better off than average SNL homesteads in general and nonirrigators in particular. Almost 47% of

Table 2. Method of irrigation, Swaziland, 1983-84 season.

Irrigation Method	Private irrigators		Scheme irrigators		All irrigators	
	Frequency	%	Frequency	%	Frequency	%
Furrow	1,506	35.7	371	78.9	1,877	40.0
Sprinkler	131	3.1	36	7.7	167	3.6
Bucket	2,393	56.7	50	10.6	2,443	52.1
Other	192	4.5	13	2.8	205	4.4
Total	4,222	100.0	470	100.0	4,692	100.0

Source: CSO (1986)

the nonirrigators own no cattle and 82% of the irrigators do own cattle, a common wealth indicator in a society where cattle holdings represent saving capability, as well as status.

In general, irrigators are more progressive in terms of agricultural practices. Almost 8% of all irrigators own a tractor; scheme irrigators score a high 12% here. Tractor ploughing is fairly common; more than one-third of the irrigators use a tractor to plough at least some fields; for the nonirrigators this is only one-quarter. Tractor ploughing on schemes is very high, probably because the scheme cooperative often operates its own tractor service. The availability of a span of plough oxen is also higher among irrigators, which means that for ploughing activities, irrigators are generally less reliant upon other farmers to plough their fields. In practice, this means that the time of ploughing can be chosen optimally.

Area under crops

Further analysis of data collected during the *Agricultural Census 1983-84* gives a fair picture of areas under different crops. The data used refers to SNL irrigators, irrespective of their organizational status, since no distinction was made by the Central Statistical Office between scheme and private irrigators. Furthermore, land measurements were made only for a sample of farmers.

The mean total cropped area per homestead is larger for irrigators than it is for nonirrigators; 1.8 ha vs 1.6 ha respectively; whereas, the mean area left fallow is the same, 0.1 ha per homestead. The 0.2 ha difference constitutes the irrigated area. In other words, the extra land available to these homesteads was put under irrigation. However, it must be kept in mind that this does not necessarily reflect an actual decision by the individual farmer, as we are presenting national means. The situation on individual farms may be quite different from this. Furthermore, the difference in size seems to be mainly due to the fact that there are more farmers in the category "more than 2 ha", the only category where the difference is significant (32.4% of irrigated farms vs 24.4% of the nonirrigated farms).

More than 80% of the farm areas is devoted to dryland maize, but there is hardly any maize under irrigation. Almost all irrigated land on SNL is under fruit and vegetables which account for 80% of the irrigated area. Most irrigated plots are

very small; almost 43% are less than 0.05 ha with a range from 5 square metres to 3.35 ha and a mean of 0.23 ha.

POLICIES AND DEVELOPMENT PLANS

Policies

The Government of Swaziland has committed itself "to promote increased crop production and reduce its seasonality by encouraging the use and number of irrigation schemes" (*Fourth National Development Plan*, p. 386). Two of the priorities of the section identified for the plan period are: to provide an intensive irrigation and horticultural advisory service" and "to encourage the expansion of areas under irrigation on individually operated schemes from 76 to 263 ha and on cooperative schemes from 444 to 1,000 ha".

Government schemes

Government-operated schemes are not mentioned in the list of priorities, but in another section of the plan, mention is made of rehabilitation of RDA irrigation schemes as proposed under an International Fund for Agricultural Development (IFAD) funded Smallholder Credit and Marketing Project. However, it is stated, that "experience to date indicates that there is first a need to restructure the schemes before additional expenditure is incurred. It must be ensured that only interested and committed farmers are involved, ... and that adequate extension support is available" (*ibid*, p. 155). On the same page, the plan emphasizes that only small-scale schemes are appropriate on SNL, "so as to be in congruence with the traditional system".

Nuclear estate model

In the same spirit, the plan endorses the Vuvulane Irrigated Farms nucleus/smallholder model, as part and parcel of estate schemes, when it notes that:

> given the need to improve the elasticity of employment and develop the country's irrigation potential in the most productive way, it is widely recognized that future agricultural development in the modern sector should concentrate on more labour intensive irrigation schemes on the nucleus/smallholder model.

The experience of Vuvulane is considered to provide a successful example in this respect (*ibid*, p. 145).

Thus, effectively suggesting a more direct involvement of smallholders in the estate-irrigation sector. However, the plan recognises that this sector is over-dependent on sugar. Therefore, it suggests that another cash crop would have to provide the foundation for other potential schemes and proposes that cotton may be a promising crop, given the good market prospects.

Large-scale schemes

This government standpoint opens the way for various development agencies and multinational corporations to initiate large-scale irrigation schemes, albeit with some smallholder component in the form of an outgrower or contract-farming scheme. This is not the place to review outgrower schemes[2], but it should be noted here that this type of scheme is problematic as it does not fit into the traditional system, where land and water are acquired free of charge. VIF went through a period of disputes relating to this problem, and no satisfactory solutions have as yet been found.

Swazi Nation Land

Turning to government policies relating to SNL irrigation, the Central Rural Development Board (CRDB) is charged with the responsibility of ensuring that irrigation development takes place in an orderly manner to prevent conflicts over resource use. As Funnell notes, "Traditional access to land and water under communal tenure provides a good starting point for vegetable producers, but the development of more elaborate arrangements means that the appropriate authorities ... must give their sanction. Water abstraction becomes more obvious when extensive furrows and diversions are constructed" (Funnell, 1985a p. 16). Water abstraction is controlled by law. For abstraction over 3,400 litres per day, a permit has to be obtained through the CRDB from the Water Apportionment Board. The water used by SNL irrigators is part of the general allocation to SNL and, although at present there is spare capacity, future expansion may result in conflicts between small irrigators and other developments.

Irrigation development plans

Development plans for further SNL irrigation schemes are heavily influenced by donor interests and experience. Two recently proposed irrigation programmes deserve mentioning here. The first one originates from the USAID Small Farmer Irrigation Project; the second one is proposing the rehabilitation of RDA irrigation schemes as part of the IFAD Smallholder Marketing and Credit Programme.

