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Cropping Enterprises in
Eastern Upper Volta

by

Gregory C. Lassiter

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Department of Agricultural Economics
Michigan State University
East Lansing, Michigan 48824
U.S.A.

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**Formerly Specialist in Agricultural Production Economics, Department of Agricultural Economics, Michigan State University, East Lansing, Michigan.

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The African Rural Economy Program was established in 1976 as an activity of Michigan State University's Department of Agricultural Economics. The African Rural Economy Program is a successor to the African Rural Employment Research Network which functioned over the 1971-1976 period.

The primary mission of the African Rural Economy Program is to further comparative analysis of the development process in Africa with emphasis on both micro and macro level research on the rural economy. The research program is carried out by faculty and students in the Department of Agricultural Economics in cooperation with researchers in African universities and government agencies. Specific examples of ongoing research are, "Poor Rural Households, Income Distribution and Technical Change in Sierra Leone and Nigeria," "Rural and Urban Small-Scale Industry in West Africa," "Dynamics of Female Participation in the Economic Development Process in West Africa," and "The Economics of Small Farmer Production and Marketing Systems in the Sahelian Zone of West Africa."

Carl K. Eicher
Professor of Agricultural Economics
Michigan State University

1. INTRODUCTION

1.1 Overview of this Report

The purpose of this report is to provide a brief descriptive handbook of the major cropping enterprises used in the Eastern ORD (EORD), based on farm survey data collected during the 1978-79 agricultural year. It is hoped that the descriptive analysis presented here can contribute to a better understanding of the economic structure of the cropping components of farming systems in the region while providing a baseline by which to evaluate the future progress of the ORD's extension and development efforts.

This report is divided into three main sections. Chapter 1 describes the coverage of the survey and the data obtained. Chapter 2 presents a brief overview of cropping patterns, yields, and the timing of agricultural activities during the 1978 season. Chapter 3 presents detailed regional crop enterprise budgets for six major crop enterprises: sorghum/millet, maize, groundnuts, soybeans, cotton and rice.

1.2 Data Base

The results presented in this report are based on analysis of data from the 1978-79 farm survey conducted by the Bureau of Economic Analysis and Planning of the EORD in cooperation with the MSU contract team.[1/] During the period of May 1, 1978 to April 30, 1979, the farm survey monitored

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[1/] This survey was carried out with support from contract AID/afr-C-1314 between USAID and Michigan State University.

the economic activities of 480 farm households[1] selected from 27 villages.[2] The sample is stratified across 12 zones that were purposively selected in order to represent the broad agro-climatic variation found in the EORD. Within each zone, a sample of agricultural households was randomly selected in order to represent the currently most common technology--hoe agriculture. In addition, a purposive sample of the most successful animal traction (ANTRAC) farm households, as identified by local extension personnel, was selected in 5 zones in order to represent the "performance frontier" or potential of this new technology.[3] After attrition, the entire sample consisted of 355 randomly selected "hoe" households and 125 ANTRAC households. The distribution of these 480 households across the 27 villages and 12 agro-climatic zones of the EORD is presented in Table 1.1. Their geographical dispersion is represented in Figure 1.1.

The farm interviews covered a wide range of farm, off-farm, and household activities. The survey employed the "cost route" method of data collection, based on weekly or monthly recurrent interviews to obtain information on household resource allocation. Labor information on all farm field activities was obtained through weekly interviews of one-third of both hoe and ANTRAC households.

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[1] As unit of analysis, "farm household" is defined as all nuclear families or individuals who farm together and eat from a common granary.

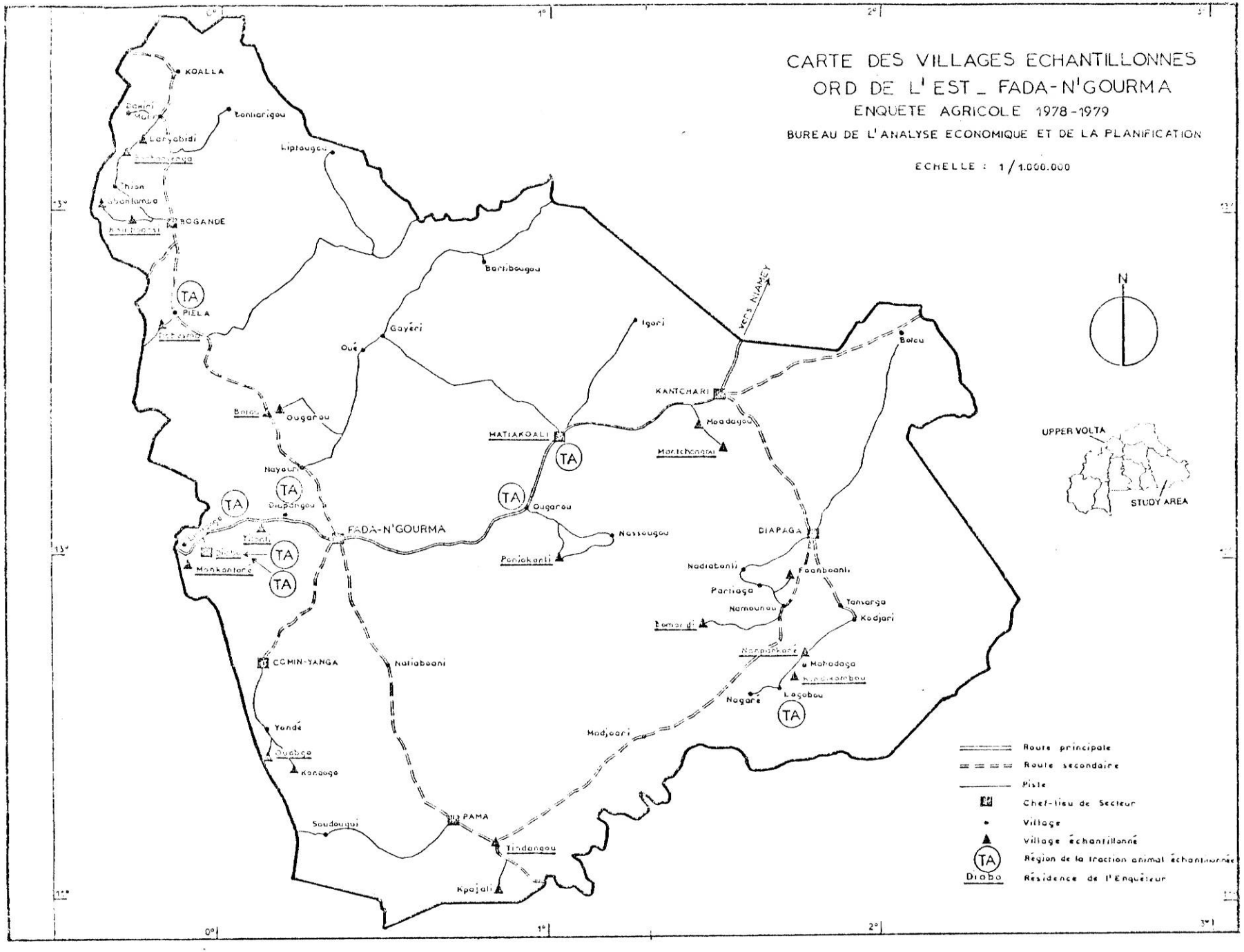
[2] For additional details on the objectives, structure, and methodology of the survey, see MSU Contract Team, "Six-Month Report: December 1977-May 1978", pp. 31-54.

[3] Because of the newness and geographical dispersion of the program, the majority of EORD ANTRAC users in 1978 were recent adopters who had hardly begun to use their ANTRAC equipment or experience any benefits from it. For this reason, a non-random sample was used to permit a "most favorable case" evaluation of ANTRAC in order to provide an indication of ANTRAC potential under EORD conditions.

Table 1.1 DISTRIBUTION OF THE 480 FARM HOUSEHOLDS SURVEYED IN 1978-79 BY ZONE, VILLAGE, AND SUB-SAMPLE

Agroclimatic Zone	Village	Number of Sampled Households by Sub-sample: Traditional (TRAD)	Number of Sampled Households by Sub-sample: Animal Traction (ANTRAC)
1. Bogandé	1. Balemba	18	-
	2. Komboassi	18	-
2. Mani	3. Lanyabidi	18*	-
	4. Bombonyenga	18	-
3. Piela	5. Dabesma	18	-
	6. Piela (ANTRAC)	-	18
4. Diabo	7. Mocontoré	18	-
	8. Lantaogo (ANTRAC)	-	18
	26. Diabo I (ANTRAC)	-	17
	27. Diabo II (ANTRAC)	-	18
5. Logobou	9. Namponkoré	18*	-
	10. Kindi Kombou	18*	-
	11. Logobou (ANTRAC)	-	18
6. Partiaga	12. Bomondi	18*	-
	13. Dupcaali	18	-
7. Yondé	14. Ouobgo	17	-
	15. Kondogo	18*	-
8. Diapangou	16. Tilonti	18	-
	17. Diapangou (ANTRAC)	-	18
9. Botou (N. de Fada)	18. Botou (N. de Fada)	18*	-
	19. Ougarou (N. de Fada)	19*	-
10. Kantchari	20. Mantchangou	17	-
	21. Mohadagou	18	-
11. Ougarou	22. Poniokondi	18	-
	23. Ougarou (ANTRAC)	-	18
12. Pama	24. Tindangou	16	-
	25. Kpcaali	16	-
TOTAL		355	125

*Village chief purposively included in sample in order to assure village support for the survey, but excluded from analysis due to non-random nature.


