ECONOMIC ADVISOR'S

END OF TOUR REPORT

April 1, 1965 - May 31, 1967

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in

Economic Development

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I. Introduction

Effective April 1, 1965, I was appointed an advisor in agricultural economics with the M. S. U. group at the University of Nigeria. I was posted to the Economic Development Institute, an integral part of the University of Nigeria located on the Enugu campus. I arrived in Nigeria on April 14th, 1965. Normally, the tour would have terminated on March 31st, 1967. However, to make some urgent preparations for analyzing the results of one of the major research projects, the Director of the Economic Development Institute requested, through the Vice-Chancellor of the University, that I continue for two additional months. This request was granted by the Agency for International Development and I departed Nigeria in early May, 1967.

II. Major Elements of Assignment

When I was first invited to consider this assignment by Prof. Glenn L. Johnson, first Director of the Economic Development Institute, I was advised in general terms that my responsibilities would be to conduct research in the area of agricultural economics and to assist in training Nigerians in the conduct of research. Once in the position, under the dedicated and enthusiastic guidance of Dr. Carl K. Eicher, the second Director of EDI, the following more specific areas of responsibilities emerged:

1. To take major responsibilities within the Economic Development Institute for the formulation and conduct of research under the contracts with the United States Department of Agriculture.

2. To work closely with Nigerian economics graduates to formulate their research problems and to devise their research procedures. In the course of the tour, I also gave guidance to American scholars who came to the EDI to conduct research.

3. To assist the Director in numerous administrative matters including serving as Acting Director for a total of about eight weeks during the tour. This assistance included negotiation of contracts for research with the Agency for International Development, Lagos, and negotiating for the cooperative participation by other research institutions (the Rural Economy Research Unit at Ahmadu Bello University and the Nigerian Institute for Social and Economic Research at the University of Ibadan) and the Ministries concerned with agricultural research in the Western and Northern governments as well as those in the East and (two) in the Federal Establishment.

4. To maintain more or less regular liaison with Ministries of the Eastern Government on matters within my areas of competence.

5. To give general assistance in the formulation of a long-term research and training program for the Economic Development Institute.

III. Major Accomplishments

1. Although the U. S. Department of Agriculture was conducting productivity studies in a number of countries around the world, there were substantial differences among them. All were basically designed to ascertain reasons for observed differences in productivity within agriculture. Important differences emerged, however, because of the wide variety of basic

materials available to the researchers in the different countries. Since Nigeria had practically no backlog of time series pertaining to agricultural production and marketing, it was necessary to formulate a study to gather such basic data. The final formulated research project (see Appendix) encompassed the survey procedures as well as the general approach for the analysis. Formulation of the project content did not commence until some time after the arrival of the assigned USDA researcher, Mr. William Huth, on October 1st, 1965. Arrangements for the project were not completed until April, 1966, and the field work for the project was initiated in May, 1966, for the Eastern Region, and in June and July for the Western and Northern Regions.

As is evident from the project description, it was originally contemplated that about 35 villages (30 farmers in each village) would be surveyed, half of which were to be in the North and the others distributed through the Southern Regions. A total of 25 villages, included in the 35, were to be surveyed in cooperation with the Federal Office of Statistics. Thus, 25 villages were selected in which the Federal Office had two enumerators working during the preceding year. The plan was for the EDI to place a third man in each of these villages to gather data on consumption from the same farmers the Federal Office of Statistics collected data on production, marketing, etc. Another 10 villages were to be selected by our staff and two enumerators placed in each village to gather data on both production and consumption.

The field phase of the study encountered numerous obstacles. The first occurred in late May and early June, 1966, just as the training was getting under way in the Northern Region. This was in the form of the riots that occurred at the end of May. Nevertheless, enumerators were recruited for surveys in the region, and they were subsequently trained and placed in their villages in July, 1966. Despite determined efforts by the EDI staff, the field operation in the North really never reached a smooth level of performance, primarily because the research assistants, all of Eastern origin, were unable to travel freely in the Northern Region. With the widespread and far more intense riots at the end of October, 1966, all field work was terminated in the Northern Region.

In late February, 1967, a fatal accident removed from the University of Ife (Wisconsin) Team their staff member, Professor William Tompkins, who was working closely with us on the field survey in the Western Region. The Wisconsin Group did not replace Professor Tompkins, and after a series of interim arrangements employing a research assistant from the University of Ife staff, it was decided to terminate the Western Region project somewhat ahead of schedule.

Shortly after the outbreak of civil war in July, 1967, the field survey was also terminated in the Eastern Region.

Data had been collected in a number of villages for a full twelve-month period but all data were left at Enugu when the American staff was evacuated in mid-July, 1967. At last report, the Nigerian

staff was within about two weeks of completing all summarizations and tabulations from the Field Forms. The plan was to forward the summarizations to Lagos for transmission to Washington for final analysis. Prospects for ever getting these data are as uncertain as the course of the civil war itself.

A lasting outcome of the productivity study, regardless of the fate of collected data, is the linkage established with the Nigerian Officers in the Federal Office of Statistics. A procedure was devised whereby basic data collected from farmers for establishing averages and aggregates were made available for the intermediate purpose of analyzing the economics of Nigerian Peasant farming. This can be a substantial economy measure where conditions permit such an arrangement; in the U.S. and some other countries the comparable data-collecting agencies are barred by law from permitting third parties to use data on individual farms.

2. Opportunities arose to participate directly, or cooperatively with others, in training a number of Nigerians during the course of my tour. Some of these were appointees to the regular EDI staff for approximately one year to undertake either projects associated with the on-going research program of the EDI or one of their own choosing. Two of these were from Ministries in Enugu who were preparing Masters theses for presentation to the University of Maryland and the Institute for Social Studies at the Hague. Moreover, during the closing weeks of my tour, the Ministry of Economic Planning in Enugu assigned a statistician and

an economist to work with me in analyzing results of the productivity study. Their purpose here was to gain general experience in research methodology and to specifically learn the procedures employed on the productivity study as a basis for similar work by Ministries of the Eastern Government. One of the biggest satisfactions from my tour was to observe the progress made by some of the young Nigerian researchers.