New smallholder schemes

The first project aimed at introducing irrigation into the farming system of SNL homesteads as a means of converting these primary subsistence farms into commercial ventures (Funnell, 1984, p. 12). A total of US$7.2 million would be made available over a five-year period. Included in the proposal was the development of 15 new irrigation schemes, five of which would be about 40 ha each, the remainder about 12 ha each, introducing a total of approximately 350 farmers to irrigation. Farmers were expected to submit plans to the Ministry's Irrigation Section, thus following the established pattern of small-scale irrigation development.

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[2]For a critical discussion of contract farming in Swaziland, see Neocosmos and Testerink (1985), in which it is shown that to a large extent, the outgrowers are at the mercy of the multinational corporation running the scheme.

However, this project did not reach the stage of implementation and according to de Vletter (1987, p. 6) "Lack of government commitment to the project is said to be behind its ultimate demise".

Rehabilitation of RDA irrigation schemes

The IFAD programme proposes to complement the USAID schemes, and funds are made available to rehabilitate 12 RDA irrigation schemes. As noted above, the government has not received this proposal with great enthusiasm; but the project is being implemented and at present the Ministry of Agriculture and Cooperatives is negotiating to extend the number of schemes to be upgraded. The main thrust of the IFAD proposal lies in improving marketing services. A central market with cooling facilities was built in Nokwane near Manzini last year, and this could obviously have important effects on irrigated vegetable production. Furthermore, the IFAD credit scheme will materially assist (among others) irrigating farmers.

Usutu and Ngwavuma River Basin Project

Two large-scale TDL/Tibiyo land-based schemes, employing the nucleus/smallholder model, have been proposed and feasibility studies carried out. One of these is the Usutu and Ngwavuma River Basins Project, for which a feasibility study was undertaken by Tate & Lyle consultants in 1982, commissioned by Tibiyo. The study proposes the development of seven irrigation development units within the catchment areas, covering a total of 35,000 ha, to be implemented over a 20-year period. On full development after 30 years, a total of 4,410 smallholders were projected to have been settled; a total permanent employment of 7,470 was foreseen, as well as a seasonal employment of 39,680.

Komati Basin Project

A second proposal for a large-scale irrigation project is the Komati Basin Project, for which a feasibility study was carried out by Devres in 1985. A smallholder/nucleus estate irrigation project, covering 3,000-5,000 ha is proposed. On the 3,000 ha alternative, 1,200 ha would be set aside for a total of 600 smallholders. The 5,000 ha option would allocate 2,000 ha to 1,000 families. The scheme would employ a total of 927 full-time farm workers and 627 part-timers under the first alternative, and 1,545 and 1,045 workers, respectively, in the bigger set-up (Devres, 1985). However, after careful consideration, the Ministry of Agriculture and Cooperatives decided that the plans were unrealistic. A further feasibility study was proposed that will be undertaken in the near future.

More recently, three additional projects have come under consideration, *viz.* a European Development Fund (EDF) supported rehabilitation scheme, and the Ngwempisi and Nyonyane schemes.

AGRICULTURAL PRODUCTION AND FOOD SUPPLIES

Government has introduced improved farming techniques to SNL farmers through programmes such as the Rural Development Areas Programme (RDAP). While this

has resulted in increases in crop yields, such programmes fall short of increasing the yields to their greatest potential because of the failure to solve the problem of unreliable rainfall.

The rainfed agricultural system leaves the country susceptible to drought. Available statistics show stagnant maize production over the years, as well as a general increase in imports. The proportion of food imports in the country's total imports is low, averaging 8.6% for the period 1981-86.

Fluctuations in production are enormous, ranging from 30,000 mt of maize in 1982-83 to 170,000 mt in 1984-85. Vegetables are mainly produced under irrigation. In the early 1980s when vegetable imports were banned, local prices and vegetable production increased. Today, the bulk of vegetable production comes from the modern subsector, including Vuvulane Irrigated Farms. During 1979-80 and 1982-83 when local production was insufficient to meet demand, a large amount of vegetables had to be imported.

The introduction of the Nokwane central fresh fruit and vegetable market in 1987 encourages local production by providing a guaranteed and readily available market for vegetables. Although it is too early to judge this market's performance, there are already indications that it is failing to find buyers for the vegetables. The above analysis shows that the rainfed agricultural system is subjected to drought. The need for water control is high if stable yields are to be attained.

FARM AND NONFARM EMPLOYMENT

Importance of wage employment

Russell and Ntshingila's study of the Central Rural Development Area shows that income from wage employment (from both residents and absentees) accounts for 69.5% of the homestead income. Agricultural enterprises contribute 13.5%, while livestock accounts for 4.7% (Russell and Ntshingila, 1984, p. 9).

Studies on African farming have shown that labour demand in rainfed agriculture is highly seasonal. For any crop, labour use is concentrated in peak periods of relatively short duration. This pattern of labour absorption in agriculture creates a need for off-farm employment, which often involves seasonal migration--either to urban or to other rural areas. Furthermore, seasonal agricultural work must compete for labour with nonseasonal jobs in urban areas, mining, and industry. This seasonal labour demand pattern contributes to the withdrawal of labour from agriculture.

Lack of adequate employment opportunities is one of the main development problems facing Swaziland. In 1987, the number of paid employees in a population of 676,000 was 95,000. That year had relatively good employment figures and represented a decrease in retrenchments from 2,200 in 1985-86 to only 340 in 1987, and most employment opportunities were created in the private sector. Despite these improvements in the domestic labour market during the last two years, they are insufficient to meet the demand for paid employment. There is an estimated average increase of 4,100 people per year seeking formal sector employment, but not finding it.

Given the economic sanction threat to South Africa, the mines which offered good employment opportunities can no longer be safely relied upon to continue this service to Swazi labour. There is a need not only to increase formal employment, but also to increase informal employment opportunities in the country.

Conflict between labour needs for rainfed vs irrigated farming

A consensus of opinion supports the notion that farmers are willing to concentrate full time on irrigated cropping. According to Funnell (1984, p. 3), this is justified, from an individual's viewpoint, because it may represent an optimal use of time and labour.