CARTE DES VILLAGES ECHANTILLONNES
ORD DE L'EST _ FADA-N'GOURMA
ENQUETE AGRICOLE 1978-1979
BUREAU DE L'ANALYSE ECONOMIQUE ET DE LA PLANIFICATION
ECHELLE : 1/1.000.000
N
UPPER VOLTA
STUDY AREA
KOALLA
Bontarigou
Liptougou
BOGANDE
PIELA
Bartibougou
Gayéri
Oué
Igori
VERS NIAMEY
Bolou
KANTCHARI
Ougarou
MATIAKOALI
Nayouri
Diapangou
FADA-N'GOURMA
Nassougou
Paniokanti
DIAPAGA
Nadiabanti
Foanboanti
Partiaga
Namounou
Tanvarga
Kodjari
COMIN-YANGA
Natiaboani
Yondé
Ouebgo
Kanaago
Soudougui
PAMA
Tindangou
Kpajali
Madjoari
Nagare
Logobou
Route principale
Route secondaire
Piste
Chef-lieu de Secteur
Village
Village échantillonné
Région de la traction animal échantillonnée
Diabo Résidence de l'Enquêteur

In order to conserve resources, certain data were collected only from random sub-samples of households in each zone. All cultivated acreage was measured for two-thirds of the households (234 hoe households and 83 ANTRAC households); only sorghum/millet acreage was measured for the remaining households. Labor, seed, fertilizer, and chemical input data were compiled for only one-third of the households (119 hoe and 41 ANTRAC). As a result, yields, harvest dates, and acreage[1/] data are estimated from all 480 households for sorghum/millet, but from only 317 households for all other crops. Seeding dates, labor use, and other input use are estimated from 160 households.[2/]

[1/] In order to permit comparisons between crops, sorghum/millet acreage is presented for only 317 households in Table 2.1.

[2/] Note that the one third subsample is a subset of the two thirds subsample.

2. OVERVIEW OF CROPPING CHARACTERISTICS DURING THE 1978 SEASON

2.1 Household Size and Cultivated Acreage

Table 2.1 summarizes basic demographic and acreage information from a previous report.[1/] It is reproduced here to provide various measures of the regional variability in the size of the farming unit, as well as to indicate structural differences between hoe and ANTRAC farmers.[2/] The relative importance of the different major crops is shown in Table 2.2, which presents the proportion of cultivated acreage that each major crop occupies. Sorghum/millet[3/] is overwhelmingly the predominant crop in terms of acreage (83.3 percent of hoe cultivated acreage), while groundnuts and maize are the most widely cultivated secondary crops.

[1/] D. Baker and G. Lassiter, "Crop Production in the Eastern ORD," BAEP, ORD de l'Est, August 1980, Tables 2 and 3.

[2/] The reader should note that hoe vs. ANTRAC comparisons should not be made on the basis of "all zone" averages, as presented at the bottom of Table 2.1, since the entire hoe sample represents a different agroclimatic stratification than the ANTRAC sample. Hoe/ANTRAC comparisons may be made either within common zones or across all the five zones in which both samples occur. For an in-depth analysis of the impact of ANTRAC, see V. Barrett et al., "Animal Traction in Eastern Upper Volta: A Technical, Economic and Institutional Analysis", Department of Agricultural Economics, Michigan State University, January 1981.

[3/] "Sorghum/millet" refers to any combination of sorghum, milllet, or Niadi (a 60 day variety of millet grown mainly in the wetter zones, such as Logobou and Pama, as a "hungry season" food crop).

TABLE 2.1
HOUSEHOLD SIZE AND CULTIVATED ACREAGE[a]

	Total Number of persons per household		Number of Active Workers[b] per Household		%'age Household members that are active workers		Total Cultivated Area per household (ha.)		Sorghum/Millet Area per household (ha.)		Total Area per person (ha.)		Total Area per Active Worker (ha.)		Sorghum/Millet Area per person (ha.)		Sorghum/Millet Area per Active Worker (ha.)	
Zone	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC
1. Bogandé	6.21	--	3.33	--	53.2	--	3.974	--	3.470	--	0.641	--	1.193	--	0.559	--	1.042	--
2. Mani	7.33	--	3.29	--	44.9	--	4.199	--	3.503	--	0.573	--	1.312	--	0.478	--	1.095	--
3. Piela	6.33	9.83	2.83	4.08	44.7	41.6	3.555	5.214	2.805	3.898	0.562	0.530	1.256	1.278	0.443	0.397	0.991	0.955
4. Diabo	6.83	11.31	3.08	5.20	45.1	46.0	3.998	7.236	3.103	5.583	0.585	0.640	1.298	1.392	0.454	0.494	1.008	1.074
5. Logobou	9.48	11.83	4.54	4.08	47.9	34.5	4.681	5.293	3.617	3.585	0.494	0.448	1.031	1.297	0.382	0.303	0.797	0.879
6. Partiaga	7.83	--	3.46	--	44.2	--	3.664	--	2.964	--	0.468	--	1.059	--	0.379	--	0.857	--
7. Yondé	5.95	--	3.00	--	50.4	--	4.027	--	3.534	--	0.677	--	1.342	--	0.594	--	1.178	--
8. Diapangou	7.75	13.58	3.33	5.00	43.0	36.8	4.123	6.999	3.752	5.617	0.532	0.515	1.238	1.400	0.484	0.414	1.127	1.123
9. Botou	7.61	--	3.83	--	50.3	--	4.296	--	3.783	--	0.565	--	1.122	--	0.497	--	0.988	--
10. Kantchari	7.22	--	3.52	--	48.8	--	5.184	--	4.340	--	0.718	--	1.473	--	0.601	--	1.233	--
11. Ougarou	7.92	12.83	3.92	6.75	49.5	53.0	3.611	5.655	2.955	3.926	0.456	0.441	0.921	0.838	0.373	0.306	0.754	0.582
12. Pama	7.36	--	3.14	--	43.0	--	4.479	--	3.602	--	0.609	--	1.426	--	0.489	--	1.147	--
ALL ZONES	7.34	11.72	3.47	5.07	47.3	43.3	4.209	6.400	3.506	4.816	0.573	0.546	1.213	1.262	0.478	0.411	1.010	0.950

[a]All data presented was estimated from a random 317 household subsample to which complete acreage data were available. Demographic data for the entire 473 household sample is presented.

[b]Defined as persons of age 15-54.

TABLE 2.2
PROPORTION OF CULTIVATED AREA BY MAJOR CROP AND ZONE (IN %[a])

	Sorghum/Millet		Maize		Groundnuts		Bambara Nuts		Rice		Soybeans		Cotton		Manioc, Sweet Potato, or Yam		Okra		Diverse Crops (including Garden Crops)	
Zone	Hoe	Antrac	Hoe	Antrac	Hoe	Antrac	Hoe	Antrac	Hoe	Antrac	Hoe	Antrac	Hoe	Antrac	Hoe	Antrac	Hoe	Antrac	Hoe	Antrac
1. Bogandé	87.3	--	3.5	--	9.1	--	0.1	--	0.1	--	0	--	0	--	0	--	0	--	0	--
2. Mani	83.4	--	3.3	--	11.9	--	0.4	--	0	--	0	--	0.2	--	0	--	0	--	0.8	--
3. Piela	78.9	74.7	3.5	3.8	14.2	19.0	1.0	0.5	2.2	1.3	0.2	0.2	0	0	0	0	0.1	0.1	0	0.5
4. Diabo	78.0	77.1	1.0	2.5	13.0	8.7	1.5	0.6	2.1	2.8	0.5	4.2	0	2.6	0.6	0.6	0	0	3.3	1.0
5. Logobou	77.2	67.7	2.2	2.4	9.9	10.4	0.8	0.7	3.5	5.4	0.2	3.9	0.6	2.9	2.3	2.2	2.2	0.6	1.1	3.6
6. Partiaga	80.9	--	7.5	--	1.8	--	0.5	--	3.6	--	1.0	--	1.1	--	1.8	--	1.2	--	0.4	--
7. Yondé	87.8	--	1.5	--	9.0	--	1.0	--	0.1	--	0	--	0	--	0.1	--	0	--	0.5	--
8. Diapangou	91.0	80.3	3.2	2.9	1.8	6.8	0.6	0.4	0.3	1.3	0.8	3.8	0	0.1	0.4	0.4	0.1	0.5	1.8	3.6
9. Botou	88.1	--	3.8	--	5.5	--	1.1	--	0.1	--	0	--	0.9	--	0.3	--	0.1	--	0.1	--
10. Kantchari	83.7	--	7.3	--	0.3	--	0.4	--	0.3	--	0	--	0.8	--	6.2	--	0.8	--	0.1	--
11. Ougarou	81.9	69.4	11.2	7.9	1.4	2.0	0.8	0.4	1.5	7.6	0.5	8.4	0.4	0.3	0.7	1.9	1.0	1.3	0.6	0.8
12. Pama	80.4	--	3.6	--	2.1	--	1.5	--	2.8	--	1.6	--	3.6	--	3.7	--	0.5	--	0.2	--
ALL ZONES	83.3	75.2	4.2	3.4	6.4	9.0	0.8	0.5	1.3	3.3	0.4	4.1	0.7	1.6	1.7	0.9	0.6	0.3	0.6	1.6

[a]Values represent the percentage of total cultivated acreage per zone.

For the purposes of this paper, rice,[1/] soybeans, and cotton[2/] are treated as minor secondary crops. They are of interest because of their marketing potential and their acreages, which exceed 1 percent of total area in a majority of either hoe or ANTRAC zones. Tubers (manioc, sweet potatoes, and yams) and "diverse crops" (mainly garden crops for on-farm consumption) have similar average acreages but are more regionally concentrated and, except for yams, have more limited current marketing potential. Further, a lack of sufficient yield data prohibits analysis of these two enterprises for this report. Bambara nuts and okra have only insignificant acreages.

The relative importance of sorghum, millet, and Niadi (short season millet) is shown in Table 2.3. Sorghum is the preferred grain because of taste and its higher yields. It demands more rainfall and higher soil fertility than millet and is more sensitive to drought and striga. Zones with poorer soil fertility (usually due to high population density) or a recent history of drought therefore tend to place more emphasis on millet than other zones. However, the emphasis on millet is not as strongly related to rainfall as one would expect (see Table 2.4 below).

2.2 The 1978 Harvest in Historical Perspective

Analysis and interpretation of a single season's harvest requires a comparative context. Unfortunately, historical data on yields are virtually non-existent, rainfall data are very spotty and soil maps of sufficient detail are unavailable in the EORD. Rainfall data for the EORD are presented in

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[1/] Rainfed rice only. No sampled farmers irrigated rice in 1978.

[2/] Almost entirely consisting of cotton production for on-farm weaving, using indigenous varieties and few chemical inputs, and providing little surplus for market sale.

