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9. ABSTRACT

A PROJECT: To provide empirical information on unemployment in rural Africa and to use this information to analyze the impact of alternative policies and development strategies on output and employment. Conducted by Michigan State University (MSU), Department of Economics.

DURATION: June 24, 1976-June 30, 1978

DEVELOPMENTS: During this report period activities were focused on the preparation of data files, descriptive analysis of data on income distribution, and specification of a conceptual framework and models to be employed in more detailed analysis. The countries chosen for study were Northern Nigeria and Sierra Leone. The institutional environments of both areas are essentially similar. Traditional village leadership is still dominant with the absence of a stable class structure defined on the basis of income or control of assets. The land tenure systems of both areas are relatively egalitarian with the communal assignment of usufructuary rights considerably more important than direct ownership of land. The farming technology of both areas is largely traditional with no substantially improved input packages currently available for widespread distribution. Natural conditions and population differ markedly, with Sierra Leone in a high rainfall forest zone and Nigeria in a zone of higher population density and savannah agriculture. Comparable analytical techniques and income measures are used whenever possible. Socioeconomic characteristics of the farming environment in Nigeria reduce the potential for a wide range of incomes. These characteristics include: (1) available surplus land; (2) a relatively egalitarian land tenure system; (3) absence of a class system based on ethnic criteria; (4) predominantly traditional agricultural production systems; and

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(5) an inheritance system effectively limiting permanent assets accumulation between generations. Much of the initial period of the Sierra Leone project was spent reorganizing data into a form suitable for the analysis of household incomes and technical change. Major projection systems were identified, and income and labor allocated in those systems.

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ANNUAL REPORT

FOR THE PERIOD

1 JULY 1976 - 30 JUNE 1977

POOR RURAL HOUSEHOLDS, TECHNICAL CHANGE AND INCOME DISTRIBUTION

Department of Agricultural Economics
Michigan State University
East Lansing, Michigan 48824

Contract Number AID/ta-C-1328

August 1977

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SUBSTANTIVE REPORT

Derek Byerlee and Peter Matlon

Principle Investigators

1. Introduction

During the period July 1, 1976 through June 30, 1977 the MSU component of the Poor Rural Households contract has focused on the preparation of data files, descriptive analysis of data with respect to income distribution, and specification of a conceptual framework and models to be employed in more detailed analysis. Moreover, during this period, Northern Nigeria has been added as a major area of study to broaden the scope of the original proposal. Peter Matlon joined the MSU staff in April 1977 and will devote the major part of his time to the analysis of data he collected in Nigeria. Since income distribution was a major objective of Matlon's research, this data bank is particularly appropriate for testing hypotheses for the research objectives of this contract. This data series is very comparable with the Sierra Leone data series both in the type of information collected and the methodology employed in data collection. In fact, through the African Rural Employment Research Network there was considerable interaction between Matlon and the Sierra Leone researchers (Spencer and Byerlee) in the design of the data collection systems.

The MSU component of the research therefore will proceed with two highly comparable and comprehensive data sets drawn from two contrasting regions of West Africa. The addition of the Nigerian case study will enable conclusions with a greater level of generality to be drawn from the results of the analyses. In Table 1 characteristics which are importantly related to the

Table 1

Comparison of the Sierra Leone and Northern Nigeria Study Areas

		Sierra Leone	N. Nigeria
1.	Major Crops		
	a. Subsistence	Rice, cassava, groundnut, Fundi	Sorghum, millet
	b. Cash	Rice, oil palm, coffee, cocoa	Groundnut, sugar cane
2.	Ecology		
	a. Ave. annual rainfall	70" - 160"	35"
	b. Ave. length of rainy season	150 - 180 days	120 days
	c. Natural vegetation	Secondary forest in the south and west; savannah grassland in the north	Savannah grassland
3.	Population Pressure		
	a. Persons per square mile	77	130
	b. Ave. cultivated farm size	3.0 hect.	2.5 hect.
	c. Ave. area controlled per household	18.0 hect.	Not known
	d. Ave. cultivated land area per resident	.41 hect.	.37 hect.
	e. Ave. land area controlled per resident	2.4 hect.	Not known
	f. Hours of total farm labor per hectare per year	2,060 hours	708 hours
	g. Hours of adult male farm labor during peak month	188 hours	108 hours
4.	Income		
	a. Ave. income per capita	$88	$85
	b. Farm income as a percent of net household income	88.9%	71.9%
	c. Gini coefficient calculated on income per resident	.38	.28