The question that can be raised is whether there will be a conflict over labour needs on rainfed crops. Irrigation requires an increased labour input. Given that it is mainly women who are available to work on farms on SNL, due to the high engagement of men off-farm, there may be a limit to the availability of labour. Women are already engaged in a range of activities; as the mainstay of the homestead on a day-to-day basis, as those who bear children, fetch water and fuelwood, work in the fields, and earn money through handicrafts and services such as brewing. However, irrigation can be utilized to spread on-farm labour demand as crops are produced not seasonally, but throughout the year. Provision of income earning opportunities, if made available, may require that women be freed from time-consuming but essential tasks before they can take them up.

Forward and backward linkages

Irrigated farming will likely have economic backward and forward linkages. Backward linkages will take the form of creating and/or increasing business activities for those dealing in farm inputs. To the extreme we could expect, for instance, the revival of the defunct chemical industry to supply chemical fertilizer and other agricultural chemicals. This would create employment and increase incomes.

Forward linkages will occur if irrigation leads to cash cropping, which no doubt would be the case as the cost of setting up an irrigation system may have to be justified by producing for a market. This production of crops for sale will promote agro-industries. In the case of Swaziland, the canned fruit and sugar industries provide good examples.

The sugar industry, composed of three sugar mills, depends on sugarcane as an input. Sugar is the "King" in the Swazi economy today, in terms of its contribution to foreign exchange: its share in total exports over the period 1981-86 was 37.1%. In addition, it is estimated that about 14% of the population is wholly or partly dependent on employment in the sugar industry.

The canned fruit industry relies on pineapple and citrus fruits produced by farmers (both on large scale and small scale). This industry contributes 5.6% of the country's foreign exchange earnings. In addition, the cannery is the country's largest single employer of women. In 1988, the cannery had a labour force of 3,949, a great proportion of these being women.

Increased crop production, due to improved yields stemming from water control and crop production throughout the year, can be expected to encourage the

establishment of more agro-industries to process the output. This, coupled with the good investment incentives offered in the country, will lead to increased employment opportunities and increased standard of living. As food insecurity at the individual level is usually caused by a lack of purchasing power, irrigation would thus contribute to increasing the degree of self-sufficiency.

SUGGESTED AREAS OF RESEARCH

The above analysis clearly suggests that there is need for research into the manner in which irrigation can best contribute to increased food supplies, as well as improved access of people to food supplies. Below is a list of suggested areas of research with brief explanations, leaving the details of each to be decided on at a later stage.

- There is need to update the existing data on irrigation, *viz.* types of irrigation, irrigated crops, and areas under irrigation. In the process of updating this, data should be extended to fill up gaps of missing information, such as a clear breakdown on production figures on irrigated crops and information on the nutritional status of irrigators vs nonirrigators.
- There is need to investigate the household-level decision-making process on land allocation to irrigation and dryland farming. The aim is to identify the factors taken into consideration when such a decision is made.
- Tied with this is the need to understand the employment history of the initiators of irrigation in the homestead. To what extent, for example, has income accumulated from off-farm employment been utilized to start irrigation? Also, the homestead development cycle of irrigators needs to be studied.
- Although irrigation may generally require higher labour input than rainfed agriculture, there is need to investigate the labour demand and use pattern under irrigation. Given the coexistence of irrigation with dryland farming, an investigation into possible conflicts on labour demand of the two systems is in order. Closely tied to this is the need to investigate the extent of conflict between female labour demand on the irrigated crops and their other numerous homestead tasks. The exercise calls for a monitoring study on labour use, carried out through visits of selected irrigated farms at least once a week.
- The impact of irrigation on employment creation also needs attention. The hypothesis that irrigation will increase labour demand--which homestead membership may fall short of providing, resulting in increased demand for hired labour, which in turn increases employment opportunities and incomes, and consequently increases access of people to food supplies--needs to be fully investigated.
- There is need to investigate, at the homestead level, the contribution irrigation will make to total farm income, as well as total homestead income--both in terms of crop sales and production for own consumption. In this

context, control over income and income distribution within the homestead also has to be studied.

- o There is need to assess the sources and magnitude of information on irrigation (both technical and on marketing) available to farmers, (*i.e.*, the impact of government and nongovernment agencies in providing information and equipment).
- o A farmer using irrigation may be seen to be interfering with water use in his community, especially on SNL where there is limited access to piped water. Thus, there is need to investigate the existence and extent of such conflicts.
- o A study on the potential irrigable land in the country should be undertaken by looking at the availability of physical resources in terms of soil moisture budgets, soils (texture, depth, soil permeability, etc.), salinity and alkalinity limitations, and topographic factors (including erosion and drainage limitations) in the different ecological zones.
- o Once the necessary data is collected, linear programming should be used to identify a crop mix that maximizes returns to farmers, taking into consideration the coexistence of irrigation and rainfed agriculture. Different crop mix for different areas and different types of irrigation should be identified.

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IRRIGATION AND FOOD SECURITY: CURRENT STATUS AND RESEARCH PRIORITIES IN TANZANIA

Sylvester Sisila[1]

INTRODUCTION

Agriculture forms the backbone of the Tanzanian economy. Approximately 85% of the population live in the rural sector. The sector contributes about 50% of the Gross Domestic Product (GDP) and approximately 80% of the total export earnings (Msambichaka *et al.*, 1983; Tanzania, 1987). The performance of the sector will therefore determine the capacity to import capital and other goods required for investment and consumption.

The objectives of irrigation policy are to increase national income; modernise agriculture; stabilize farmers' incomes; expand agricultural output; stabilize food supplies; and solve specific local problems (Tanzania, 1983; FAO, 1987).

Irrigation is practiced in all stages of production technology, but in varying degrees of importance and sophistication. Traditional irrigation is common in some areas of the country such as Kilimanjaro, Kilombero, Arusha, Mbeya, and the Lake Victoria zone. These small-scale schemes were based on gravitation and traditionally-constructed control works. Water management and control were exercised through local and village governments. Crops grown under traditional irrigation include paddy, maize, bananas, coffee, and some legumes and vegetables.