TABLE 2.3
BREAKDOWN OF SORGHUM/MILLET ACREAGE BY PRIMARY CROP AND ZONE (in % each zone's Sorghum/Millet acreage)

Zone		Sorghum Alone		Sorghum and Millet		Millet Alone		Niadi[a]	
		Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC
1.	Bogandé	32.5	--	42.6	--	25.5	--	0	--
2.	Mani	59.2	--	26.9	--	13.9	--	0	--
3.	Piela	8.8	21.6	35.9	27.1	55.3	51.3	0	0
4.	Diabo	10.8	24.6	15.3	31.8	73.9	43.7	0	0
5.	Logobou	50.9	49.3	5.3	11.7	11.4	1.0	32.3	37.9
6.	Partiaga	70.1	--	29.9	--	0	--	0	--
7.	Yondé	26.5	--	39.9	--	33.5	--	0	--
8.	Diapangou	15.6	14.9	55.2	52.2	29.2	32.9	0	0
9.	Botou	42.6	--	36.8	--	20.6	--	0	0
10.	Kantchari	16.7	--	80.8	--	2.5	--	0	--
11.	Ougarou	85.7	94.7	14.3	3.2	0	2.1	0	0
12.	Pama	27.6	--	50.2	--	4.1	--	18.1	--
	All ZONES	38.1	34.2	38.6	28.9	18.5	32.7	4.8	4.2

[a]Any field containing Niadi (a 60-day short season millet) whether or not in association with sorghum or millet.

Table 2.4. Unfortunately, much of these rainfall data are misleading. For example, we observed a severe drought during the 1978 season in Piela, Diapangou, and Botou (north of Fada)[1/] but not in Logobou, Pama, Partiaga, Ougarou, and Kantchari as shown in Table 2.4. Also, Mani had one of its best harvests in over a decade while the rainfall data show below average precipitation.

One source of inconsistency between rainfall data and observed yield performance may be the underenumeration[2/] of rainfall data. Logobou's reported rainfall appears unreasonably low. Other stations are similarly suspect. Another source of inconsistency may be that the timing of rainfall probably had more effect on yields than total rainfall. Many stations experienced a drought from early June through mid-July. The timing and intensity of rains during this drought and at the end of the rainy season could have had a critical effect on yields. Also, in some cases the regional rain station may have been located sufficiently far from the surveyed village (Kantchari, Pama and Mani) to be unrepresentative, given the high micro-variability of tropical rain squalls.

One method for placing the 1978 season in historical perspective is to use farmers' subjective evaluations of the harvest. Table 2.5 presents the percentage of farmers[3/] who evaluated the 1978 harvest for each crop as

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[1/] The Botou survey zone refers to the small village of Botou that is 50 km north of Fada and 25 km south of Bilanga. This should not be confused with the major village of Botou found east of Kantchari near the Niger border.

[2/] One rainfall station's low estimate (not reported here) resulted from the extension agent taking vacation in August and reporting no rainfall while away.

[3/] Includes both hoe and ANTRAC farmers. For each crop, estimates were based only on farmers who actually grew that crop.

TABLE 2.4
RAINFALL BY ZONE FOR 1978 (IN mm.)[a]

Zone	March & April	May	June	July	August	September	October	Total For 1978	Estimated Longterm Average[b]	% Change From Longterm Average
1. Bogande	91	55	89	178	133	87	10	644	690	- 6.7
2. Mani	57	29	93	145	149	79	4	558	610	- 8.5
3. Piela	85	65	91	98	113	87	11	549	750	-26.8
4. Diabo	27	82	175	178	126	127	61	776	880	-11.8
5. Logobou	20	102	132	90	153	15	0	512	960	-46.7
6. Partiaga	29	125	134	61	195	105	5	655	900	-27.2
7. Yondé	101	137	116	128	224	136	19	861	900	- 4.3
8. Diapangou	55	103	125	122	123	114	31	672	910	-26.2
9. Botou	61	50	133	107	137	164	5	658	858	-23.3
10. Kantchari	0	52	178	105	155	191	18	698	870	-19.8
11. Ougarou	43	100	126	114	181	127	14	703	880	-20.1
12. Pama	101	84	94	60	290	85	18	731	1060	-31.0

[a]From "Rapport Technique: Campagne 1978-79," BPA, ORD de l'Est, 1979. Zonal rainfall data represent averages from regional rain stations: Bogandé (Diaka + Kossougou); Mani (Diaka + Dakiri); Piela (Piela); Diabo (Diabo I + II, Lantaogo, Saatinga, + Tangaye); Logobou (Logobou); Partiaga (Namounou + Partiaga); Yondé (Yondé); Diapangou (Tangaye + Tibga); Botou north of Fada (Bilanga + Yamba); Kantchari (Kantchari); Ougarou (Matiacoali due to serious underreporting at the Ougarou station); and Pama (Pama).

[b]From J. Weldring "Synthese sur les Amenagements Hydro-Agricoles dans l'ORD de l'Est, Fada N'Gourma," Direction du Fonds de Developement Rural, Ouagadougou, May 1979, pp. 5-6. These figures were taken from an uncited 1974 S.A.E.D. report and probably represent 20 year rainfall estimates extrapolated from a few national rainfall stations from similar latitudes. In cases where Weldring did not present an estimate for a survey village, regional averages were used: Bogandé (Bogandé + Thion); Mani (Coala); Botou (Bilanga + Yamba); and Diapangou (Fada).

Table 2.5 PROPORTION OF FARMERS WHO FELT THE 1978 HARVEST WAS BETTER THAN AVERAGE

Zone	Sorghum	Millet	Niadi	Maize	Groundnuts	Bambara Nuts	Cowpeas	Soybeans	Sesame	Cotton	Rice	All Crops[b]	Rank for All Crops
1. Bogandé	6	28	X[a]	6	19	X	3	X	4	10	X	29	8
2. Mani	79	85	X	46	66	44	33	X	29	46	X	74	1
3. Piela	19	26	X	7	31	6	10	X	12	X	X	21	9
4. Diabo	68	61	X	50	48	44	42	56	X	54	25	61	3
5. Logobou	52	63	53	27	37	44	51	18	X	10	18	52	4
6. Partiaga	46	25	X	44	33	X	20	10	X	X	74	36	6
7. Yondé	3	3	X	15	14	17	3	X	X	X	X	15	10
8. Diapangou	0	3	X	9	4	X	0	8	X	X	X	6	12
9. Botou	3	0	X	3	3	0	15	X	5	10	X	7	11
10. Kantchari	21	33	X	41	58	46	26	X	X	25	X	29	7
11. Ougarou	89	57	X	56	47	44	18	55	X	X	38	67	2
12. Pama	81	25	6	13	24	0	36	8	X	6	5	45	5
ALL ZONES[c]	41	36	30	28	32	31	23	30	13	23	32	36	

[a]X = less than 10 farmers cultivated this crop.

[b]Weighted average with sorghum and millet each given a 40 percent weight end the simple mean of all other crops given a 20 percent weight.

[c]Mean of producing zones only.

being "better than average." While the meaning of "better than average" is problematic, particularly since farmers tend to give overly pessimistic responses,[1] Table 2.5 still provides useful information for making zonal comparisons for individual crops. Further, when zones are ranked according to an "all crops" composite value, these rankings are far more consistent with field observation than were the rainfall data. Only Diabo (ranked 3rd for all crops) stands out as having a more favorable rating than its 1978 harvest would merit.[2]

Table 2.6 helps put the 1978 harvest in context by relating it to the average harvest for the 1973-77 period. Since no other historical harvest data exist, Table 2.6 was calculated on the basis of farmers' estimates of each crop's total harvest for each year from 1973 to 1978. Though a surprising number of farmers could estimate the past 5 years' harvests, limited data make estimates possible in only 9 of the 12 zones.[3] In general, yields were higher in 1978 than the 1973-77 average, as one would expect. Further, the relative performance of the different zones is consistent with field observation and farmers' subjective evaluations of the 1978 harvest.

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[1] Over all zones, only 36 percent of farmers evaluated the all crop harvest as above average. However, compared to recent years which were plagued by drought, 1978 was clearly an above average year for the region as a whole, which is supported by Table 2.6 below.

[2] Diabo farmers' favorable evaluation of the 1978 harvest may reflect how devastated by drought the area was as recently as 1977.

[3] While the absolute annual harvest quantities may be difficult to estimate accurately for many crops, the procedure only analyzes relative changes in harvests. Further, the end of year recall method of harvest measurement appears to be a reasonably accurate, low cost survey procedure.

Table 2.6 PERCENTAGE INCREASE IN THE 1978 HARVEST RELATIVE TO THE AVERAGE HARVEST FOR 1973-1977[a]

Zone	Sorghum	Millet	Maize	Groundnuts	Cowpeas	Sesame
1. Bogandé	- 4	52	-24	3	-23	-21
2. Mani	108	191	26	109	- 6	46
3. Piela	X[b]	-12	-55	19	11	2
4. Logobou	15	26[d]	4	-23	57	X
5. Partiaga	33	- 6	41	X	6	X
6. Diapangou	8	-38	-19	-42	13	X
7. Botou (N. Fada)	-47[e]	X	-56	X	X	X
8. Kantchari	39	194	51	X	30	X
9. Ougarou	168	X	45	X	-36	X
ALL ZONES[c]	51	50	11	19	10	4

[a]Based on farmers' recall of annual harvests from 1973-78. These data reflect changes in acreages as well as yields.

[b]X = less than 12 farmers reporting.

[c]Mean of all households reporting.

[d]Refers to Niadi only.

[e]Sorghum plus millet.

2.3 Crop Yields

Crop harvests were measured by three alternative methods during the 1978-79 farm survey: (1) yield plots, (2) monthly recall of each field's off-take, and (3) end-of-season recall of total annual production. In a previous report, [Baker and Lassiter, pp. 39-44], the yield plot method was discussed and its preliminary estimates were presented. Subsequent analysis of the yield estimates based on both field off-take and end-of-season recall have led us to believe that the yield plot method seriously overestimated crop yields.[1/] As a result, revised yield estimates are presented in Table 2.7. These revised estimates represent averages of the estimates of both the field off-take and the end-of-season recall method.