3. On behalf of EDI, I undertook rather delicate negotiations with Ministries in the Northern and Western Regions looking to the cooperative participation in research on fertilizers and poultry as well as the productivity study.

4. I reviewed internal proposals for research and made recommendations where appropriate for altering their content. A similar function was performed with respect to proposals by U. S. scholars who planned to conduct studies on the scene in Nigeria and wished to be attached to the Economic Development Institute.

5. I participated in the appraisal of research results and gave assistance and advice for the revision of these where appropriate in preparation for publication.

6. As Acting Director of the Economic Development Institute, I presented a comprehensive review of the EDI research program at Fort Collins, Colorado, in August, 1965, where a meeting was held of representatives and guests of institutions which constitute the Consortium for the Study of Nigerian Rural Development.

7. I presented a paper to the Nigerian Society for Economic and Social Studies in January, 1966, the title of which was, "Some Considerations Bearing on International Transfer of Agricultural Technology with Particular Reference to Poultry in Nigeria." This article was published in the Nigerian Journal of Economic and Social Studies, Vol. 8, No. 2, (July, 1966).

8. Plans were formulated for a periodical to be issued by EDI carrying pertinent data and analyses for use in interpreting the current economic situation and prospects for the Nigerian economy as a whole and for important product or industry segments. Several significant analyses were developed by one of the research assistants (Mr. Moses Odaro). Final plans for this were developed in cooperation with the Ministry of Economic Planning of the Eastern Region. Unfortunately, the growing crisis in the country precluded actual initiation of the series.

IV. Problems Encountered

1. To a considerable extent, my work in EDI during the first several months was handicapped from what was construed by some outside observers as too aggressive initial promotion of EDI's capabilities. To a degree, there was validity in this complaint as very aggressive efforts were made to promote the EDI competence in other regions and in the Federal establishment before sufficient staff was "on seat" to actually conduct the research. By and large, however, the basis for this complaint was more apparent than real. The projects chosen for early

study by EDI were urgently needed by the country, and EDI was encouraged both by AID/Lagos and influential Nigerians in the Federal establishment. However, by EDI's moving into what was for all intents and purposes a vacuum, certain individuals who were just beginning to establish or enlarge similar research institutions became quite antagonistic. An added factor was the latent animosity toward an institution from the Eastern Region--a fact that was to emerge with shattering consequences later and were unpredictable earlier even by seasoned Nigerian observers. In any event, a considerable amount of my time as well as that of others within EDI was diverted in attempting to negotiate cooperative arrangements on research projects, some of which, notably fertilizer, were eventually dropped from further consideration because of the internal political instability.

2. The Economic Development Institute actually had three separate contracts with the United States Department of Agriculture:

   (a) A $20,000 contract to synthesize secondary data as the basis for making preliminary analyses pertaining to the productivity study.

   (b) A $45,000 contract to support the collecting of primary data from farmers in villages.

   (c) The master agreement for the productivity study itself which involved EDI, RERU at Ahmadu Bello University, NISER at University of Ibadan, AID/Lagos, and the Federal Ministry of Economic Development. The first two contracts were directly between EDI and the U.S. Department of Agriculture in Washington.

Within the Economic Development Institute, we tried to operate as if there was one central objective; namely, the productivity study, and the results of the other two supporting projects would supply data for the analysis. Stemming again from the prevailing jealousies in the country of EDI, it was not possible to develop a contract which recognized explicitly the role which EDI, in fact, was to play in the whole study. Instead, an exchange of letters between the above Nigerian institutions and USDA in Washington was employed as a tactical device. This procedure assigned a leadership role nominally (supposedly) to the USDA researcher. As the events unfolded, it became evident the USDA representative had not been informed of the rationale for the nature of this exchange of letters which was to constitute the "agreement." Moreover, his superiors apparently intended, informally at least, that he would represent the USDA in Nigeria for supervising contracts (1) and (2). The resulting confusion caused a delay of several crucial months in initiating actual field work because:

(1) Although the USDA representative presumably was waiting to depart for Nigeria upon completion of an agreement, he did not arrive in Nigeria until October 1st, even though the agreement was completed in mid-July.

(2) The jurisdictional problems involved were not resolved in a manner that permitted agreement on the final research content until the senior USDA representative visited Nigeria in April, 1966. From then on, relationships were very harmonious.

V. Recommendations

My experience during this tour, including the attempt to overcome obstacles cited earlier, gives rise to certain conclusions as to priorities and procedures that may be useful in other situations:

1. Advisors recruited for an organization such as the Economic Development Institute should have had previous experience in or have demonstrated a clear-cut aptitude for government service.
2. Excellent early linkages were established between the Economic Development Institute and planning units of government. Unfortunately, as usually is the case, there was not harmony as between the planning agencies on the one hand and operating agencies on the other. Close linkages were needed between EDI and both types of Ministries. Our experience demonstrated that more meaningful and lasting linkages can be established by offering to post a person with the Ministry or having the Ministries second persons to on-going projects within the EDI, projects in which the Ministry has a keen and urgent interest, preferably under conditions by which they incur some direct financial outlays in addition to the person's salary. Needless to say, there are two-way benefits from such relationships: (1) EDI personnel become quickly atuned to the current problems and opportunities in the country and in government operations, and (2) Ministerial employees can benefit from effective on-the-job training under seasoned researchers and supervisors.

3. Once a long-term research program is formulated in which the host government is thoroughly involved, senior advisors within an organization such as the EDI can consider inviting relatively short-term researchers, such as doctoral candidates, to take part in on-going projects and reasonably expect to obtain a useful product while giving the visiting researcher an opportunity for a rich and exciting experience. In this connection, it would appear that the cooperation of the Mid-west Consortium of Universities should be sought to help recruit competent researchers who could become involved in institutions such as the EDI. This would appear to be particularly feasible in this instance because both MSU and the University of Wisconsin are actively involved in Nigeria in agricultural development problems.