Modern large-scale irrigation started around the 1930's (FAO, 1987) with the introduction of estate agriculture, particularly for the production of sugarcane, coffee, tea, cotton, and paddy. Today most of the sugarcane is produced on estates under irrigation.

The development of irrigation in Tanzania is justified by the low rainfall, which is unreliably distributed in large areas of the country, with occasional total failure in the whole country. Only about one-half of the country receives 750 mm of annual rainfall with an 80% probability. Under East African conditions, 750 mm per year is the threshold value below which cultivation is marginal (Tanzania, 1976).

Three-quarters of Tanzania receives less than 1,000 mm of rainfall per year, while a greater part of the country has an annual potential evapotranspiration of over 2,000 mm from open water. Such low rainfall, its unreliable distribution, and occasional total failure--combined with high evapotranspiration--make irrigation a necessity for the development of agriculture in Tanzania. Also, irrigation increases the yields of agricultural crops (Table 1).

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[1]Food and Agriculture Organization, Dar es Salaam.

Table 1. Effects of irrigation on crop yields in Tanzania, 1981.

Crop	Yield (kg/ha)	
	Irrigated	Rainfed
Paddy	4-5,000	1,200
Maize	3,300	1,600
Cotton	1,800	500

Source: Agrar-und Hydrotechnik (1981).

CURRENT STATUS OF IRRIGATION DEVELOPMENT

Potential for irrigation development

Tanzania is a large and diverse country with an area of 939,700 km^2. While approximately 20-30% (Kaplan, 1978; Msambichaka, *et al.*, 1983) of the area is considered arable, only about one-fifth of the arable area is presently under cultivation. The cultivated area amounted to 5,561,370 ha in the 1985-86 planting season (Tanzania, 1987).

In contrast, the irrigated area is only about 3% of the area under cultivation (FAO, 1987; Msambichaka, *et al.*, 1983. The Ministry of Agriculture and Livestock Development (MALD) estimates the area under irrigation at 144,000 ha (Tanzania, 1987).

The major potential for irrigation is based on the existence of numerous basins and valleys formed by various rivers and lakes (Table 2). In addition to the major basins, there are numerous smaller basins, mostly of internal drainage systems, offering some potential for small-scale irrigation developments.

The Rufiji Basin harbours the greatest irrigation potential in the country. It is also probably the most studied of all the basins, not least because this basin also has the largest hydro-power potential. A number of operational and planned irrigation schemes are found in the Rufiji Basin.

The Rufiji Basin comprises the river systems of Great Ruaha, Kilombero, and Luwegu-Luhombero, which join to form the Rufiji River *per se* before entering the Indian Ocean. Studies by FAO (1961) identified the following irrigation potential in the three main subbasins of the Rufiji river systems: Great Ruaha (Usanga Plains), 240,000 ha; Kilombero Valley, 300,000 ha; and Lower Rufiji Valley, 100,000 ha. More recent investigations have indicated that up to 65,000 ha could be economically developed for irrigation in the Lower Rufiji Valley (Agar-und Hydrotechnik, 1981).

Table 2. Major basins with irrigation potential, Tanzania.

Name	Potentially irrigable area (ha)
Rufiji River Basin	640,000
Wami River Basin	32,000
Lake Victoria Basin	29,000
Kagera River Basin	20,000
Ruvu River Basin	20,000
Ngono River Basin	16,000
Luiche River Basin	10,000
Pangani River Basin	10,000
Others	88,000
Total	865,000

Source: FAO (1980) and Msambichaka *et al.* (1983)

Current and planned irrigation schemes

There are a number of large-scale and smallholder irrigation schemes currently operational in the country. More schemes are either under implementation or planned for execution in the near future. The most important of these schemes and their status are presented in Table 3.

This table also shows that irrigation in Tanzania is applied on a large scale on a very few crops, mainly rice, sugarcane, tea, and maize. Supplementary irrigation, mainly by sprinklers, is also applied on some coffee plantations.

Constraints on irrigation development

A major constraint on irrigation development is the lack of financial resources for implementing projects. The general poor performance of the national economy, and particularly the lack of foreign currency, has had a profoundly adverse impact on the ability to undertake irrigation projects. Generally, foreign exchange constitutes over one-half of the total development costs of irrigation projects. Development costs range between US$5-10,000 (FAO, 1987a). The absence of a government irrigation policy has led to irrigation projects being introduced on an *ad hoc* basis. Despite these problems, irrigation has an important role to play in the economy.

INSTITUTIONAL ARRANGEMENTS

Historical Perspective

The present Irrigation Division in the Ministry of Agriculture and Livestock Development is an outgrowth of numerous changes in the administration of water

Table 3. Major irrigation schemes and their status, Tanzania.

Staus/ Scheme	Crop	Area (ha)	Irrigation method
Operational			
Mbarali[a]	Rice	3,200	Surface
Madibira[a]	Rice	600	Surface
Dakawa	Rice	2,000	Surface
Ruvu	Rice	730	Surface
Kahe	Maize/lucerne	1,510	Surface
TPC	Sugarcane	6,480	Surface/sprinkler
Kilombero[a]	Sugarcane	4,480	Sprinkler
Mtibwa	Sugarcane	1,750	Sprinkler
Lower Moshi	Rice	2,300	Surface
Mufindi Estates	Tea	2,000	Sprinkler
Under construction			
Usangu Village Project[a]	Rice	4,200	Surface
Bahi/Kintiku[b]	Rice	4,000	Surface
Tanga (rehabilitation)	Rice	4,120	Surface
Mto wa Mbu	Rice/maize	2,500	Surface
Iringa (rehabilitation)	Rice	1,300	Surface
Kitivo Village Project	Rice	495	Surface
Mwamapule Village Project	Rice	540	Surface
Kilimanjaro[c]	Rice/maize	4,000	Surface
Mngeta[a]	Rice/maize	5,000	Surface
Planned design			
Kapunga Rice Project	Rice	5,700	Surface
Madibira[a]	Rice/maize	8,000	Surface
Ikwiriri	Rice/maize	1,000	Surface
Feasibility study			
Morogoro Village Irrigation	Rice	2,000	Surface
Planned for 1988			
Kimani Village Project	Rice	2,000	Surface

[a]Located in the Rufiji Basin; [b]400 ha completed; [c]Rehabilitation of traditional irrigation.
Source: FAO

resources development. Based on the recommendation of a Royal Commission to identify possible measures of improving living standards in East Africa, the Water Development Department of the Ministry of Agriculture was expanded into the Water Development and Irrigation Department in 1955, and later up-graded to the Water Department and Irrigation Division (WDID).