The yields in Table 2.7 clearly reflect certain general characteristics of the 1978 season, such as the serious drought that affected Piela, Diapangou, and Botou. Low sorghum/millet yields were experienced in zones which put greater emphasis on millet, such as Bogandé, Yondé and Diabo. Excellent yields were experienced in Ougarou and Mani.

Crop yields are generally low which reflects, in large part, the low level of soil fertility that is characteristic of the bush fallow system. Yields vary dramatically between zones which is largely attributable to differences in rainfall and soil. A smaller but appreciable amount of zonal yield variation is due to both sampling and measurement error, which is more marked for secondary crops than for sorghum/millet. Unfortunately, such zonal yield variation makes intrazonal comparisons difficult on the basis of a single season's data.

[1/] Probable causes of yield plot overestimation are: (1) failure to account for the yield-reducing "border effect," (2) harvest exaggeration by farmers who harvest beyond the true boundary of the plot, and (3) plot location bias due to field staff placing plots in either the most productive fields or the most productive portions of a given field.

Table 2.7 YIELDS PER HECTARE FOR MAJOR CROPS[a]

Zone		Sorghum, Millet and, Niadi		Maize		Groundnuts		Soybeans		Cotton		Rice	
		Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC
1.	Bogandé	243	-	420	-	289	-	X[d]	-	X	-	X	-
2.	Mani	991	-	963	-	407	-	X	-	X	-	X	-
3.	Piela	159	170	123	124	328	203	X	X	X	X	268[b]	X
4.	Diabo	274[b]	307[b]	1,539[c]	884	78	237	X	329	X	236	379[c]	563
5.	Logobou	517[b]	516[b]	940	1,189	359	357	X	42	70	103	401	212
6.	Partiaga	748	-	451	-	192	-	238	-	X	-	1,597	-
7.	Yondé	257	-	842	-	180	-	X	-	X	-	X	-
8.	Diapangou	172	287	1,135	1,306	259[c]	466	X	843	X	X	X	220
9.	Botou	328	-	910	-	199	-	X	-	288	-	X	-
10.	Kantchari	690	-	255	-	371[c]	-	X	-	230	-	X	-
11.	Ougarou	1,405	1,258	412	679	440[c]	1,079	X	571	X	X	923[c]	1,063
12.	Pama	796	-	806	-	362	-	527	-	122	-	1,649	-
	All Zones	547	450	588	797	287	299	378	437	145	203	982	717

[a]Estimated for fields in which the given crop was predominate. Estimates represent the average of two alternative harvest estimation methods: (1) end of season recall of total annual production and (2) monthly recall of field off-take. Sorghum/millet yields are calculated from the entire sample of 473 households (an additional 7 purposively selected village chiefs were excluded). Other crop yields are based on a randomly chosen 318 household sub-sample.

[b]Based on end of season recall only.

[c]Based on less than 1 hectare of cropped area.

[d]X = acreage too small to permit estimation.

Table 2.8 presents the yields of sorghum, millet, and Niadi in grain fields. While the aggregated nature of this table obscures a slight stratification bias (more millet data come from the dryer zones while more sorghum and all Niadi data come from wetter zones), it clearly shows the higher yields of sorghum versus millet. Note that Niadi proves to be a productive crop when the yield of relay cropped sorghum is counted.

2.4 The Cropping Calendar

The timing of individual cropping activities is a key factor in determining the success of a farmer's total crop production efforts in an area like the EORD, though climatic and technical limitations can greatly reduce farmers' flexibility in allocating their labor. The short rainy season, characterized by sporatic drought particularly in May and June, forces farmers to race to get crops planted as quickly as possible. By late June, weeding requirements are so demanding that the household labor supply is working to capacity.

Table 2.9 presents the average seeding and harvest dates for 8 crops. Seeding dates[1/] generally vary between early June and mid-July, with sorghum seeded earliest and cotton and bambara nuts seeded latest. With the exception of maize which is harvested as an important "hungry season" food crop in early September, there is little variation in the harvest dates of other crops. Both seeding and harvest dates vary across zones for each crop in accordance with each zones' rainfall patterns. While their zonal differences generally follow historical patterns for the on-set and end of the rainy season, seeding dates are greatly influenced by local drought patterns.

[1/] Seeding dates represent weighted average dates for all seeding and reseeding activities (weighted by the quantities of seed used). Since some early seedings completely fail, particularly for sorghum and millet, these average dates are slightly earlier than the "effective" seeding date.

TABLE 2.8
PRIMARY CROP YIELDS IN SORGHUM/MILLET FIELDS
(Kgs./Ha.)

Crop	Field Type: Sorghum alone Hoe	Sorghum alone Antrac	Sorghum and Millet Hoe	Sorghum and Millet Antrac	Millet alone Hoe	Millet alone Antrac	Niadi Hoe	Niadi Antrac
Sorghum	753	811	346	177	--	--	324	361
Millet	--	--	173	211	276	209	68	17
Niadi	--	--	--	--	--	--	253	443
All Grain Total	753	811	516	389	276	209	645	821

TABLE 2.9
AVERAGE SEEDING AND HARVEST DATES[a] FOR THE 1978 SEASON

Zone	Sorghum		Millet[e]		Maize		Groundnuts		Bambara Nuts		Rice		Soybeans		Cotton	
	Seeding	Harvest	Seeding	Harvest	Seeding	Harvest	Seeding	Harvest	Seeding	Harvest	Seeding	Harvest	Seeding	Harvest	Seeding	Harvest
1. Bogandé	6/13	10/30	6/17	11/1	6/23	9/16	7/1	10/28	X	X	X	X	X	X	X	X
2. Mani	6/15	11/25	6/27	11/20	6/22[b]	10/11	6/22	10/12	X	X	X	X	X	X	X	X
3. Piela	6/8	11/22	6/18	11/20	X[d]	X	7/1	11/13	X	X	X	X	X	X	X	X
4. Diabo	5/28	10/18	5/18	11/27	6/7[c]	9/4[c]	6/14	10/25	7/1[c]	10/17	6/13[c]	10/22	6/28[c]	10/4[c]	6/24[c]	10/31[c]
5. Logobou	5/29	11/17	5/28	11/7	6/4	9/7	6/9	10/7	7/31[c]	11/2	6/22	11/4	7/26[c]	11/15[c]	X	3/12[c]
6. Partiaga	6/22	11/24	7/4	11/29	7/9	9/26	7/16[b]	10/29	7/30[b]	11/10	6/22	11/18	X	11/18	X	X
7. Yondé	5/24	10/18	6/3	12/10	6/17[b]	8/31	6/16	10/20	7/17	10/31	X	X	X	X	X	X
8. Diapangou	6/3	11/11	6/3	11/23	6/21[c]	9/7[c]	6/17	10/21	X	X	X	X	X	10/21[c]	X	X
9. Botou (N. Fada)	5/24	11/13	5/30	11/8	6/10	9/3	X	10/23	X	10/16	X	X	X	X	6/11[b]	10/21
10. Kantchari	6/24	11/16	6/8	11/16	6/5	9/11	X	X	X	10/21	X	X	X	X	X	11/12
11. Ougarou	6/1	11/17	6/8[c]	11/9	6/17	9/18	7/5[c]	10/18	X	10/19	6/18[c]	11/6[c]	X	11/9[c]	X	X
12. Pama	5/27	11/8	5/14	11/7	6/16	8/23	6/21	9/28	7/18[b]	10/23	6/20	10/31	6/28[b]	10/13	7/30	11/29
ALL ZONES	6/4	11/12	6/8	11/16	6/17	9/7	6/22	11/1	7/17	10/26	6/16	11/6	7/9[c]	10/28	7/12	11/13

[a] Calculated for fields in the hoe agriculture sample in which the given crop was predominant. Harvest dates are based on 240 hoe households. Seeding dates are based on 120 hoe households.

[b] Less than 1 hectare of valid data.

[c] Due to low acreage in hoe sample, ANTRAC sample data used.

[d] X = insufficient data to permit estimation.

[e] Excluding Niadi.

Table 2.10 presents the seeding and harvest dates for the 9 most common sorghum varieties. Some varieties, such as Dimoani (which includes red sorghum) and Osoango provide short season crops for certain zones. In addition, Niadi (short season millet) provides an important short season cropping alternative in Logobou (seeding on 5/25; harvest on 8/28) and Pama (seeding on 5/23; harvest on 7/26).

2.5 Labor Use

Family labor is the major input in farming in the EORD. The use of chemical fretilizer or insecticide is extremely uncommon. Even animal traction was uncommon in 1978 except in a limited number of areas with intensive extension programs. Wage labor represented less than 0.5 percent of agricultural labor among all surveyed farmers. Approximately 10 percent of labor used on surveyed farms originated from "invitations de culture."[1/]

The intensity and timing of total labor use (including both family and non-family labor) is summarized in Table 2.11 for the 6 crop enterprises. Note that hoe and ANTRAC sample means are not strictly comparable because of their different regional stratifications [see footnote 2, page 6 above]. For both hoe and ANTRAC samples, the table shows that peak labor requirements occur during the early June to mid-August seeding and weeding season. The harvest does not represent a peak labor period. Rice is the most labor intensive crop in the hoe sample and second only to groundnuts among ANTRAC

1/ "Invitation" refers to a festive work party organized by a farmer, usually when he falls behind in his weeding, for which the invitees are paid in food and drink.

TABLE 2.10
GENERAL CHARACTERISTICS OF MAJOR SORGHUM VARIETIES[a]

Variety Code[b]	Gourmantche Name	Moré Name	Yield per Hectare[c]: Of this Variety	Yield per Hectare[c]: Of other associated sorghums or millets in the same field	Average date[d] of: Seeding	Average date[d] of: Harvest	% of Sorghum acreage in which this variety is present[e]	Zones of Primary Usage[f] by order of importance
1	Suoodi	--	386	98	May 30	Nov. 23	9.0	Logobou
2	Dimoani, Dimoammoanga, Dimoanga	Kazinga (Red Sorghum)	248	126	May 29	Oct. 24	23.1	Pama, Bogandé, Yondé, Diabo
3	Conlooli, Belko	Belko	545	148	June 2	Nov. 18	13.7	Kantchari, Mani, Yondé
4	Dagbani, Digbeni, Osansan-calo	--	259	561	June 7	Oct. 27	1.2	Logobou[g]
5	Cuadi	Baninga (White Sorghum)	329	266	June 7	Nov. 11	22.1	Kantchari, Diapangou, Partiaga, Ougarou
6	Osoango	Karaaga	93	463	May 26	Sept. 4	2.7	Pama[h], Diapangou[h]
8	Papienli, Biadi-pieni	--	716	136	June 7	Nov. 22	15.4	Ougarou, Logobou, Partiaga
10	Litandi-jali	--	166	130	May 24	Nov. 13	8.0	Botou (N. Fada)
11	Diedaan-Kan-Fiagi, Muabidi	--	974	53	June 22	Nov. 16	5.4	Mani

[a]This local variety classification system was provided by R.A. Swanson and is summarized on pages 122-129 of "Gourmantche Agriculture, Part II: Cultivated Plant Resources and Field Management", Integrated Rural Development Project, Eastern ORD, Upper Volta, April 30, 1979, by Richard Alan Swanson.