Table 1 - Continued

Comparison of the Sierra Leone and Northern Nigeria Study Areas

	Sierra Leone	N. Nigeria
5. Agricultural Technology		
a. Predominant type	Traditional, hand tool	Early transitional, hand tool
b. Annual cost of farm tools	$2.80	$2.50
c. Use of modern inputs		
(1) General	Use of improved technologies highly localized and project specific; low representation in sample.	Improved groundnut seed and chemical fertilizer in general use for last 5 - 10 years--seed only marginally improved compared with local varieties.
(2) Percent of sample using tractor cultivation	4%	<1%
(3) Percent of sample using chemical fertilizers	3%	40%
(4) Fertilizer application rates on treated fields	50 - 200 kg./hect.	55 kg./hect.
6. Rural Institutions		
a. Leadership	Traditional; farmers committees and cooperatives of minor importance.	Same
b. Extension worker to farmer ratio	Not known	1:3,000
c. Land tenure system	Communal allocation of usufructuary rights; relatively egalitarian.	Same
d. Class structure	Absence of stable economic classes based on income or assets control. High intergenerational mobility hypothesized to be derived from following factors: (1) access to surplus land; (2) lack of durable physical capital; (3) lack of highly remunerative off-farm occupations; (4) traditional farming technologies resulting in low and variable returns to labor;	

Table 1 - Continued

Comparison of the Sierra Leone and Northern Nigeria Study Areas

	Sierra Leone	N. Nigeria
(5)	inheritance system which restricts inter-generational concentration of wealth.	

distribution of income are summarized for both Sierra Leone and the northern Nigeria study area. The institutional environments of both areas are essentially similar. Traditional village leadership is still dominant with the absence of a stable class structure defined on the basis of income or control of assets. The land tenure systems of both areas are relatively egalitarian with the communal assignment of usufructuary rights considerably more important than direct ownership of land. The farming technology of both areas is largely traditional with no substantially improved input packages currently available for widespread distribution.

The Sierra Leone data, however, represent a more land extensive system of cultivation set in a high rainfall forest zone in contrast to the Nigerian data which is set in a zone of higher population density in savannah areas. In spite of the greater availability of land, the intensity of labor use is greater in Sierra Leone due to a longer rainy season, the dominance of a more labor intensive crop (rice), and due to the high labor requirements of clearing which are a part of the Sierra Leone bush fallow system.

These two areas provide then,case studies characterized by similar institutional and technological environments but differing markedly with respect to natural conditions and population pressure, and thus with respect to the predominant farming systems.

Whenever possible, efforts are being made to coordinate analysis of the Nigerian and Sierra Leone data by using comparable analytical techniques and income measures. This will provide a broad comparative study of factors affecting income distribution within rural households in West Africa.

During the first year of the project there have been important personnel changes among the researchers involved in the project. Derek Byerlee and

Dunstan Spencer provided initial research leadership until Dunstan Spencer departed in March, 1977, to the West African Rice Development Association. As mentioned above Matlon joined MSU in April 1977 as a principle researcher in this project. He will provide leadership to the research project on the departure of Derek Byerlee to CIMMYT in October, 1977. Carl Eicher has continued to provide overall guidance to the project. Carl Liedholm and Victor Smith have been involved, particularly in the specification of a model to represent household-firm decision making. Research assistants Robert King and Frank Rose both completed M.S. theses[1] during the year and have moved to other research topics for Ph.D. research. Research assistants Steven Franzel, Helen Gunther, McIvan Amechi-Jarrett and Thomas Eponou have joined the project and will write M.S. theses on topics related to the current project. Finally Bert Pulaski and Janet Munn have continued to provide administrative and secretarial support.

2. Relationship to Previous Research

The present research underway on poor rural households is an outgrowth of previous research projects and utilizes data collected under those projects. To provide background perspective on the present research, the types of data collected and research findings of these earlier research projects are summarized below.