In 1964 WDID was transferred to the then Ministry of Lands, Settlement and Water Development. WDID had a tendency of concentration on large-scale irrigation developments while paying little attention to the development of smallholder schemes, including rehabilitation of traditional irrigation systems. As a result, in 1968, the Ministry of Agriculture initiated its own section to cater for the traditional small-scale irrigation. In 1969, WDID was transferred to the Ministry of Agriculture, only to be moved again, this time to a new Ministry of Water Development and Power. This transfer was rather unfortunate as far as irrigation

was concerned, since the parent ministry was more interested in rural water supply and energy than in irrigation.

In 1973, all functions relating to irrigation development were transferred to the Ministry of Agriculture and the present Irrigation Division of the Ministry was established in 1975. It is today under the new Ministry of Agriculture and Livestock Development (MALD).

Current organization of irrigation

The Director of the Irrigation Division reports directly to the Principal Secretary of MALD. In addition to the Irrigation Division, there are other institutions, mostly parastatals, with some responsibility for irrigation development. The most important are the Rufiji Basin Development Authority (RUBADA), the National Agricultural and Food Corporation (NAFCO), and the Sugar Development Corporation (SUDECO). RUBADA is responsible for the management of the Rufiji Basin. It is also undertaking irrigation development in the basin with assistance from the Governments of the Islamic Republic of Iran and the Democratic People's Republic of Korea. NAFCO is responsible for the production of food grains and owns the large-scale rice schemes (Mbarali, Dakawa, and Ruvu). SUDECO is the holding parastatal of the sugar estates.

FUTURE RESEARCH NEEDS

Current research is being carried out through the Tanzania Agricultural Research Organization (TARO) and the Directorate of Research and Training in the Ministry of Agriculture and Livestock Development. Under TARO are a number of research institutes with crop-specific research programmes. Furthermore, research is undertaken by other institutions like the Sokoine University of Agriculture and the Uyole Agricultural Centre.

Policy formulation

The absence of an irrigation policy has been partly blamed for the slow pace of irrigation development and for some of the failures. Research is required to establish realistic policy approaches and targets, taking into account available resources and potentials and their sustained use. The on-going FAO/UNDP Project on Institutional Support seeks to formulate a medium- and long-term plan for irrigation development in Tanzania.

Institutional arrangements

The history of institutional arrangements serves to illustrate the need to establish a rational and effective set-up for irrigation development in the country. Some research is necessary to establish the optimum size of institutions, organizational and functional relationships, manpower requirements, and development training needs.

Economics of irrigation

Hardly any investigations have been carried out on the economics of irrigation in Tanzania. There is an urgent need to undertake research on existing and on-going projects, in order to identify ways of increasing the profitability of irrigation schemes.

Surface and sprinkler irrigation in Tanzania is limited to areas of abundant water. However, there are some arid and semi-arid areas in the country with good soils for crop production and sometimes with adequate underground water resource. In such areas, water-saving irrigation methods could play a great role in increasing crop production. Research is required to establish the quantity and quality of available water resources and determine appropriate irrigation methods. It is also important to establish, when implementing new schemes or rehabilitating existing ones, particularly smallholder schemes, whether full-levelling of the farm areas for total water control is of any significant advantage over partial-levelling. The FAO/UNDP irrigation project in Usanga intends to test various development alternatives in the project area, including total development with full-levelling and canal improvement compared to partial levelling. Similar research would be required in other areas with different physiographic and ecological conditions to test the economics of various development alternatives.

Regional cooperation

Lastly, there is a need for research on the potential of implementing joint irrigation projects on a regional basis. This collaboration need not necessarily be limited to shared land and water resources. The Rufiji Basin, for example, has irrigation potential which, due to limited resources, Tanzania alone will not be able to exploit fully in the foreseeable future. If, however, several countries could cooperate on a regional basis, this potential could be tapped for the benefit of all. Some research is therefore required to establish the possibilities and modalities of such collaboration.

CONCLUSION

Tanzania has abundant potential for irrigation development. If adequately exploited, this potential could make an important contribution, not only to current crop production, but also to safeguarding this production against vagaries of the weather. Current government efforts to develop irrigation are welcome and deserve the necessary support. Lessons learned from past mistakes and failures should thereby serve as a useful tool in future developments.

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IRRIGATED AGRICULTURE IN BOTSWANA

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INTRODUCTION

Botswana's population was estimated at 1,212,000 in 1988 and is growing at around 3.4% per year. About 50% of the population is below the age of 15. The majority of the population live in rural areas. Many able-bodied men and women in both the rural and urban areas are either underemployed or unemployed. At present about 25% of Botswana's labour force (most of whom are in town) are unemployed.

Per capita agricultural production is lagging behind the population growth rate, and employment-generation in the sector is frustratingly low. The hostile physical environment is partly responsible for the poor performance of agriculture. The recent political decision to develop irrigated agriculture is linked to the disappointing performance of rainfed agriculture and the incapability of the livestock subsector, and the mining and manufacturing sectors to generate jobs and raise incomes of rural households.