[b]From Swanson, pp. 122-124.

[c]Yield estimated for the entire sample from sorghum fields in which this variety was present and thus represents this variety's yield in association with whatever other sorghum varieties may have been present in the field.

[d]Due to the low occurance of certain varieties, estimates are based on the entire (hoe + ANTRAC) sample.

[e]Based on approximately 1380 hectares of sorghum fields from the entire sample, the 399 ha. of millet fields are not counted.

[f]Zones where the average sorghum acreage containing this variety is at least 1.0 hectare per household.

[g]Represents only 0.3 ha. per household but this represents 93% of the entire sample's use of this variety.

[h]Less than 0.5 ha. per household.

TABLE 2.11
LABOR USE PER HECTARE FOR MAJOR CROP ENTERPRISES BY MONTH AND BY ACTIVITY (in worker equivalent[a] hours of family and non-family labor per hectare)

	Crop Enterprises													
	Sorghum/Millet		Maize		Groundnuts		Soybeans		Cotton		Rice		All Crops	
Period or Activity	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC
May 1 - 28	45	46	21	21	32	4	10	0	10	17	112	59	42	38
May 29 - June 25	139	104	318	113	113	40	142	23	61	55	259	132	140	93
June 26 - July 23	145	107	306	237	205	127	192	65	157	170	322	148	156	113
July 24 - Aug. 20	127	102	208	96	189	166	423	105	257	187	163	207	137	113
Aug. 21 - Sept. 17	74	60	128	62	97	97	129	44	71	113	100	73	79	64
Sept. 18 - Oct. 15	36	29	84	34	195	81	93	98	122	39	106	54	50	43
Oct. 16 - Nov. 12	83	62	62	16	134	332	61	78	73	83	97	51	85	84
Nov. 13 - Dec. 10	64	79	14	11	93	13	23	1	172	109	106	66	66	67
Dec. 11 - Jan. 1	7	9	1	0	17	0	2	0	15	1	46	25	11	13
Jan. 8 - Apr. 30[b]	11	13	4	0	4	0	0	0	2	0	3	30	11	14
Total[c]	731	611	1147	589	1077	862	1075	416	940	775	1314	845	777	642
Tillage	471	378	763	397	549	301	664	188	483	426	709	519	483	365
Seeding	55	47	139	93	62	101	156	67	105	95	155	114	62	60
Harvest	155	149	187	98	428	451	144	113	308	198	193	82	174	169
Other	50	37	58	1	38	9	112[e]	48	45	57	257[d]	131[d]	58	47

[a]See Table 3.1, footnote f for the definition of worker equivalent hour.

[b]A 112 day period. All other periods are 28 days. Excludes the clearing of new fields.

[c]Total hours may differ slightly from the sum of hours across periods due to rounding errors plus slight differences in sample size by period.

[d]Mainly threshing.

[e]Includes clearing of new fields.

farmers. Sorghum/millet are the least labor intensive crops, requiring only 731 worker equivalent[1/] hours per hectare.

The majority of labor for most crop enterprises is used for tillage (either plowing, weeding, or ridging, whether by hand or with ANTRAC). Maize requires proportionally more tillage than other crops, probably because of the higher fertility of maize fields which stimulates weed growth. Groundnuts, cotton, and rice (when threshing is included) entail proportionally high harvest labor use. Rice tillage requirements are high as well due to the close plant spacing.

[1/] See footnote f, Table 3.1 for the worker equivalency conversion coefficients.

3. CROP ENTERPRISE BUDGETS

3.1 Introduction

This chapter presents crop enterprise budgets by zone for sorghum/millet, maize, groundnuts, soybeans, cotton, and rice. Few of these enterprises are commonly based upon inter-cropping though a farmer's field can often consist of a mosiac of sole-cropped sub-plots. True inter-cropping mixtures do consist of combinations of sorghum + millet or Niadi + cowpea or sesame, and of maize + cotton or tobacco (relay cropped). However, due to the high incidence of sub-plot fields, the crop enterprise budgets are presented here as if they were inter-cropped in order to include the production of the minor sub-plots. Thus for each enterprise, yields are presented for each primary and major secondary crop. In addition, the value of production is summarized for all primary crops, major secondary crops, and minor secondary crops.

The budget data are generally presented only for zones in which the survey obtained yield data for at least one hectare of the crop in question. Since labor, seeding, and other input data were collected only for one-third of the households, such data are occasionally insufficient to support a zonal estimate. In such cases, the corresponding hoe or ANTRAC sample mean value is substituted (such substitutions are always footnoted). Hoe and ANTRAC sample mean values represent weighted averages of all enterprise acreage in the given sample, which implicitly gives greater geographical weight to zones where the given enterprise is most common.

Prices used to value both production and seed represent average prices realized by all farmers in both samples during the 1978-79 year. All non-family labor is valued at 31.6 FCFA per worker equivalent hour, the average cost of wage labor for both samples.[1/] The reader should note that these values are seldom realized in cash since less than 8 percent of crop production is sold, less than 10 percent of seed is purchased, and less than 5 percent of non-family labor is paid in cash.

3.2 Sorghum/Millet

Table 3.1 presents the crop enterprise budget for sorghum/millet, the major crop enterprise in the EORD. Sorghum is clearly the dominant crop in this enterprise, but both millet and cowpeas make a major contribution in terms of value. The use of purchased agricultural inputs is extremely low, except for fungicide seed treatment among ANTRAC households. While the use of organic fertilizer (of on-farm origin) is common, the use of chemical fertilizer is extremely uncommon. Even in the few cases when chemical fertilizer was used, its average application rate is so low as to suggest only farmer experimentation on a small proportion of "fertilized" acreage. The employment of non-family labor is fairly consistent across zones and between the two samples. However, family labor inputs are lower for ANTRAC households than for hoe households in similar zones.

In general, both the variable and fixed costs of sorghum/millet production are low. Of these, the real cash costs of production are insignificant, except for ANTRAC-related expenses. Overall, total costs amount to only 10.2 percent of the value of output for the hoe sample and 20.9 percent for the ANTRAC sample.

[1/] This assumes that the real cost of invitation labor is similar to that of labor paid in cash, probably a reasonable assumption given the fairly high cost of invitations and the low productivity of such labor.

TABLE 3.1
CROP ENTERPRISE BUDGETS BY ZONE FOR SORGHUM/MILLET[a]
(in units per hectare)

	All Hoe Zones	All AN-TRAC Zones	Bo-gande	Mani	Piela		Diabo		Logobou		Par-tiaga	Yonde	Diapangou		Botou	Kant-chari	Ougarou		Pama
			Hoe	Hoe	Hoe	AN-TRAC	Hoe	AN-TRAC	Hoe	AN-TRAC	Hoe	Hoe	Hoe	AN-TRAC	Hoe	Hoe	Hoe	AN-TRAC	Hoe
Yields (Kgs/ha.)[b]:																			
Primary Crops																			
Sorghum	421	283	154	864	43	81	154	165	374	357	720	52	59	105	229	415	1403	1215	620
Millet	116	103	88	126	115	89	119	142	54	12	28	205	114	182	99	277	2	44	139
Niadi	11	13	0	0	0	0	0	0	89	147	0	0	0	0	0	0	0	0	7
SUBTOTAL	547	450	243	991	159	170	274[g]	307[g]	517[g]	516[g]	748	257	172	287	328	690	1405	1258	796
Major Secondary Crops[c]																			
Cowpea	53	56	21	12	11	16	67	53	125	63	17	64	75	109	54	69	16	22	69
Sesame	2	1	13	7	4	7	0	0	0	0	0	0	0	0	0	0	0	0	0
Input Use:																			
Seed rate for grains (Kgs/ha.)	11.4	10.3	5.1	17.2	12.0	6.6	8.1	9.4	10.4	12.6	11.4[k]	5.7	8.1	10.5	11.1	8.1	11.6	13.0	11.8
Seed rate for cowpeas (Kgs/ha.)	1.2	1.7	0.5	0.5	0.5[l]	0.5[l]	8.1	1.0	1.8	1.0	0.4	0.7	1.4	3.2	1.1	1.2[k]	3.5	3.2	1.0
% of grain seed treated with fungicide	16.2	53.8	0	30.3	7.2	14.6	2.7	45.0	23.2	31.9	18.6	7.9	8.3	70.0	18.9	0	85.8	100.0	11.7
% of cowpea seed treated with fungicide	15.1	52.8	0	43.7	X[m]	X	0	31.4	20.6	0	8.5	17.1	0	59.3	10.2	X	84.3	100.0	2.1
% of area fertilized organically[d]	21.1	15.2	51.8	4.1	0	26.4	25.8	17.3	26.2	10.7	3.9	21.8	8.4	17.0	25.2	5.1	27.3	1.0	39.5
% of area fertilized chemically[e]	0.2	7.6	0	2.2	0	0	0	16.9	0	2.8	0	0	0	0	0	0	0	0	0
Family Labor (W.E.[f] hours/ha.)	671	538	862	629	671[p]	538[p]	682	490[x]	669	463	540	645	718	571	660	779	679	622	533
Non Family Labor (W.E. hours/ha.)[g]	60	73	43	65	60[p]	73[p]	26	44[x]	55	121	74	99	107	54	48	38	55	92	59
TOTAL Labor (W.E. hours/ha.)	731	611	905	694	731[p]	611[p]	708	534[x]	724	584	614	744	825	625	708	817	734	714	592
Value of Output[h,i]																			
Primary Crops	24889	20475	11057	45091	7234	7735	12467	13969	23524	23478	34034	11694	7826	13059	14924	31395	63928	57239	36218
Major Secondary Crops	3968	4127	2293	1313	1002	1578	4878	3864	9128	4577	1261	4667	5483	8005	3953	5015	1171	1622	5036