4. Considering the role of the MSU advisory group as a whole, it is clear that agricultural economists should have been posted in Nigeria much earlier in the University of Nigeria program. In fact, it is unbelievable that MSU would have waited until the sixth year to post an agricultural economist at Nsukka. The whole thrust of the AID program including the University of Nigeria component is to promote economic development. Agriculture accounts for around two-thirds of the gross domestic product of Nigeria and for the employment of around three-quarters of the workers. Viewed in this context it would appear an agricultural economist would have been more important to the University of Nigeria than to the best land-grant Universities in the United States. Had one or more agricultural economists come with the first contingent of advisors

to the University of Nigeria, the following benefits could have been realized:

(a) Economic rationale could have played a larger part in structuring the Faculty of Agriculture and planning the University Farm. There undoubtedly would have been, for example, less inputs for poultry and fewer resources channeled into overly-sophisticated agricultural engineering, considering the plausible near-term potential for Nigerian agricultural development.

(b) Some meaningful research would have been initiated much earlier, providing the basis for more effective teaching and a sounder basis for government policy-making.

(c) More students would have been encouraged to enter the field of agricultural economics in the earlier years and their training would have been stronger. As a result, the minimum needs of government and private firms for this scarce specialty would have been more adequately supplied. Moreover, promising students could have been identified for participant graduate training overseas and by 1967 would have been ready to return to Nigeria for their thesis research and soon be ready for responsible positions both in government and in the University. As it is, only one person, (I. E. Odumodu), has been sent overseas for graduate training in agricultural economics, and he did not leave Nigeria until the autumn of 1966.

(d) Earlier posting of expertise in agricultural economics could have been helpful to the AID program in Eastern Nigeria. AID has had

one agricultural economist to cover all of Nigeria and, unfortunately, he has been engaged primarily in agricultural program operations and other administrative matters and, therefore, has had little time to conduct even ad hoc kinds of economic analysis.

5. As a general rule, most students should be returned to Nigeria from overseas as soon as they complete their course work for the Master's degree. This would give them a further opportunity to demonstrate that additional resources could be justifiably invested in them. Moreover, this would keep them oriented to the Nigerian scene and do research which would be useful to the Nigerian Government.

6. In the nature of suggestions regarding administration, I offer the following:

   (a) In contracting for air freight service, it should be made explicit to the transport firms they will be compensated at air-freight rates only if they render truly air-freight service. In my case, our main air shipment was picked up at our Silver Spring residence on July 2, 1965, but did not move out of a Washington, D.C., warehouse until September 22, arriving in Enugu a month later. The total elapsed time exceeded that for our surface shipment. Many have had experiences similar to ours, causing very substantial unjustified payments by the U.S. Government.

   (b) The transport companies should be required to submit gross and net truck weights, based on a government (state or local) inspected scale on all household goods destined for storage. I happened to

have net weights from a recent move (July, 1964) which showed the agency of NavPac was billing for at least 2,000 pounds extra weight. I returned to them the bill for the extra weight (for storage) with my previous documents and after 8 months have heard nothing from them.

(c) A summary of relevant AID and/or contract regulations should be distributed so that each advisor as well as the administrative staff may be more efficiently informed of responsibilities and entitlements.

APPENDIX

SOURCES OF CHANGES IN AGRICULTURAL PRODUCTIVITY IN NIGERIA

I. Objectives:

A. To estimate present productivity levels for important agricultural inputs.

B. To evaluate farmers' economic efficiency in use of available resources, given the techniques acautlly employed by them.

C. To identify reasons for observed differences in productivity of the inputs, particularly of labour, and attempts to quantify the separate contributions of major elements to these observed differences, including external factors, especially agricultural research, extension services, formal education and possibly credit, transportation and health facilities.

D. To describe the frame of reference in which Nigerian farmers make economic decisions; evaluate farmers' motivations, the factors influencing them and, in turn, their influence along with other factors on responsiveness of farmers to price and other economic incentives.

E. To gather basic economic data on income and expenditures by the household-farm decision-making units that will permit insights concerning savings functions, investment patterns including those for education as well as non-cash-cost kinds of physical investments. Also, to gain additional insights as to the relative contribution of the subsistence sector as it may vary over the Federation.

F. Incidental to pursuit of the foregoing objectives, to depict statistically the internal structures of Nigerian farms and the extent to which they vary both within villages and among localities.

II. Relevance of Objectives--In Summary:

Estimates of current (value) productivity levels (sought in Objective I-A) when compared with prevailing prices for the resource-services in the same villages (utilized in seeking Objective I-B) would permit some judgments as to directions and kinds of advice farmers need in order to become more efficient. The comparisons could indicate, for example, how much, if any, improvement in output could be achieved just by using resources in different combinations. They might indicate the kind of extension specialists needed--e.g., whether agronomists, engineers, economists, rural sociologists, etc.

Meaningful answers from pursuit of Objective I-C would suggest the more productive, long-term investments which government and possibly some private firms could make to expedite agricultural progress. It would be possible in a companion study, employing results of earlier steps in this analysis, to estimate the economic gain from introduction of available but not yet generally used techniques. Estimates of peoples' economic behaviour in spending, saving, investing (Objectives I-D and I-E) could be very revealing as to how the mass of the Nigerian agricultural population, under certain realizable conditions, might increase investments and improve agriculture, given adequate incentives. The release of statistical information for villages (Objective I-F) would be a secondary objective, so far as the study is concerned, but would be of immeasurable value to

many observers and analysts of the Nigerian economy, in view of the very limited statistics which now exist concerning the nature of farm enterprises.

III. Justification:

Among theoriticians and empericists concerned with economic development, there is still a rather wide range of views as to the role of agriculture in the entire development process. The relevance of these differences varies among the developing countries but this need not be of great concern in the present context. It is sufficient to recognize that progress in agriculture is needed in order to help assure balanced growth if not to initiate economic growth in the first instance.