Botswana's climate is semi-arid. Potential evapotranspiration is invariably higher than precipitation. As a result, available moisture is not always adequate for the development of plants to maturity. Average annual rainfall ranges from 250 mm in the southwest to over 650 mm in the north. Most livestock and arable crop production (including human settlement) is concentrated along the eastern edge of the country, largely due to the relatively better access to water and rainfall distribution. But rainfall reliability ranges from 20% in the south west to over 70% in the north. This rainfall pattern poses serious problems to the overall development of the economy and the agricultural sector. Botswana's rivers, except for the Chobe in the north, are seasonal and they flow between October and April. As a result, water for human consumption, livestock, and irrigated agriculture is obtained from underground sources.

Surface water sources are available only in the Chobe and Okavango areas. For almost all the urban areas, water is obtained from dams. Poor rainfall and water supply are some of the major bottlenecks to agricultural development. Drought is endemic to Botswana's agricultural production system.

The October to April growing season is dominated by high temperature. Average daily temperature ranges from 22°C in July to 33°C in January.

IRRIGATED AGRICULTURE

Over the past few years, the Government of Botswana has initiated studies to determine the area suitable for irrigation. Estimates of irrigation potential based

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on the availability of water and suitability of soil range from 33,211 ha to 255,150 ha. The country's total surface area is about 580,000 square km. The estimated irrigation potential is less than 1% of the country's physical areas. Two irrigation feasibility studies, recently undertaken in the Okavango Delta and Chobe Enclave, are being further analysed to enable the government to formulate cost-effective investment plans. The third potential area for irrigation is on the eastern side of the country in the Limpopo Basin.

The total area under irrigation by commodity is as follows: cereals, 1,560 ha; horticulture, 100 ha and cotton and other crops, 340 ha. About 3,000 people are employed in irrigated cereal production and 500 are employed producing irrigated horticulture crops (Botswana, 1988).

The private/freehold production system dominates irrigated agriculture in Botswana. Smallholders in the communal areas account for an insignificant area (30 ha) and they concentrate on vegetables and green mealies (maize). Cereal crops produced under irrigation are mainly maize, wheat, and sorghum. Freehold farmers also dominate the production of cash crops such as cotton and citrus. About 75% of the total areas under irrigation is on the eastern side of the country along the Limpopo Basin because of the availability of underground water from sand rivers.

Almost all the water for irrigation is obtained from diesel-powered engine boreholes. Few farmers depend on surface water to irrigate their crops. The sprinkler irrigation system is the most popular, but some farmers have started introducing drip irrigation. Unlike established large farmers, smallholders mostly use hand-made canals to water their vegetables.

Yield levels range from as low as 20 mt/ha (tomatoes) under smallholder vegetable production to over 40 mt/ha (tomatoes) in highly commercial systems. In fact, smallholder yields are about one-half of the large-scale ventures. Cereal yields range from 3 mt/ha to over 5 mt/ha, depending on the level of management, variety, water supply, etc.

Because of import controls, most farmers market their produce in the country at prices determined by market forces. Cotton is exported, mainly to South Africa, because of the lack of processing facilities in the country.

CONSTRAINTS ON THE DEVELOPMENT OF IRRIGATION

One of the major obstacles to the development of irrigated agriculture and the agriculture sector is the shortage of surface and underground water. Sizeable amounts of surface water are found in the Chobe and Okavango Delta, but evapotranspiration rates are high. Almost all the rivers are ephemeral. Although underground water continues to provide water for livestock, households, and irrigation, the source is risky because it largely depends on recharging from rain.

Second, predominantly sandy, low-humus and phosphorus-deficient soils are a major constraint on irrigation. The water-holding capacity is low and would require heavy fertilizer investments to sustain productivity. The distribution of irrigable soils is spotty.

Third, the major source of water for irrigation is deep aquifers. In almost all cases, water is drawn through diesel-powered engines because electricity prices are high. For instance, in South Africa farmers pay about 9 thebe per kilowatt, compared with 24 thebe in Botswana.

Given the high tariffs and foreign exchange requirements for the current energy sources available to irrigation farmers, the viability of irrigation is uncertain. It remains to be seen whether the vast coal resources that are also converted to electricity will relieve both consumers and farmers of the escalating energy cost. Surprisingly, electricity consumers at the copper and nickel mine (BCL) in Selebi Phikwe pay 50% less than other non-BCL consumers (World Bank, 1986). Technically, the coal project should make Botswana almost self-sufficient in her energy requirements.

Bio-chemical and mechanical technology to support irrigated agriculture in the country is regrettably lacking. Attention has been paid to rainfed agriculture, since most farmers will remain in this system for decades to come.

The institutionalization of irrigated agriculture in the long run depends on the number and quality of human resources. At present, Botswana has only two local irrigation specialists. Horticultural farmers have expressed concern over the acute shortage of qualified irrigation specialists. Experience elsewhere in the world shows that the success of irrigation partly depends on the number and quality of human resources, including farmers. Generally this takes decades to achieve.

Thus, the lack of physical infrastructure, inputs, and access to profitable markets are serious constraints on the development of irrigated agriculture.

PLANS TO DEVELOP IRRIGATED AGRICULTURE

The government's policy toward the development of irrigation is part of a multipronged development strategy with the following goals:

- o increasing and improving household and national food security;
- o generating employment opportunities for the fast-growing labour supply;
- o reducing dependency on the mining and livestock (cattle) sectors through diversification; and
- o conserving natural resources.

The agricultural sector has performed poorly in helping to achieve household and national food security goals (Appendix 1). There is growing dependency on food imports, including food aid. It is hoped that the development of irrigation will contribute to food security through increasing employment and food production in designated potential areas, including flood recession agriculture.

The government has launched several initiatives to promote irrigated agriculture. The flood recession agriculture practiced in the Okavango Delta is a gradualistic approach, designed to improve water conservation and management techniques. Smallholders normally plant less than 2 ha under flood recession and obtain yields of 1-2 mt/ha if floods are timely and adequate. The government hopes to improve the productivity of smallholders through better water and crop husbandry techniques. Several projects are helping farmers in the region develop improved farm practices.

However, the risks associated with flood recession are still high. Sometimes, only a very small portion of the potential area is flooded.