TABLE 3.1 (Continued)

	All Hoe Zones	All AN-TRAC Zones	Bo-gande	Mani	Piela		Diabo		Logobou		Par-tiaga	Yonde	Diapangou		Botou	Kant-chari	Ougarou		Pama
			Hoe	Hoe	Hoe	AN-TRAC	Hoe	AN-TRAC	Hoe	AN-TRAC	Hoe	Hoe	Hoe	AN-TRAC	Hoe	Hoe	Hoe	AN-TRAC	Hoe
Value of Output[h,i] (Cont)																			
Minor Secondary Crops	624	102	119	16	118	0	200	148	798	0	627	746	124	0	40	235	0	281	4438
SUBTOTAL	29481	24704	13469	46420	8355	9313	17545	17981	33450	28055	35922	17107	13433	21064	18917	36645	65099	59142	45692
Variable Costs																			
Seed[j]	607	593	269	819	583[n]	337[n]	961	501	605	647	548[n]	311	471	712	586	456[n]	784	826	610
Chemical Fertilizer, Fungicide, & Insecticide[o]	82	317	0	165	36	72	13	335	115	177	92	39	41	347	94	0	425	500	58
Non-household labor[r]	1896	2307	1359	2054	1896	2307[p]	822	1390	1738	3824	2338	3128	3381	1706	1517	1201	1738	2907	1864
ANTRAC feeding and maintenance expenses[s]	--	675	--	--	--	631	--	718	--	631	--	--	--	631	--	--	--	718	--
Fixed Costs																			
Depreciation and repairs on hand tools[t]	433	442	421	391	638[p]	624[p]	580	440	422	380	494	402	694	453	347	456	451	450	307
Depreciation and repairs on ANTRAC equipment[s,u]	--	1009	--	--	--	954	--	1064	--	954	--	--	--	954	--	--	--	1064	--
Performance Measures																			
Gross Margin per hectare[v]	26896	20812	11841	43382	5840	5966	15749	15037	30992	22776	32944	13629	9540	17668	16720	34988	62152	54191	43160
Net Margin per ha[w]	26463	19361	11420	42991	5202	4388	15169	13533	30570	21442	32450	13227	8846	16261	16373	34532	61701	52677	42853
Net Margin per WE hour of family labor	39.4	36.0	13.2	68.3	7.8	8.2	22.2	27.6	45.7	46.3	60.1	20.5	12.3	28.5	24.8	44.3	90.9	84.7	80.4

[a]Fields in which any combination of sorghum, millet, or Niadi is predominant.

[b]All weights are in terms of the threshed, hulled, or shelled equivalents for each crop. Yields are calculated without respect to actual crop presence. For example, a cowpea yield of 53 Kgs per hectare represents the average contribution of cowpea to the grain production enterprise, taking into account that cowpea is not always included in this enterprise. While this understates the potential yield of cowpea as an enterprise itself, it correctly measures its average importance to grain production.

[c]Yield estimates for primary crops represent the average of two alternative harvest estimation methods: end of season recall and field off-take. Yields for secondary crops are estimated by the field off-take method only. Other crops occasionally occur in grain fields but typically as subplots or border delimiters rather than in a true mixture with grain.

[d]Mainly by corralling small ruminants or cattle in a field.

[e]Mainly cotton fertilizer (18 - 35 - 0) applied at a average rate of only 19 Kgs/ha. in those fields fertilized.

TABLE 3.1 (Continued)

[f]W.E. hours = worker equivalent hours. The following conversion coefficients, based on the subjective evaluations of 72 representative men and women from the 12 sample zones, were used.

Worker Equivalent (WE) Conversion Coefficients

Worker Category	Tillage	Harvest	Other
1. Males age 0-14	0.81	0.86	0.96
2. Females age 0-14	0.71	0.91	0.88
3. Males age 15-54	1.00	1.00	1.00
4. Females age 15-54	0.86	1.04	0.97
5. Males age 55+	0.58	0.59	0.59
6. Females age 55+	0.46	0.61	0.59

[g]Based on the end of season recall estimation method only.

[h]All values are in FCFA. The average 1978 exchange rate was approximately 220 FCFA = $1.00.

[i]Prices used represent the weighted average selling price realized by sample households during the 1978-79 survey period per Kg. of threshed, shelled, or hulled crop equivalent, as shown below:

Crop	Price/Kg
Sorghum	45.5
Millet	45.5
Niadi	45.5
Maize	39.6
Groundnuts	68.9
Bambera Nuts	59.0
Cowpeas	73.2
Soybeans	72.4
Sesame	57.6
Cotton	67.4
Rice	90.2

[j]Value of seed for primary crops plus major secondary crops only.

[k]Due to data errors for this zone, the sample mean value (for either Hoe or ANTRAC) was used.

[l]Due to data errors for this zone, the regional mean value was used.

[m]X = data unreliable due to a small number of valid observations.

[n]Corrected for seeding rate data errors noted above.

[o]Organic fertilizer not valued. The average application of fertilizer (18 - 35 - 0) on fields where it is used is only 19.0 Kgs/ha. for sorghum/millet fields (versus 50.3 Kgs/ha. for cotton and 25.9 Kgs/ha. for all other crops). Fertilizer was priced at 35 FCFA/kg. Prices per Kg for other chemical inputs are: fungicide ("Thioral") at 1400 FCFA; HCH ("acracide") and silo fumignat ("Gamagran") at 235 FCFA; and cotton insecticide at 340 FCFA. To show the relative importance of these inputs of the "Hoe" sample mean of 81.5 FCFA for such inputs, 1.3 FCFA was for chemical fertilizer, 74.2 FCFA for fungicide, and only 6.0 FCFA for all other chemicals.

TABLE 3.1 (Continued)

[p]Due to lack of labor data during May and June 1978, sample mean values are used.

[q]Approximately 90% of non family labor is "invitation" (festive work party) labor to which payment is the food and beer consumed on the spot.

[r]Valued at the average hourly rate of 31.6 FCFA that was paid to field wage labor in both samples.

[s]Represent total household value allocated to each crop enterprise proportionally to plowed acreage. Average values for oxen zones and donkey zones are used (See Barrett et. al., Table 5.2).

[t]Represents total household depreciation allocated to each crop enterprise proportionally to the allocation of labor.

[u]Animal depreciation (or appreciation) is not included.

[v]Total value of output less variable costs.

[w]Total value of output less both variable and fixed costs.

[x]Lantaogo only.

By all performance measures - gross margin[1/] per hectare, net margin[2/] per hectare, and net margin per hour of family labor - the returns to sorghum/millet production are low. Returns per hour average only 39.4 FCFA for hoe farmers and only 36.0 FCFA for ANTRAC farmers.[3/] In addition, these returns vary greatly across zones, primarily due to the high variability of yields.

3.3 Maize

Table 3.2 presents the maize enterprise budget. Maize is grown primarily to provide an early grain harvest during the "hungry period" in early September when food stocks are short. Typically, maize occupies the richer, more fertilized soils surrounding the compound. Soil fertility is maintained by organic manure. Table 3.2 shows that the returns to land (net margin per hectare) are higher for maize than for sorghum/millet. Returns to labor are higher as well in the ANTRAC sample but lower for hoe farmers. Across zones, the returns to labor are quite variable. Although returns to maize are high, the area planted is small and most of the production is consumed at harvest.

3.4 Groundnuts

Although groundnut production is commercially important in the EORD, Table 3.3 reveals that the returns to both land and labor were quite low in 1978. Because groundnuts are typically grown on poorer soils and fertilizer use (both organic and chemical) is so insignificant, yields are poor.

[1/] Value of output less variable costs.

[2/] Value of output less both variable and fixed costs.

[3/] These exceed the rural agricultural wage rate of 31.6 FCFA/hour, however rural wage labor opportunities are so uncommon that few farmers could consider wage labor as a viable alternative to farming.

TABLE 3.2
CROP ENTERPRISE BUDGETS FOR MAIZE FIELDS
(in units per hectare)