In the following terms, the Food and Agriculture Organization [1] of the United Nations has summarized the tasks facing Nigerian agriculture:

A. To provide increases in the per capita quantity and a general improvement in quality of food for a population likely to increase at least 55 per cent by 1980.

B. To provide raw materials for domestic industries.

C. To provide the means to increased export earnings.

D. To help provide increased employment.

E. To provide a major part of the capital needed to finance economic development.

F. To modernize production methods in agriculture so as to:

   1. release a portion of the population for producing other goods and services;

2. raise per capita incomes of rural population with that for non-farm people;
3. lower production costs to benefit domestic consumers and enhance comparative advantage in export markets.

Clearly, Nigerian agriculture faces tremendous tasks for the foreseeable future. It is to assist in meeting these challenges that this study will be directed. It is expected, also, that some of the results from this analysis, along with the outcome of similar studies under way in other countries, will be generally useful in development of countries some of which face more serious agricultural problems than Nigeria.

In pursuit of individual objectives of this study, analyses will be oriented to the development of practical information of critical importance to Nigerian policy-makers in:

1. advising individual farmers or farmers' groups on use of resources over which such farmers have control;
2. changing amounts or kinds of direct services made available to farmers by government (e.g., research, extension or education); and
3. deciding on advice or encouragement that government could give to private agencies which in turn provide or could provide services to farmers (e.g., marketing and credit facilities for both inputs and products).

It is not anticipated that a single key element will be discovered to open the way to a broad and immediate transformation of traditional agriculture. It is

expected, however, that approaches will be identified and which hold promise for a significant beginning. It is anticipated, moreover, that some approximations will be made of returns to scarce government resources applied in alternative directions to achieve these ends.

The behaviour of farmers as consumers can influence their performance, currently or potentially, as producers. This influence flows from the manner by which they allocate income as between current consumption and savings (or investments). In a large context, behaviour of households in saving-practices influences the rate of capital formation--both of the physical and human kinds. Also, consumers' allocation of expenditures can influence the direction of a country's production in the non-agricultural sector as well as the size of domestic production as compared to imports. Thus, in total, the data on consumers' expenditures and consumption functions can be highly valuable beyond the immediate purposes of this particular study.

IV. Plan of Analysis:

A. Hypotheses:

This study will be designed to test the following set of hypotheses:

1. That through a long period of time, generations, if not centuries, Nigerian farmers have adjusted to the agricultural techniques now generally used and as a result there is little opportunity at present to increase output by altering the combinations under which existing resources are employed.

2. Those sectors of Nigerian agriculture where improved technologies have been introduced show higher output per unit of labour and land resources employed and also larger opportunities for gain from recombining resources actually used.
3. That introduction of improved technology to an agricultural enterprise is a powerful inducement to productive investments and savings (or borrowing) for that purpose, even by people with very low incomes provided appropriate rewards prevail.
4. That returns to society's investments to develop and/or provide improved technology can be very significant by virtue of their direct contribution toward increasing technical efficiency of agricultural resources. Other services such as formal education, extension, credit and marketing can contribute to facilitating technological advance as well as to more efficient utilization of existing resources.

B. General Approach--In Summary:

This study will be conducted in two related and simultaneous phases:

PHASE I.

In cooperation with the Rural Economic Survey of the Federal Office of Statistics, data will be gathered from 30 farms (and households related thereto) in each of up to 25 villages well distributed over the entire Federation. Data will include quantities and values of inputs, value of output, income per farmer and household expenditures. Employing acceptable data from these villages along with similar data to be

collected from up to 8 additional villages (also 30 units each, PHASE II below), analyses will be conducted which fall into the following two categories:

1. Within-Village: Using regression analyses, an attempt will be made to quantify the functional relationships between major annual inputs and output for farmers and to determine income elasticities for foods and other purchases by households along with savings and investment patterns and outlays for education.
2. Between-Village: In this step, the annual averages of farm and household data will be employed as observations. Measures of certain non-farm provided services such as research and extension inputs will be included in a regression analysis in an attempt to appraise their contribution to observed differences in agricultural productivity of farms in rather widely separated villages.

PHASE II.

With resources available to this project, up to 8 villages will be surveyed somewhat more intensively than those in PHASE I. The greater intensity will take two forms:

1. Greater variety and more detailed statistics will be collected concerning the farms, households and villages.
2. Each of up to four senior researchers located in different areas of the country will make frequent visits to two substantially different villages to obtain meaningful information on individual and group behaviour. To be sought particularly will be information which has

an important and relevant bearing on decision-making in the economic process. These include individuals' beliefs and values, structure of authority within the village and existing traditions and institutional organizations.

C. Data Requirements and Survey Methods:

1. Statistical Information

Economic data needs are of two kinds:

a) micro, i.e., data on individual farms, farmers and households;

b) macro, i.e., averages or aggregates pertaining to inputs of non-farm provided services such as research, extension, education and possibly data pertaining to such items as credit, transportation and marketing.

a) Micro Data:

The wide array of economic data needed for this study will encompass amounts of family labour used (by seasons and crops), crop areas and rotations, amounts and prices of purchased inputs including labour, land rental rates where applicable, prices of various products, quantities and values of home-produced and purchased foods consumed, value of production of the farm, outlays for education, savings and investments including non-cash kinds and some social characteristics of the farmers such as number, age and sex of family members, membership in organizations or societies.

Data on farms and households will be obtained by frequent interviews with farmers (and their wives) and closely observing them as they work and live. This is the method used by the Rural Economic Survey (RES) of the Federal Office of Statistics (FOS). In fact the RES posts two enumerators on year-round basis in each of the 205 villages it covers currently. These are located as follows: 96 in the North, 48 in the East, 37 in the West and 24 in the Mid-West. The RES program has been under way for several years looking to the perfection of procedures and results to permit periodic release of aggregate production data and related information.