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[1]Robert P. King, "An Analysis of Rural Consumption Patterns in Sierra Leone and their Employment and Growth Effects." M.S. Thesis, Michigan State Univerversity, 1977. Frank S. Rose, "A Linear Programming Analysis of the Employment, Income and Productivity of Small Farm and Rice Processing Sectors of Sierra Leone." M.S. Thesis, Michigan State University, 1977.

2.1. Sierra Leone

The Sierra Leone study was conducted as part of the African Rural Employment Project (AREP) between 1972 and 1976. Although research was conducted in several countries, the major emphasis was in Sierra Leone. The research in Sierra Leone was carried out through a subcontract from Michigan State University to Njala University College under an AID contract (AID/csd-3625).

2.1.1. Objectives

The general objectives of the research were to provide empirical information on employment and unemployment in rural Africa and to use this information to analyze the impact of alternative policies and development strategies on output and employment in rural Africa.

The specific objectives of the research were to:

1. Provide detailed information on labor utilization and allocation for rural households in selected African countries.

2. Analyze the consumer demand patterns of rural households in order to identify labor intensive commodities with favorable demand outlooks.

3. Analyze the demand for labor under different production technologies and systems and, in particular, assess the potential for labor-capital substitution in the following sectors of selected African countries:
   a. Agriculture
   b. Agricultural processing
   c. Small scale industry (both rural and urban)
   d. Fishing

4. Provide a detailed description of rural-urban migrants and the migration process and analyze the causes and implications of rural-urban migration.

5. On the basis of objectives 3 and 4, identify specific policies and programs which will lead to increased output and employment in agriculture, small scale industries, and agricultural processing and which will slow the rate of migration to urban areas.

6. Conduct an aggregate analysis in one African country (Sierra Leone) of the rural economy to evaluate macro-economic implications of selected policies on output and employment.

7. On the basis of objectives 5 and 6, provide general policy guidelines to selected African countries for dealing with the employment problem.

2.1.2. Data Sources

Data for Sierra Leone rural households were collected under the AREP and the methodology and sampling procedures are given in Spencer and Byerlee (1976), Byerlee, et al (1976), etc. The sampling and survey methods are briefly summarized as follows:

Sampling Method

1. Rural areas stratified into eight resource regions,
2. Three census enumeration areas (EA's) randomly chosen in each region,
3. Listing of all households in each Enumeration Area,
4. Twenty farm and four nonfarm households randomly selected from each EA to give total sample size of 500+ households.

Survey Method

1. Households visited twice weekly from May 1974 to May 1975 to obtain daily data on labor, output, etc.
2. Field measurements and yield plots laid for each field.
3. Special questionnaires administered on migration, fertility, changes and perceived constraints.

In addition a number of other surveys were conducted on fisheries, processing, small-scale industry and marketing. These data, however, will not be used in the current project.

2.1.3. Summary of Findings of the AREP

Results of the AREP are extensively reported in Byerlee et al (1976) and only some highlights are noted here. One of the principle objectives of the African Rural Employment Project (AREP) was to collect primary data in order to describe the current pattern of employment and unemployment in

rural Africa. The research results strongly reinforce other empirical evidence that seasonal labor demands act as a critical constraint on farm output. In addition nonfarm activities were found to be important in rural areas particularly in the slack farming season. These activities accounted for about 11 percent of total labor input in Sierra Leone to about 47 percent in Nigeria. The most important component of this nonfarm activity is small scale industry which comprises over half of all industrial output in Sierra Leone. Although labor was constraining in the farming systems surveyed, labor productivity was very low as a result of the traditional technologies employed by most farmers. Low rural earnings are a major factor explaining the rapid rate of rural-urban migration observed. This migration occurs despite the fact that 33 percent of young migrants were unemployed.