	All Hoe Zones	All AN-TRAC Zones	Bo-gande	Mani	Piela		Diabo		Logobou		Par-tiaga	Yonde	Diapangou		Botou	Kant-chari	Ougarou		Pama
			Hoe	Hoe	Hoe	AN-TRAC	Hoe	AN-TRAC	Hoe	AN-TRAC	Hoe	Hoe	Hoe	AN-TRAC	Hoe	Hoe	Hoe	AN-TRAC	Hoe
Yields (Kgs/ha.)[a]																			
Primary Crop:																			
Maize	588	797	420	963	123	124	1539[c]	884	940	1189	451	842	1135	1306	910	255	412	679	806
Major Secondary Crops																			
Sorghum/Millet	224	298	21	24	39	50	32[c]	44	313	43	520	90	199	327	3	273	123	759	429
Tobacco	83	9	0	74	10	10	82[c]	17	1120	23	4	0	19	0	1	32	6	0	14
Rice	21	0	0	0	0	0	0	0	146	0	57	0	0	0	0	0	0	0	40
Input Use																			
Maize seed rate (Kgs/ha.)	22.3	20.0	9.8	26.8	28.5	15.1	58.5	20.7	27.5	37.0	12.8	27.7	20.3	31.3	38.6	5.5	32.6	14.4	52.6
% of maize seed treated	9.9	45.1	0	20.7	0	0	0	15.0	5.0	0	2.1	0	7.6	13.4	4.0	0	49.9	99.1	0
% of area fertilized organically[b]	76.6	37.9	88.0	46.5	67.3	43.2	47.3	34.4	76.4	29.6	85.7	100.1	58.1	46.5	92.5	64.3	95.7	37.4	57.9
% of area fertilized chemically	1.5	2.0	0	0	0	0	0	0	0	0	7.8	0	0	0	0	0	0	5.4	0
Family Labor (W.E. hours/ha.)	1100	579	1724	631	1100[e]	579[e]	687	316[f]	1321	747[c]	779	1429[c]	843[c]	769	1490	1380	580	570	973[c]
Non family labor (W.E. hours/ha.)	47	10	0	128	47[e]	10[e]	0	5[f]	10	104[c]	84	0[c]	0[c]	4	37	6	117	0	0[c]
TOTAL labor	1147	589	1724	759	1147[e]	589[e]	687	321[f]	1331	851[c]	863	1429[c]	843[c]	773	1527	1386	697	570	973[c]
Value of Output																			
Maize	23285	31561	16632	38135	4871	4910	60944[c]	35006	37224	47084	17860	33343	44946	51718	36036	10098	16315	26888	31918
Major Secondary Crops[d]	12087	13570	936	1108	1753	2291	2011[c]	1457	14253	1971	36905	9231	9047	14892	158	12452	5585	34549	23137
Minor Secondary Crops	1364	825	4559	2327	844	0	1690[c]	0	566	47	1218	0	0	0	1214	282	1014	762	3116
SUBTOTAL	36736	45956	22127	41570	7468	7201	64645[c]	36463	52043	49102	55983	42574	53993	66610	37408	22832	22914	62199	58171
Variable Costs																			
Seed	1483	1231	519	1074	1386	2579	2318	952	1249	1684	2735	1095	803	1445	1529	220	1293	910	2084
Chemical inputs	63	241	0	102	0	0	0	74	25	0	81	0	38	66	20	0	247	540	0
Non Household labor	1486	316	0	4045	1485	316	0	158	316	3286	2654	0	0	126	1169	190	3697	0	0
ANTRAC Expenses	0	823	0	0	0	770	0	876	0	770	0	0	0	770	0	0	0	876	0
Fixed Costs																			
Depreciation and repairs on tools	679	397	803	428	679[e]	397[e]	563	244	776	553	695	772	709	561	748	774	428	359	505
Depreciation and repairs on ANTRAC equipment	0	1231	0	0	0	1164	0	1298	0	1164	0	0	0	1164	0	0	0	1298	0

Table 3.2 (Continued)

	All Hoe Zones	All AN-TRAC Zones	Bo-gande	Mani	Piela		Diabo		Logobou		Par-tiaga	Yonde	Diapangou		Botou	Kant-chari	Ougarou		Pama
			Hoe	Hoe	Hoe	AN-TRAC	Hoe	AN-TRAC	Hoe	AN-TRAC	Hoe	Hoe	Hoe	AN-TRAC	Hoe	Hoe	Hoe	AN-TRAC	Hoe
Performance Measures																			
Net Margin per hectare	33025	41717	20805	35921	3918	1975	61764	32861	49677	41645	49818	40707	52443	62478	33942	21648	17249	58216	55582
Net Margin per W.E. hour of family labor	30.0	72.1	12.1	56.9	3.6	3.4	89.9	104.0	37.6	55.7	64.0	28.5	62.2	81.2	22.8	15.7	29.7	102.1	57.1

[a]See footnotes b and o, Table 3.1.

[b]Mainly the manual application of animal manure and compound wastes.

[c]Based on less than 1 hectare of cropped area.

[d]Tobacco is not valued since most production is consumed directly within the household.

[e]See footnote p, Table 3.1.

[f]Lantaogo only.

TABLE 3.3
CROP ENTERPRISE BUDGETS BY ZONE[a] FOR GROUNDNUTS
(in units per hectare)

	All Hoe Zones	All AN-TRAC Zones	Bo-gande	Mani	Piela		Diabo		Logobou		Par-tiaga	Yonde	Diapangou	Botou	Ougarou		Pama
			Hoe	Hoe	Hoe	AN-TRAC	Hoe	AN-TRAC	Hoe	AN-TRAC	Hoe	Hoe	ANTRAC	Hoe	Hoe	ANTRAC	Hoe
Yields (Kgs/ha.)[b]																	
Primary Crop: Groundnuts	287	299	289	407	328	203	78	237	359	351	192	180	466	199	440[c]	1079	362
Major Secondary Crop: Sorghum/Millet	21	2	4	0	0	0	0	1	84	8	12	1	0	0	0	0	0
Input Use																	
Groundnut seed rate (Kgs/ha.)	21.6	18.0	8.0	31.4	45.3	10.8	21.4	21.0	13.5	24.0	21.3	5.3	15.9	23.5	X	9.3	16.6
% of seed treated	14.9	25.3	0	20.2	11.8	11.7	0	18.3	25.3	45.8	3.7	41.9	17.3	5.2	0	73.8	29.8
% of area fertilized organically	4.5	1.4	0	0	0	0	15.4	3.5	0	0	2.9	3.7	0	0	72.5	0	27.8
% of area fertilized chemically	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Family labor (W.E. hours/ha.)	930	684	1388	1195	930[e]	684[e]	516	736[f]	855	668	782	731	586	891	930[d]	822	405
Non family labor (W.E. hours/ha.)	147	179	117	138	147[e]	179[e]	84	119[f]	268	309	68	133	188	193	147[d]	28	0
TOTAL labor (W.E. hours/ha.)	1077	862	1505	1333	1077[e]	862[e]	600	854[f]	1123	977	850[c]	864	774	1084	1077[d]	850	405
Value of Output																	
Groundnuts	19774	20601	19912	28042	22599	13987	5374	16329	24735	24184	13229	12402	32107	13711	30316	74343	24942
Sorghum/Millet	962	77	166	0	0	0	0	52	3844	382	538	64	0	0	0	0	0
Minor Secondary Crops	666	169	25	662	0	0	34	0	28	0	5244	2541	1407	502	0	0	74
SUBTOTAL	21402	20847	20103	28704	22599	13987	5408	16381	28607	24184	19011	15007	33514	14213	30316	74343	25016
Variable Costs																	
Seed	1522	1278	605	2166	3161	790	1477	1524	944	1655	1579	470	1098	1619	1522[d]	641	1148
Chemical Inputs	74	125	0	100	58	58	0	91	125	227	18	207	86	26	0	365	148
Non household labor	4645	5656	3697	4361	4645	5656[e]	2654	3760	8469	9764	2149	4203	5941	6099	4645	885	0
ANTRAC Expenses	0	983	0	0	0	930	0	1046	0	930	0	0	930	0	0	1046	0
Fixed Costs																	
Depreciation and Repairs on tools	638	624	701	752	638[e]	624[e]	492	674	655	635	684	467	624[d]	531	638[d]	536	210
Depreciation and Repairs on ANTRAC equipment	0	1471	0	0	0	1391	0	1551	0	1391	0	0	1391	0	0	1551	0

TABLE 3.3 (Continued)

	All Hoe Zones	All ANTRAC Zones	Bogande	Mani	Piela		Diabo		Logobou		Partiaga	Yonde	Diapangou	Botou	Ougarou		Pama
			Hoe	Hoe	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	Hoe	ANTRAC	Hoe	Hoe	ANTRAC	Hoe
Performance Measures																	
Net margin per hectare	14523	10711	15100	21325	14097	4538	785	7735	18414	9582	14581	9660	23444	5938	23511	69319	23510
Net margin per W.E. hours of family labor	15.6	15.7	10.9	17.8	15.2	6.6	1.5	10.5	21.5	14.3	18.6	13.2	40.0	6.7	25.3	84.3	58.0

[a]Presented only for zones in which valid data exists for at least 1 hectare of cultivated area. Diapangou (hoe) and Kantchari (hoe) are thus excluded.

[b]See footnotes b and o, Table 3.1.

[c]Based on less than 1 hectare of cropped area.

[d]Sample mean value used due to lack of sufficient data.

[e]See footnote p, Table 3.1.

[f]Lantaogo only.

Below normal rainfall in June and early July further contributed to reducing yields in 1978. Low yields are most marked in Piela and Diabo, the most important groundnut production zones in the EORD. Groundnuts employ more non-family labor than other enterprises. This plus high seed costs leads to substantially higher input costs than for other crops.

3.5 Soybeans

Soybeans are a minor crop in the EORD which was introduced during the seventies. The returns to soybean production, shown in Table 3.4, are similar to those of sorghum/millet, but these returns are highly variable across zones. Soybeans are used primarily for the local manufacture of soumbala, a fermented spice that typically was made from locust beans prior to the introduction of soybeans. As a result, soybeans represent a specialty crop for those farmers who participate in a soumbala manufacture and marketing system, which is profitable though limited in size. The major constraint on the expansion of soybean production is the lack of a reliable alternative market at remunerative prices.

3.6 Cotton

The cotton enterprise, as described in Table 3.5, represents the traditional system of producing cotton for off-season weaving by family members but not for direct sale. The traditional system is based on low input use. Cotton is late seeded and receives little maintenance. Consequently, both yields and returns are extremely low by West African standards. No 1978 sample farmers participated in an intensive CFDT cotton production program such as that found in the Diapaga region.

TABLE 3.4
CROP ENTERPRISE BUDGETS BY ZONE[a] FOR SOYBEANS
(in units per hectare)

	All Hoe Zones	All ANTRAC Zones	Diabo ANTRAC	Logo-bou ANTRAC	Par-tiaga Hoe	Dia-pangou ANTRAC	Ouga-rou ANTRAC	Pama Hoe
Yields (Kgs/ha.)[b]								
Primary Crop:								
Soybeans	378	437	329	42	238	843	571	527
Major Secondary Crops:								
Sorghum/Millet	57	0	0	0	16	0	0	126
Groundnuts	16	5	10	0	68	0	0	0
Input Use								
Seed rate (Kgs/ha.)	70.5	17.6	13.9	43.0	78.8	24.0	10.8	69.9
% seed treated	20.7	62.7	75.0	7.0	0	33.3	80.2	47.2
% area fertilized organically	39.2	5.7	0	43.7	0	0	2.3	60.7
% area fertilized chemically	0	1.1	2.9	0	0	0	0	0
Family labor (W.E. hours/ha.)	981	389	551[f]	338	961	357	389	1112
Non family labor (W.E. hours/ha.)	94	27	20[f]	101	54	18	11	134
TOTAL labor	1075	416	571[f]	439	1015	375	400	1246
Value of Output								
Primary Crops	27367	31639	23820	3041	17231	61033	41340	38155
Major Secondary Crops	3739	332	693	0	5403	0	0	5722
Minor Secondary Crops	1066	14	0	0	456	0	54	2247
SUBTOTAL	32172	31985	24513	3041	23090	61033	41394	46124
Variable Costs								
Seed	5129	1280	1007	3137	5702	1736	784	6115
Chemical Inputs	103	320	398	35	0	165	397	234
Non-household labor	2970	853	632	3192	1706	569	348	4234
ANTRAC expenses	0	1036	1102	969	0	969	1102	0
Fixed Costs								
Depreciation and repairs on tools	636	330	406	285	208[c]	272	252	647
Depreciation and repairs on ANTRAC equipment	0	1549	1633	1464	0	1464	1633	0
Performance Measures								
Net margins per hectare	23334	26613	19335	-6041	15474	55858	36878	34894
Net margins per W.E. hours of family labor	23.8	68.4	35.1	-17.9	16.1	156.5	94.8	31.4

[a]Presented only for zones in which valied yield data exists for at least 1 hectare of cultivated area.