To obtain the data needed in PHASE I, a cooperative arrangement has been made with the RES. Officials of RES have accepted our suggestions for six amendments to their schedules pertaining to farms and farming operations in 25 villages. With these slight alterations or additions, acceptable data concerning agricultural production and disposition should be forthcoming. Because of other demands on their village enumerators, the RES in 1966-67 will not gather data on household consumption and expenditures. They have, however, accepted our proposal to furnish a third man for each of the 25 villages to gather data on household operations and some selected information through questionnaires and schedules to be developed by the Project team. Supervisory staff from this

project will have limited access to the villages and enumerators but data on individual households as well as the farms will not be delivered to this project until normal editing by the RES supervisory staff. The RES has given full assurance, however, that processing of data (obtaining relevant averages and aggregates) will be given high priority as soon as field work is completed so that analyses proposed herein may be expedited.

The selection of 25 villages out of the total of 205 surveyed by RES will be done primarily by the research team but with the active advice of RES officials. A prime objective will be to get considerable variation among them in terms of measurable phenomena of most relevance to the productivity study. Specifically, they will be chosen to represent extremes in techniques, encompassing the most stagnant and the most advanced to the extent this is possible within the RES group. Another criterion will be measurable differences in certain macro data (discussed below) which on a priori basis would be expected to influence productivity levels. Finally, substantial consideration will be given to the competence of the RES enumerators. Within villages, of course, random choice of farmers will continue to be employed by the RES enumerators; households to be studied will be those associated with the 30 farmers.

Recognizing that the RES selects villages to achieve statistical representativeness, rather than encompass all extremes, the 8 villages for PHASE II will be selected to represent more unusual situations within the limits this is possible considering travel problems from the University sites and the need for frequent visits by the senior analysts. In collecting basic economic data, the survey procedures will closely parallel those employed by RES. However, EDI direct-hire enumerators will be employed and an effort will be made to get substantial supplementary information, some of which will be suggested in the course of the study itself. In this connection, it is anticipated that insightful data will be collected on credit operations (sources, rates of interest and repayment practices), on intricacies of land tenure arrangements, informational and physical provisions for marketing and transport as well as data on amounts and forms of investments (and savings).

b) Macro Data:

Data on inputs for agricultural research extension, education and any other relevant phenomena that would seem to hold promise of explaining variability in productivity among villages, will be assembled mainly from appropriate jurisdictions, to the extent available and applicable. Some observations as to village characteristics also may be relevant; data on these will be collected from both ministerial and similar sources as

well as from respondents in the villages. This would apply particularly to land tenure, credit, marketing, transport and pricing systems. It will be necessary to devise methods to quantify these phenomena in order to meaningfully express village differences in them. An approximate idea of the relative magnitudes for research, extension and possibly education, at least, as indicated above, will be needed in selecting the villages. But collection of final data on these variables can proceed concurrently with surveys of farms and households within the villages.

To facilitate gathering of data on land use, some consideration is being given to a limited employment of photogrammetry. It appears that from mid-April to mid-May, air photographs can be obtained with sufficient foliage distinctions as to indicate areas of even small plots of the different crops. This may be useful in other aspects of the study, also. Any such information would be used only for internal research purposes--no composite figures would be released which could in any sense be confused with official statistics issued, or to be issued, by the FOS. The results, of course, would be freely available to that office.

2. Information and Social Phenomena in villages for PHASE II will initially consist of an interpretative, impressionistic or qualitative approach invilving penetrating observations and questioning of

individuals as they live and work in their normal environment. This information will be gathered primarily by the four senior researchers each concentrating on two villages. This aspect of the study will be oriented to get observations that can be used either directly in the economic analyses, indirectly for interpretative purposes, or as a basis to develop more appropriate hypotheses and/or specific methodologies. Specifically to be sought for use in PHASE II will be:

a) background information on beliefs and values held by individuals and the manner in which these influence decision-making in the economic realm. Particular attention will be given to factors affecting motivations.

b) The role of institutions (communal, governmental and others including hierarchy of authority) in facilitating or inhibiting shifts in (individual or group) behaviour in a direction that would appear to offer promise for economic betterment. These enquiries should suggest threads of similarities as well as differences that prevail in the processes of change in Nigerian agriculture. Besides providing insights of immediate use in a functional analysis, the results could help in formulating other hypotheses or in generally developing additional quantitative research approaches for the same villages. Even without such extensions, the findings are expected to be of considerable use

in suggesting additional questions for the general enquiry as well as in interpreting the results of the statistical analyses.

D. Specific Analytical Procedures:

1. Information for achieving Objective "D", which will be assembled in part prior to, in part concurrently with, other aspects of the study, will be of a qualitative nature. Insights will be sought as to:

   a) factors affecting the motivations of farmers particularly in their decision-making with respect to operating their farms and households;

   b) farmers' response to economic incentives; and

   c) farmers' receptiveness to innovations both in technical agriculture and in the conduct of their business and social affairs.

The manner and extent to which social institutions may facilitate or impede adoption of more productive techniques will be given close specific scrutiny.

As the qualitative aspect of PHASE II proceeds, the nature and extent of the quantifiable evidence that should be collected to test the stated hypothesis may become more clearly evident; some additional hypotheses also may be suggested. The results of these studies may indicate the need for additional questionnaires both for within-village and between-village analyses.

Qualitative insights gained in this stage concerning responsiveness to economic incentives will be combined with statistical evidence to more fully appraise adjustments in resource use to

variations in prices of products and of factors (or services of factors). This will contribute to achievement of Objective "B" as well as "D".

2. The statistical analyses will be divided into two parts--within-village and between-village.

   a) Within-Village Analyses:

      (1) Descriptive. Presentation of the statistical nature of farms and the range of their characteristics will be rather straight forward in pursuit of Objective "F". In this the main focus will be primarily on presenting in relatively simple and understandable form the averages and the ranges in internal characteristics of farms. This will be primarily in tabular form supplemented appropriately by interpretative charts and text. For the first time, this should give rather comprehensive insights concerning variations in the internal organization of farms in Nigeria. (It is emphasized that it is not the objective in this part to develop aggregate estimates of agricultural output for defined areas.) The village averages for farms and households will probably of widespread direct interest and use; they will serve as valuable raw materials for subsequent steps in this analysis.