Second, two feasibility studies in the Okavango Delta and Chobe Enclave have been undertaken to determine the potential for viable irrigated agriculture. The results of the two investigations are being studied in detail in order to formulate cost-effective, long-term investment plans that are environmentally sound. These areas also cover a very sensitive ecology and include a sizeable wildlife population.

Third, a long-term master plan for water development is being developed by Botswana to harness the available water resources to benefit the various sectors of the economy, including irrigated agriculture. Already, 70 dam sites have been identified and plans are underway to tender for dam designs. The dam sites designated for irrigation will be developed after finalising soil and infrastructural supportive systems. Most of the sites are on the eastern side of the country since this is where most rivers are found. Road infrastructure is being developed alongside the water master plan. In addition, a rural electrification programme is underway.

To encourage the development of irrigated agriculture, in 1982 the government introduced a Financial Assistance Policy (FAP), and a capital and labour grant assistance programmes to encourage investors to generate jobs for the economy. Irrigated agriculture is eligible for five-year grants under the scheme. But the failure rate among the small-scale entrepreneurs (ventures up to P20,000) has been very high.

The demand for irrigation personnel is growing, yet Botswana has only two qualified irrigation specialists. Plans are underway to strengthen the Irrigation Unit in the Ministry of Agriculture through training. Farmers will also be trained in irrigation management.

NEEDED RESEARCH

While Botswana is committed to developing irrigated agriculture to complement rainfed agriculture, several policy issues require more analysis at both the micro and macro levels. Failure to do so could cost the country a lot in both political and economic terms. Below is a brief summary of some of the major research needs for the development of technically feasible, cost-effective, socially relevant, and environmentally sound irrigation.[2]

Socioeconomic viability.

Data are needed to determine how to reduce the cost of developing and implementing alternative irrigation systems under field conditions. For large-scale schemes (> 300 ha) in Botswana, investment costs (both capital and recurrent) to irrigate field crops (maize, etc.) under sprinkler systems drawing water from 9 dams

[2]An agricultural sector assessment is currently in progress by the Ministry of Agriculture. The final report will include a discussion of irrigated agriculture.

are P12,296[3]/ha (1987 prices). For small-scale schemes (< 30 ha) using the same irrigation system, the investment costs are a staggering P91,749/ha. Certainly these investment costs are very high. In fact, to develop 50,000 ha under sprinkler irrigation to meet Botswana's annual cereal requirements of around 200,000 mt from large-scale schemes, would cost about P560 million in capital and P55 million in recurrent costs (1987 prices), respectively. In fact, the annual cost of irrigation to meet Botswana's cereal requirements is over three times the cost of the total annual food import bill over the indicated period.

Appendix 2, 3, and 4 display capital and recurrent costs/ha by size of scheme, source of water, irrigation system, and type of crop. Although there is disagreement over these estimated investment costs/ha, the figures indicate that the cost of developing irrigated agriculture in Botswana could be very high. More information needs to be generated for policymakers and planners on what needs to be done to develop cost-effective, but sustainable irrigation development projects. At present, available information is inadequate to determine the economic viability of irrigation under different levels of management, operation, etc. As earlier indicated, the opportunity cost is high, since resources allocated to the development of irrigated agriculture could probably be efficiently used for housing or industrial activities. Such information would assist the government to resolve equally important issues such as what type of crops to produce; who should produce them (*i.e.*, small or large-scale entrepreneurs); what type of irrigation system to use by crop, scale, and source of water. Each of these questions and many others require detailed research for policymakers to formulate long-term investment plans for irrigated agriculture. Further, since several governments aim to be self-sufficient in basic cereals, should the production of crops such as cotton, sunflower, be encouraged under irrigation since they are not cereals? What research and extension services would be required to promote the production of these noncereal crops since, historically, these organizations have been preoccupied with cereal grains under rainfed conditions. In summary, tough questions need to be studied and resolved to enable policymakers to formulate long-term investment plans to determine whether irrigated agriculture can improve food security and cost-effectively create jobs.

Agricultural marketing and pricing policies.

Assuming it is found that irrigated agriculture can be viably developed for different scales of production, more information is required for policymakers on how the marketing of such commodities should be undertaken. In particular, should the private sector continue to purchase produce from farmers and distribute them? What type of commodities should be marketed by the private sector or by parastatal bodies? Presently, most produce is marketed predominantly by the private sector. The Botswana Agricultural Marketing Board, for instance, only serves as a residual buyer. Do policymakers wish to continue such a marketing policy when irrigated agriculture is developed? Such questions require further research. Also related to

[3]1 Pula = about US$0.50

marketing, are what storage policies and strategies should be developed to promote irrigated agriculture?

Policymakers also require information on how the input and output prices for irrigated crops should be determined. Presently producer prices for the basic staples (maize, sorghum) are based on import parity or landed cost. For oil seeds like sunflower and groundnuts without local processing facilities, their prices are largely based on export parity. The government sets only guaranteed minimum producer prices, but the farmers are still free to sell at the market-determined prices. Under irrigated agriculture, does the government wish such a policy to continue? If not, what are the trade-offs? At present, information needed by policymakers to resolve these issues is inadequate. More research is required for in-depth analysis of both marketing and pricing policies to enable long-term but sustainable irrigation projects to be undertaken.

Human resource and technology development

Presently, Botswana has two professional irrigation specialists. Irrigated agriculture requires well-trained researchers, extension staff, social scientists, environmentalists, and farmers. If scarce resources are allocated to human resource development, to what extent would that affect rainfed agriculture and other sectors of the economy? Equally important for Botswana is the lack of a technological resource base to support irrigated agriculture. High-yielding but pest-resistant crop varieties will have to be found. Appropriate irrigation equipment will need developing. Technology development, like training, is long term. As a result, policymakers will require in-depth information to formulate investment plans to develop irrigation, as the opportunity cost of resources for technology and human resource development to institutionalise this production system is also high. Future policies for the development of irrigation would need research on the broader implications of these initiatives to improve both food security and employment creation.