The AREP also provided important findings with respect to factor markets and their implications for employment. Both the labor and capital market exhibit considerable fragmentation. In general factor price distortions favored cheap capital through low interest loans and duty free imports to the large scale sectors. In addition large scale sectors paid higher wages because of minimum wage policy. Factor price distortions are only relevant to employment questions if there exist a range of technologies of different labor intensities and if choice among those technologies is responsive to factor prices. In general, the results of the study provided evidence that this range of technologies does exist in agriculture, agricultural processing, and small scale industries. Furthermore the choice of technology in each of these sectors was found to be responsive to changes in factor prices to reflect the opportunity cost of capital. Finally the demand for labor intensive goods was investigated through consumer budget surveys. Again the evidence showed

that labor intensive sectors had potential to expand to meet future demands. A major conclusion of these results is that there need to be no trade-off between output and employment. More labor intensive industries were in general more efficient users of scarce capital and foreign exchange resources, had strong demand prospects and provided substantially more jobs.

2.2. Northern Nigeria

Data collection and initial analysis for the Nigerian rural incomes study was conducted by Peter Matlon as part of his doctoral program at Cornell University. Field work was supported in part by funds received by the Department of Agricultural Economics through an AID contract. Within the Nigerian context the study was designed to provide policy makers with a better understanding of who constituted the rural poor, their sources of incomes, the particular constraints limiting the poorest households from economic expansion, and the effectiveness of current agricultural programs in reaching and assisting the poor. In a broader context the study was intended to present a case study of the determinants of income differences within an essentially traditional society whose production system was experiencing the first stages of technological transition.

2.2.1 Objectives

Four objectives were identified:

1. To describe the size distribution of personal incomes--total and by source of earnings--in three villages of northern Nigeria.

2. To identify and evaluate factors which influence the observed distribution of personal incomes.

3. To analyze structural and behavioral differences among households in varying income groups. These distinguishing characteristics include: 1) demographic attributes, 2) assets ownership, 3) sources of income, 4) income

by type, 5) cropping emphasis, 6) techniques of agricultural production, 7) efficiency of resource use, 8) labor allocation, 9) crop marketing, and 10) cash expenditure patterns.

4. To determine differences in participation in existing agricultural programs between income groups, especially with respect to the delivery of farming inputs and extension services; and within a partial, static framework, to determine the differential impact of crop pricing policies.

2.2.2. Data Requirements and Collection Methodology

Data collected during the study include the following nine components.

1. A farm management component including field specific input-output data and an accounting of all agricultural expenditures.

2. An accounting of all non-agricultural income earning activities identifying expenditures, sales, and off-farm labor earnings and time engaged in those activities.

3. A credit component identifying the debt position of the household throughout the year with regard to both cash and in-kind items, the cost of credit, and the uses to which all cash loans were put.

4. A marketing component identifying crop sales, seasonal price variations for all marketed produce, transport costs to sales destinations, as well as costs and perceived risks of storage.

5. A household expenditure component estimating consumption-related cash purchases.

6. A gift component identifying cash and kind gift flows between households.

7. A migration component identifying all in and out-of-village labor movements.

8. An inventory of all agricultural and non-agricultural working capital, storage facilities, and livestock holdings.

9. A subjective component exploring farmers' perceptions of crop prices, cropping priorities, crop-specific production risks, and awareness of and participation in government extension programs.

Sampling Method

1. Three villages in Kano State were purposively selected to satisfy the dual objectives of minimum inter-village variation in soil and climate but maximum variation regarding access to external markets.

2. Approximately 45 households were randomly selected from recently updated tax lists in each village. An additional five households were purposively selected on the basis of special political positions occupied in the study villages.

3. Based on the results of a situational survey administered to all selected households, the general sample in each village were divided into large sample (between 33 and 35 households) and small sample (either 11 or 12 households) groups.

Survey Method

1. Small sample households were interviewed two to three times per week from May 1974 to May 1975 to collect data on field, task, and crop specific farm labor activities, non-labor field inputs, off-farm labor activities and earnings, and household cash expenditures. Weekly interviews were administered to the small sample to collect expenditure and sales data for both farm and off-farm occupations, and data on other gift and loan flows. Monthly interviews with the small sample collected data regarding land transfers and labor migration.

2. Large sample households were interviewed at four to five week intervals to obtain identical cash and kind flows information with the exception of household farm labor activities.