      (2) Analytical. Certain observed annual averages and aggregates for individual farms will serve as the direct basis for achieving Objective I-A (estimating productivity levels for

important agricultural inputs). Specifically, these primary data will be employed in regression analyses to estimate production functions for farms in individual villages and the productivity coefficients implicit in them. Initially, at least, it will be assumed that the production functions will be of the Cobb-Douglas type:

$$\log Y = \log a + b \log X_1 + b_2 \log X_2 + - bn \log Xn$$

As the study progresses, consideration will be given to alternative formulations as the data and the nature of the economic process may suggest. The advantage of the Cobb-Douglas function, aside from the relative ease of its calculation, is that the coefficients obtained represent directly the elasticity of production. This means they indicate the percentage by which the value of product increases with each 1 per cent increase in use of a particular resource while other remain unchanged at their respective central-tendency values. Moreover, the sum of estimated coefficients for a given formulation indicates the nature of returns to scale: If the sum of the coefficients is greater than 1.0, an increase in all resources by 1 per cent will increase output by more than 1 per cent; a sum of 1.0 means constant returns; while a sum of less than 1.0 indicates that the output increases by a smaller proportion than the increase in

input of resources. (However, these factors may have only limited relevance to the current Nigerian scene.)

In this formulation, the variables prior to expression in logarithms may be defined as follows:

Y = Value of output per year per farm (in £).

X_1 = Area of land actually cultivated (in acres).

X_2 = Labor actually used on the farm (equivalent man-months).

X_3 = Capital inputs, except fertilizer (£ per year).

X_4 = Expenditure (or more appropriate measure for fertilizer) (£ per year, or a measure of volume).

Content of individual components may be described as follows:

(a) Y: Value of output will be the total of:

i) The sum of physical consumption of home-produced foods multiplied by prices prevailing in months consumed.

ii) The sum of quantities of products sold multiplied by prices received at time of sale.

iii) Increase in value of home-produced saleable items between beginning and end of the year (quantities on hand multiplied by local market prices).

iv) Increases in inventory of capital items resulting from labour input of purchases with current output

between beginning and end of year (using end of year prices).

(b) X_1: Total area of land actually cultivated during the year, in acres, by each farmer. (If possible, an index of land quality will be developed and used in the analysis. Also, data on rotational sequence of individual plots should be obtained and used in the analysis.)

(c) X_2: Input of labour will be expressed in some time dimension, probably man-months equivalent. This will consist of time spent by adult males, adult females and children, the latter probably consisting of anyone under 15 years of age reported doing work on the farm. Family as well as hired labour will be included. The data may be gathered initially in terms of days but supplementary data also will be collected at intervals on number of hours worked per day and number of days per week. This will permit final expression in any term desired and standardization among villages if deemed appropriate. An effort will be made also to obtain data on distance from dwelling to individual plots, for each farm.

(d) X_3: Capital inputs will be expressed in final regression analyses as pounds/shillings per year per farm. This total will be comprised of the following:

i) Value of all variable inputs purchased for production (except fertilizer).

ii) Expenditures for maintenance of capital items.

iii) Depreciation on capital items.

iv) Reductions in inventory values for variables or capital inputs (as measured above).

(e) X_4: Fertilizer inputs, it is tentatively planned, will be expressed in value (£) per year. Alternatively, product weight or weight of actual nutrients could be used. The latter is preferable but may be impossible to collect even for inorganic fertilizers. Certainly, it would be impossible in cases involving purchases of organic fertilizers.

The arithmetic average output per unit of resource, such as per man or per acre, will be obtained in a)-(1) Descriptive, above. In an appraisal of economic performance, however, this frequently has only limited meaning and at times can be misleading. The more relevant measure to be sought is the return which the farmer would realise by applying alternatively an additional unit of each of the several resources employed. This can be done statistically by calculating the increase in value of output that will result from increasing, alternatively, each input by one unit over the average (arithmetic mean or geometric mean), while all

other inputs are held constant at said averages. These essentially are the estimates sought in pursuit of Objective I-A.

Next, to achieve Objective I-B, the estimated marginal returns as obtained above will be compared with observed rates of payment for the different resources employed within each village. On the basis of tests for significance of differences between the estimated and observed, conclusions will be made as to the economic efficiency of the farms in the respective villages. Satisfactory achievements of Objectives I-A and I-B would constitute adequate tests for Hypothesis IV-A-1.

The derivation of production functions, for all 25 RES villages, plus up to 8 intensive study-villages, it is recognised, will be a formidable task--significant coefficients may be obtainable for only a small part of them. This, of course, would seriously limit judgments regarding Objectives I-A and I-B and testing of Hypothesis IV-A-1. But this need not interfere seriously with attainment of Objective I-C, the most important of all objectives sought, or with testing of other hypotheses, especially IV-A-4. This will entail estimating a single production function for which village averages of sample farms in them will constitute the observations. Conceivably, significant

coefficients and otherwise meaningful results could flow from this analysis even though most estimates for within-village coefficients were non-significant. This arises from the fact that different (enlarged set of) variables will be employed in the inter-village part. (See b)-(1) Production, below.)

As environmental aspects of villages are observed, it may become evident that data for farms of separate but apparently similar villages should be combined. This could enhance the statistical significance of results for the "within-village" functions.