Health and environmental aspects

Quite often the development of irrigated agriculture, although intended to improve the standard of living of the population, causes serious health and environmental problems. Economically important diseases such as malaria and bilharzia, which could adversely affect the productivity of labour, require research for policymakers and planners to minimise potential human suffering. Similarly, the careless use of agro-chemicals such as pesticides and fertilizers could disturb the ecology of the area. Long-term interventions to redress the potential hazards of chemicals on the environment are required.

Other research policy issues, such as fiscal and monetary aspects, require in-depth analysis for policymakers and planners to formulate long-term cost-effective but sustainable irrigation projects.

In summary, there are numerous research topics that require further investigation. Failure to thoroughly address these issues could create serious dislocations in the overall economy.

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Appendix 1. Cereal production, area planted, imports, population, and rainfall, Botswans 1978 to 1986.

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Production (mt)[a]	50,000	10,000	46,000	55,000	19,000	15,800	8,400	20,000	22,200	21,300
Area planted (ha)	260,000	80,000	87,000	90,000	204,000	29,000	203,000	11,000	243,000	310,000
Total cereal imports (mt)[b]	79,861	161,938	109,288	79,423	111,020	173,600	171,462	187,200	200,000[f]	220,000[f]
Aid imports (mt)[c]	6,819	11,101	13,462	9,248	4,906	24,278	25,639	46,225	32,110	46,000
Population ('000)[d]	821	859	906	941	976	1,012	1,049	1,088	1,128	1,168[e]
Average annual rainfall (mm)	622	312	513	577	359	340	325	310	329	368

[a]Domestic production covers maize, sorghum, millet, beans/pulses, and wheat. [b]Cereal imports cover maize, sorghum, rice, millet and wheat together with their processed products. [c]Food aid imports excludes noncereal food such as milk power. [d]De facto population projections (medium variant growth rate). [e]National averages. [f]Preliminary estimates, Central Statistics Office for External Trade still processing the data.
Source: Central Statistics Office (various years); World Food Programme, Botswana (various years); Ministry of Agriculture (various years[a]); Department of Meteorological Services (various years).

Appendix 2. Capital and annual costs for large schemes (pula/ha), Botswana, 1987.

Type/Crop	Capital	Annual[a]	Type/crop	Capital	Annual[a]
Large Dam					
Surface irrigation			Drip irrigation		
Field crops	8,087	60	Field Crops	19,736	1,062
Citrus	8,457	66	Citrus	14,245	910
Hand move sprinkler			Centre pivot		
Field crops	11,201	1,095	Field crops	11,398	1,084
Citrus	12,626	946	Field crops[b]	16,299	826

[a]Costs of water source and electrical power transmission are excluded.
[b]Summer cropping limited to 70% of net irrigated area.
Source: Ministry of Mineral Resources and Water Affairs, p. 29 (1987).

Appendix 3. Capital and annual costs for medium schemes (pula/ha), Botswana, 1987.

Type/Crop	Capital	Annual[a]	Type/crop	Capital	Annual[a]
Multi-use dam			Direct river abstraction		
Surface irrigation	23,060	135	Surface irrigation		
Vegetables	27,871	157	Field Crops	24,517	360
Citrus	29,126	170	Vegetable	29,329	372
			Citrus	29,884	355
Hand move sprinkler			Hand move sprinkler		
Field crops	22,911	825	Field crops	20,337	245
Vegetables	24,973	1,200	Vegetables	22,399	1,374
Citrus	28,192	785	Citrus	25,619	917
Drip irrigation			Drip irrigation		
Field crops	28,230	866	Field crops	29,906	926
Vegetables	29,273	876	Vegetables	27,836	1,246
Citrus	24,724	736	Citrus	23,162	846
Centre pivot			Centre pivot		
Field crops	22,802	783	Field crops	20,854	957
Field crops[a]	18,724	607	Field crops[a]	16,950	734
Vegetables	23,509	799	Vegetables	21,650	981

[a]Summer cropping limited to 70% of net irrigated area.
Source: Ministry of Mineral Resources and Water Affairs, p. 29 (1987).

Appendix 4. Capital and annual costs of small schemes (pula/ha), Botswana, 1987.

Type/Crop	Capital	Annual[a]	Type/crop	Capital	Annual[a]
Small dam			Ground water		
Surface irrigation			Surface irrigation		
Field crops	122,066	631	Field Crops[1]	29,178	2,769
Vegetables	132,250	680	Vegetables[1]	32,549	2,644
			Citrus[1]	23,251	2,172
Hand move sprinkler			Hand move sprinkler		
Field crops	90,808	941	Field crops	17,588	1,830
Vegetables	95,734	1,170	Vegetables[1]	27,641	2,988
			Citrus	19,059	1,878
Drip irrigation			Drip irrigation		
Field crops	83,174	981	Field crops	23,260	1,588
Vegetables	88,198	1,156	Vegetables[1]	29,888	2,427
			Citrus	16,484	1,365
Centre pivot			Centre pivot		
Field crops	67,951	816	Field crops	16,073	1,639
Field crops[1]	38,944	558	Field crops[1]	13,298	1,210
Vegetables	72,308	846	Vegetables	16,073	1,671
Direct river abstraction			Sand river extraction		
Surface irrigation	8,788	443	Surface irrigation		
Vegetables	12,821	461	Field Crops[1]	21,725	1,177
			Vegetables[1]	25,259	1,127
			Citrus[1]	17,345	896
Sprinkler irrigation			Hand move sprinkler		
Field crops	8,834	690	Field crops	15,146	1,042
Vegetables	9,609	1,089	Vegetables[1]	22,921	1,663
			Citrus	16,618	1,006
Drip irrigation			Drip irrigation		
Field crops	17,489	766	Field crops	29,906	926
Vegetables	17,489	1,002	Vegetables[1]	27,836	1,246
			Citrus	23,162	846
Centre pivot					
Field crops	9,356	696			
Field crops[1]	8,904	534			
Vegetables	9,356	710			

[a]Summer cropping limited to 70% of net irrigated area.
Source: Ministry of Mineral Resources and Water Affairs, p. 30 (1987).

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