[b]See footnotes b and o, Table 3.1.

[c]Based on less than 1 hectare of cropped area.

[d]Sample mean value used due to lack of sufficient data.

[e]See footnote p, Table 3.1.

[f]Lantaogo only.

TABLE 3.5
CROP ENTERPRISE BUDGETS BY ZONE[a] FOR COTTON
(in units per hectare)

	All Hoe Zones	All ANTRAC Zones	Diabo ANTRAC	Logobou Hoe	Logobou ANTRAC	Botou Hoe	Kant-chari Hoe	Pama Hoe
Yields (Kgs/ha.)[b]								
Primary Crop:								
Cotton	145	203	236	70	103	288	230	122
Input Use								
Seed rate (Kgs/ha.)	9.5	10.7	10.9	10.4	X	8.6	6.1	11.3
% seed treated	68.7	79.3	80.0	25.4	X	64.5	0	100.0
% area fertilized organically	18.6	1.3	0	25.4	X	0	0	24.7
% area fertilized chemically	0	37.4	38.6	0	X	0	0	0
Family labor (W.E. hours/ha.)	885	709	717[f]	1390	709[d]	1405[c]	655[c]	964
Non family labor (W.E. hours/ha.)	55	66	68[f]	125	66[d]	43[c]	0[c]	80
TOTAL labor	940	775	785[f]	1515	785[d]	1448[c]	655[c]	1044
Value of Output								
Primary crop	9773	13682	15906	4718	6942	19411	15502	8223
All secondary crops	394	1026	1362	2751	0	0	3101	0
SUBTOTAL	10167	14708	17268	7469	6942	19411	18603	8223
Variable Costs								
Seed	639	721	732	702	721[c]	581	418	760
Chemical inputs	340	1051	1076	126	1051	319	0	495
Non-household labor	1738	2086	2149	3950	2086	1359	0	2528
ANTRAC expenses	0	1124	1180	0	1038	0	0	0
Fixed Costs								
Depreciation and repairs in tools	556	593	712	556[d]	593[d]	709[c]	556[d]	542
Depreciation and repairs on ANTRAC equipment	0	1659	1749	0	1569	0	0	0
Performance Measures								
Net margins per hectare	6894	7474	9670	2135	-116	16443	17629	3898
Net margins per W.E. hours of family labor	7.8	10.5	13.5	1.5	-0.2	11.7	26.9	4.0

[a]Presented only for zones in which valid yield data exists for at least one hectare of cultivated area.

[b]See footnotes b and o, Table 3.1.

[c]Based on less than one hectare of cropped area.

[d]Sample mean values used due to lack of sufficient data.

[e]See footnote p, Table 3.1.

[f]Lantaogo only.

3.7 Rice

The rice production enterprise, presented in Table 3.6, provided the highest returns of all crops in 1978. Due to the high value and yield of rice, the returns per hectare were quite high for both the hoe and ANTRAC samples. Despite the high labor requirement, the returns to labor were over twice those of sorghum/millet production. These results were quite variable across zones, primarily because of rainfall patterns. Due to low rainfall, low returns were experienced in Logobou, where rice is important commercially.

EORD rice production in 1978 was based almost entirely on rainfed rice grown on bas-fond land where rainfall run-off accumulates.[1/] This production system incurs minimal costs except for seed. Though it requires special bas-fond land, Weldring [1979] has shown that only a small proportion of such land was cultivated in 1978. Expansion of this rice production system would not be difficult technically. The major constraint on rice production is the lack of an outside market since the local demand for rice is extremely small. Due to problems of transport and milling, EORD rice could not compete with imported rice on the Ouagadougou or Niamey markets in 1978.

[1/] The economics of various EORD rice production systems for the 1980 season is currently being studied by Pascal Fotzo of Michigan State University under Contract AID/afr-C-1314.

TABLE 3.6
CROP ENTERPRISE BUDGETS BY ZONE[a] FOR RICE
(units per hectare)

	All Hoe Zones	All ANTRAC Zones	Piela	Diabo		Logobou		Par-tiaga	Dia-pangou	Ougarou		Pama
			Hoe	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC	Hoe	ANTRAC	Hoe
Yields (Kgs/ha.)[b]												
Primary Crop:												
Rice	982	717	268[c]	379[d]	563	401	212	1597	220	923[d]	1063	1649
Major Secondary Crop:												
Sorghum/Millet	13	4	0	0	6	0	0	9	0	29	4	37
Maize	64	4	0	0	0	0	0	123	0	0	13	0
Input Use												
Seed rate (Kgs/ha.)	58.9[g]	30.3	53.7	91.9	24.3	58.9[e]	30.3	66.4	X	58.1	37.3	51.0
% seed treated	27.0	25.6	0	0	35.4	25.9	1.2	0	X	3.7	33.2	71.4
% area fertilized organically	3.2	1.9	0	0	0	0	0	0	0	45.8	1.7	0
% area fertilized chemically	0	0	0	0	0	0	0	0	0	0	0	0
Family labor (W.E. hours/ha.)	1232	771	1232[h]	1100[d]	480	931	607	1173	771[e]	1232[e]	1278	1433
Non family labor (W.E. hours/ha.)	82	6	82[h]	0[d]	4	19	6	307	6[e]	82[e]	9	0
TOTAL labor	1314	777	1314[h]	1100[d]	484	950	613	1480	777[e]	1314[e]	1287	1433
Value of Output												
Primary Crop	88576	64673	24174	34186[d]	50783	36170	19122	144049	19844	83255	95883	148740
Major Secondary Crops	3127	166	0	0	289	0	0	5299	0	11355	169	5958
Minor Secondary Crops	254	0	805	0	0	0	0	0	0	0	0	952
SUBTOTAL	91957	64839	24979	34186[d]	51072	36170	19122	149348	19844	94610	96052	155650
Variable Costs												
Seed	5499[g]	2735	4841	8289	2190	5313[f]	2729	6032	5944[e]	6344	3366	4790
Chemical Inputs	134	127	0	0	175	128	6	0	134[e]	18	164	353
Non-household labor	2591	190	2591	0	126	600	190	9701	190	2591	284	0
ANTRAC expenses	0	863	0	0	918	0	807	0	807	0	918	0
Fixed Costs												
Depreciation and Repairs on tools	778	626	778[e]	901	464	554	399	1191	626[e]	778[e]	812	744
Depreciation and Repairs on ANTRAC equipment	0	1253	0	0	1361	0	1220	0	1220	0	1361	0

TABLE 3.6 (Continued)

	All Hoe Zones	All ANTRAC Zones	Piela	Diabo		Logobou		Par-tiaga	Dia-pangou	Ougarou		Pama
			Hoe	Hoe	ANTRAC	Hoe	ANTRAC	HOe	ANTRAC	Hoe	ANTRAC	Hoe
Performance Measures												
Net margin per hectare	82955	59045	16769	24996	45838	29573	13771	132434	10923	84879	89147	149763
Net margin per W.E. hours of family labor	67.3	76.6	13.6	22.7	95.5	31.8	22.7	112.9	14.2	68.9	69.8	104.5

[a]Presented only for zones in which valid yield data exists for at least 1 hectare of cultivated area.

[b]See footnotes b and o, Table 3.1.

[c]Based on end of season recall only.

[d]Based on less than 1 hectare of cultivated area.

[e]Sample mean value used due to lack of sufficient data.

[f]Corrected as noted in footnote e.

[g]Excluding Logobou due to data error.

[h]See footnote p, Table 3.1.

4. SUMMARY AND CONCLUSIONS

This report provides 1978 technical and economic data for six crop enterprises for 12 hoe and 5 ANTRAC agroclimatic zones of the EORD. These data were collected in a farm level survey which interviewed 480 farmers throughout the 1978-79 agricultural year. The purpose of the report is to provide baseline data by which to design and evaluate future development interventions.

The report provides two levels of descriptive analysis. In Chapter 2, an overview of the 1978 season is provided to describe the major characteristics of EORD agriculture while providing an historical context for evaluating economic performance. Unfortunately little useful background data on yields, soils, or rainfall exist for the EORD. This represents a key data deficiency that needs to be rectified in the future in order to allow the ORD to monitor production trends and to identify the impact of development interventions.

The second level of analysis is based on detailed crop enterprise budgets that are provided for six crops for each survey zone. These budgets demonstrate the low productivity of agriculture in the EORD. The lowest productivity is found in cotton and groundnuts, both of which are crops that typically generate more substantial income elsewhere in West Africa. Maize and soybeans have slightly higher productivity. Maize provides little marketable surplus above consumption needs and soybean production is limited by the size of the soumbala market. Rice has the highest productivity but its production is seriously curtailed by the

lack of marketing outlets. Most striking of all is the low productivity of sorghum/millet production. Yields are both low and unstable due to variability in rainfall patterns. As the staple food crop, this low and unstable productivity explains why farmers must concentrate so heavily on sorghum/millet production.

Except for ANTRAC, strikingly few technical interventions were being designed or promoted for hoe agriculture in the EORD in 1978. In order to increase agricultural productivity, the EORD needs to push aggressively on developing the bio-chemical half of an ANTRAC based technical package over the next ten years. Because farmers must now commit such a large proportion of their resources to staple food production, most technology development efforts should be aimed at sorghum and millet.

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