(3) The rather comprehensive data on quantities and/or values of goods and services purchased and/or used by people in farmers' households will be employed in a variety of analyses of immediate concern to this project. The technique most generally used here, as in the production phase, will be that of partial regression. Income (or expenditure) elasticities will be sought for major individual foods and groups of foods, clothing, certain durable items, outlays for education and health. Also, determinations will be made of savings functions. In all cases, factors other than income such as family characteristics and educational background will be studied to ascertain their separate influences, if any. As indicated in the foregoing paragraph

regarding studies on production, there may be merit in combining households of separate but physically comparable villages to enhance the statistical significance of observations on comsumers' behaviour. These calculations together with the inter-village analyses to be run (below) will represent accomplishment toward Objective "E".

b) Between-Village Analyses:

(1) Production. In this part, using village-averages for farms in them along with measures of certain external phenomena, an attempt will be made to estimate one aggregate production function for all the 25 RES villages plus up to 8 intensive study villages. As in the "within-village" study, income per farm (or per farmer) will be the variable to be explained. Also as before, land, labour and purchased inputs (averages for each village) will be employed as explanatory variables. The external variables will include recent inputs for research and extension, in that area or for that commodity, a measure of inputs for formal education and possibly some other measurable variables that would be expected to account for differences in productivity among villages. These could include such factors as accessibility to markets, availability of credit and/or its costs.

In general, the variables for individual villages will be the same as employed in equation (1). In this part,

however, the means for each variable will constitute the observations for the individual villages. In other words, variables for equation (2) (expansion of (1)) will be:

Y = Village mean income per farm (£ per year).

X_1 = Village mean labour employed (man-year, adult equivalent).

X_2 = Village mean land used (in acres).

X_3 = Village mean purchased inputs other than fertilizer.

X_4 = Village mean use of fertilizer per acre (monetary values, product or nutrient weight).

X_5 = Recent history on per "farm" or per "village" input for technical agricultural research.

X_6 = Recent history on per "farm" or per "village" input of extension services.

X_7 = Recent history on village differences in inputs for formal education.

X_8 and X_9 = Dummy variables.

Because the villages in the study will be quite heterogeneous, in terms of physical and other conditions, an attempt will be made to adjust for magnitudes of such differences (such as in soil quality) in order to enhance chances of obtaining meaningful and significant production functions rather than "mongrel" or "hybrid" kinds.

Candidates for insertion in lieu of dummy variables could be some measure of accessibility to markets, availability of credit or land tenure practices.

If the foregoing analyses yield coefficients which are statistically significant, the central purpose of the study (Objective I-C) will have been fully accomplished. These results along with the "within-village" comparisons between estimated marginal returns to resources and market prices will permit testing of Hypothesis IV-A-2 as well as contribute to IV-A-4.

In deriving production functions for both within-villages and among-villages, data on inputs will be combined to the maximum feasible extent so as to restrict the total number of variables in the function, leave ample degrees of freedom and improve chances of obtaining statistically significant results. As the study progresses, it may become evident that fertilizer should be simply encompassed with other variable inputs.

Besides the marginal productivities, calculations will be made of standard errors, t-values, coefficients of determination as well as arithmetic and geometric means.

(2) Consumption. Attention will be focused on identification and measurement of factors influencing consumers' behaviour which vary significantly among villages. For

this, the village means for household data--income, expenditures, savings, etc.--will become the observations. These will be supplemented in the regression analysis with measures of relevant external factors such as:

(a) Formal education levels.

(b) Nearness to a major urban area.

(c) Nearness to all-weather highway and/or other social services.

(d) An index of agricultural productivity or an index suggesting relative extent of agricultural modernization.

(e) One or two dummy variables to allow for role of so far unidentifiable factors.

Particularly to be sought in this part of the analysis are explanations for observed differences among villages in people's motivations for applying themselves in work and, in general, differences in spending, saving and investing patterns. Some insights also will be gained concerning differences in quality of diet among villages.

V. Relationship of Proposed Research to Previous Studies:

The development of the conceptual framework for this study leans heavily upon the formulation by Professor T. W. Schultz, presented in his "Transforming Traditional Agriculture" [2]. Important supplementary sources for assistance at particular points were W. A. Lewis [3] and Wolfgang Stolper [4].

Useful in the initial formulation and in subsequent development of research procedures in peasant farming were the writings of Polly Hill, particularly her seminar paper presented at the EDI in April, 1965 [5].

There is a rather impressive list of studies designed to establish production functions in developing as well as in developed economies. It is of some significance that the first published estimates for a production function for agricultural firms were made for Japan. This study used data for 1939 when Japanese agriculture was not nearly as advanced as currently; and publication occurred in 1941 [6]. The second study on agricultural firms was published in 1944 by Tintner and Brownlee, based on 468 U.S.A. (Iowa) farm records also for the year 1939 [7]. In the post-war period, with improvements in both analytical techniques and in computational devices, the volume of studies has increased substantially, particularly for the relatively developed economies. The immediate objective of most of the studies has been to evaluate for the areas studied the nearness to equilibrium based on:

1. nature of returns to scale and
2. comparison between calculated marginal value products of resources and prevailing factors prices (or services of factors).

For advanced economies, studies generally indicate that disequilibrium prevails and that farmers could improve their position by increasing inputs of capital relative to labour and frequently by increasing their scale of operations. Heady observed recently, for example, that output of U.S. agriculture probably could be increased 25 per cent by altering the proportions in which resources are applied.

A few studies have been made which permit comparisons of marginal productivities between areas although their primary objective also was evaluation as to proximity to equilibrium in the respective areas. One such study is that by Heady and Du Loit [8] which reported determinations for four states in the U. S. A. compared to a sample of farms in the Union of South Africa. A rather surprising finding of this study was that estimated marginal value products exceeded prevailing prices for factors by a substantial amount for labour as well as for capital. Further mention will not be made here of research in estimating production functions in relatively advanced economies; for these on both agriculture and non-agriculture, see references [9] and [10].

The statistical procedures outlined herein may appear overly-sophisticated, on first impression, considering the stage of development of agriculture, the purported limited knowledge of farmers and the almost complete lack of data pertaining to the operation of individual farms in Nigeria. But the hard fact is that the kinds of answers needed as a basis to formulate a suitable developmental policy for agriculture simply require the application of strong analytical tools and use of major resource inputs. First, the specification [11] and measurement problem [12, 13] overall, may be no more complex than for a developed agriculture--in some respects they can be less so--for example, the fewer kinds of inputs involved lessen the problem of inter correlation among inputs. Also, the quality of "measurable" inputs may vary less among farms. Secondly, Nigerian farmers probably have much more knowledge than is generally credited. The pre-literate status of most respondents will, in fact, mean that most of them will have good memories. This together with the limited number of operations and

transactions by the respondents and frequency of visits by the enumerators will help greatly to assure adequacy of basic data. The challenge in a study such as here proposed is to achieve a measure of empathy, the farmer's confidence and an ability to ask questions in a context that will stimulate respondents to make maximum use of their knowledge.

That it is feasible to estimate production functions for agriculture in developing countries has been demonstrated by a number of workers. Delaine Welsch [14], studying rice farms in Abakaliki area of Eastern Nigeria, found farmers allocated their scarce resources in a rational manner, that there was little room for increasing output by improvements in resource allocations. B. S. Rao [15], using data for 107 farms in West Godavari District, Andhra Pradesh, India, found, with most coefficients significant at the 5 per cent level, that, although dealing with a relatively stagnant situation, farmers could profitably employ a greater volume of purchased inputs relative to labour on paddy, but on tobacco, relatively more bullock and human labour. Likewise, C. H. H. Rao [16], based on 375 farms in India, obtained a number of significant coefficients. Incidentally, both the Rao studies employed secondary data gathered initially in farm management accounting. W. D. Hopper [17], using 1954 data for 43 farms in North Central India, obtained significant coefficients which indicated resources were allocated quite efficiently. For this study input data were gathered at the peak season of planting and tilling; production data were based on forecasts which individual farmers made shortly after planting time.

The study proposed herein has a larger number of hypotheses, in some cases more explicit than those in the above studies, and will be uniformly based

on surveillance of farmers from planting through harvest and marketing. A wide variety of situations will be surveyed in an attempt to ascertain differences in productivity levels. Explanations of these differences will be sought in an effort to identify meaningful parts of a more effective agricultural development policy. The published study with which this proposed analysis is most nearly comparable in terms of objectives and nature is that by Grilliches [18] pertaining to U. S. agriculture. In that study, per-farm state averages were used as units of observation and public expenditures on agricultural research and extension were explicitly introduced as variables in the aggregate production function. He concluded that such expenditures "significantly" affected the level of agricultural output. With respect to education, this study also confirmed earlier findings [19, 12] which indicated the important role of education in helping to increase agricultural output. Other studies [20, 21], although less statistical and definitive in nature, also point strongly in this direction.

While recognizing reservations expressed by some analysts [22], in the study proposed herein an attempt will be made to ascertain the separate influence of research and extension. Also, an attempt will be made to estimate area differences in inputs for research based on periods longer than the 5 years employed by Grilliches. This, of course, is particularly important for Nigerian tree crops. Finally, and most important, the analysis will be oriented primarily to the solution of Nigerian problems. In doing so, however, it is hoped that meaningful and significant results will be obtained that will be helpful to other developing countries as well.

VI. Relationship to Other Studies Under Way:

Nigeria is one of several countries in which studies of factors affecting agricultural productivity are currently being made, mostly under the same sponsorship as the one proposed herein. From information available so far, however, it appears that only the project for Mexico is designed to estimate influences of certain off-the-farm inputs (in that case, research), amounts of which lend themselves to some control by government decision-makers.

Within EDI, several projects are under way which relate to this project including: "A Study of Diffusion of Innovations in Developing Economies"; "Economics of Fertilizer Use in Nigeria" and "Economics of the Poultry Industry in Nigeria." Elsewhere in the Eastern Provinces there are developmental projects by the Ford Foundation and by a mission group that will be consulted in the course of the research.

On July 1, 1962, the Ministry of Agriculture of Eastern Nigeria inaugurated field investigations for its Farm Management Studies. So far two reports have been issued giving results of the survey, the first in July, 1964, and the second in May, 1965 [23]. For the 1965-66 crop year, the study was enlarged to cover 33 villages (10 in first year), distributed among all 12 provinces, 10 farmers randomly selected in each village; one representative of the Ministry of Agriculture is stationed in each village for the production season. Running accounts were obtained for each farmer.

Undoubtedly, the field procedures will provide some useful insights for the study proposed herein, particularly on the intensive portion in the 8 villages.

Every effort will be made to ascertain if it will be mutually beneficial to cooperate with the Ministry of Agriculture in the collection and analysis of data.

No attempt will be made here to inventory research currently under way in other regions of Nigeria pertaining to this and related areas, although it is understood that the Rural Economic Research Unit of Ahmadu Bello University is planning a farm management survey of a few villages. It is anticipated that the cooperation of institutions in other regions will be forthcoming in connection with the project here described.

VII. Tentative Staffing Plan for Field Study:

Enumerators

RES villages 25

Non-RES villages 16

Field Supervisors 5

The time of at least some of these may be divided between close supervision of enumerators in the non-RES villages and consulting with (RES) senior and area supervisors in contacting EDI-supported household enumerators in RES villages. The assignments for these supervisors will be influenced mainly by the geographic distribution of villages yet to be chosen.

Research Assistants 2

These men will assemble data on history of Nigerian

inputs for research, extension, education and related non-farm services.

Senior Researchers (Part-Time) 4

Each of two of these will divide his time between coordinating the entire study and conducting the intensive study in two non-RES villages. The other two will work part-time on this project and that will be devoted mostly to intensive study in the two non-RES villages for which he takes responsibility.

VIII. Time Schedule:

A. Data Collection:

1. For farms and households: May, 1966-April, 1967.
2. Inputs for agricultural research, etc.: July, 1966-March, 1967.

B. Analysis:

1. Of impressionistic observations in non-RES villages by Senior Researchers: May, 1966-September, 1967.
2. On background concerning inputs for agricultural research, extension, etc.: September, 1966-April, 1967.
3. Of basic data from farms and households for within-village phase: April, 1967-March, 1968.
4. Between-village phase: July, 1967-March, 1968.

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