3. Additional interviews were conducted with both samples once or twice during the year to obtain subjective and inventory data, and to conduct data consistency checks.

The interview frequency employed with each sample and data type is summarized in Table 2.

2.2.3. Summary of Major Findings

2.2.3.1. The Degree of Incomes Inequality

Table 3 presents mean summary statistics describing the levels and sources of income for households disaggregated into decile and quintile strata. Also shown are several household size and composition attributes stratified by

Table 2

Two-Tier Sampling Procedure in the Nigerian Rural Incomes Study: Data Types, Interview Frequency, and Sample Sizes

Information Type	Small Sample				Large Sample	
	Interview Frequency					
	2-3 Weekly	Weekly	Monthly	Once	Monthly	Once
A. Agricultural						
1. Family labor	X					
2. Hired labor	X				X	
3. Non-labor inputs	X				X	
4. Harvests	X				X	
5. Non-labor input purchases		X			X	
6. Crop and livestock		X			X	
7. Crop and livestock sales		X			X	
8. Land transfers			X		X	
9. Crop and livestock transport costs		X			X	
10. Assets inventory				X		X
B. Non-farm occupations						
1. Off-farm labor	X				X	
2. Service earnings	X				X	
3. Purchases		X			X	
4. Sales		X			X	
5. Assets inventory				X		X
C. Other flows						
1. Consumer expenditures	X				X	
2. Cash and kind loans given, rec'd., repaid		X			X	
3. Cash and kind gifts given and rec'd.		X			X	
4. Labor migration			X		X	
D. Subjective and retrospective						
1. Price awareness				X		X
2. History of land transfers, fallow, rotations				X		X
3. Storage and wastage				X		X
4. Risk				X		X
5. Government programs				X		X

Village	Small Sample	Large sample
	Number of Households	
Rogo	11	34
Zoza	12	37
Barbeji	12	34
Total	35	105

Table 3

Selected Characteristics of Rural Northern Nigerian Households Stratified by Income Per Consumer

Household Characteristic	Decile 1	Decile 2	Quintile 2	Quintile 3	Quintile 4	Decile 9	Decile 10	Total
Average income (in naira)[1]								
Per household	178	234	280	317	419	394	627	347
Per resident	19	28	39	55	68	88	99	52
Per consumer equivalent[2]	28	40	55	77	98	126	169	75
Source of income (in percent)								
Farm	79.9	75.4	77.2	77.3	73.1	60.5	63.4	71.9
Off-farm	20.1	24.6	22.8	22.7	26.9	39.5	36.6	28.1
Non-agricultural	11.6	20.5	18.8	18.2	25.9	35.6	35.4	25.0
Hired farm labor	8.3	4.1	4.0	4.5	1.2	3.9	1.2	3.1
Percent of income generated in or converted into cash	60.4	49.8	35.7	50.8	58.7	57.8	56.0	53.0
Number of residents	9.3	8.3	7.3	5.8	6.2	4.5	6.3	6.7
Number of consumer equivalents	6.4	5.9	5.0	4.1	4.3	3.1	3.7	4.6
Consumer to worker ratio[3]	2.4	2.6	2.2	2.3	2.3	2.0	2.7	2.4
Cultivated hectares								
Total	2.2	2.4	2.2	2.4	2.9	2.7	3.2	2.5
Per resident	.24	.29	.30	.41	.47	.60	.51	.38

[1]The official exchange rate during 1974-75 was N1 = US $1.64.

[2]Consumer equivalents were determined by converting the residents in each household to man equivalents using approximate F.A.O. caloric requirements tables and age-sex criteria.

[3]The number of workers in a household was defined as those persons who engaged in weeding, the farm labor bottleneck activity, converted to approximate productivity man equivalents based on age-sex criteria.

income class. Compared with international standards, the distribution of income implied by these income figures is decidedly equitable. This is reflected in Gini coefficients of .3146 calculated on an income per household base, and .2823 calculated for income per resident. Relatively minor inter-village differences in the distribution of income per resident were found, varying between .2251 and .3034. Within the three study villages it was found that the Gini coefficient was directly related to (i.e. inequality increased with) village size, population pressure and degree of monetization. When disaggregated by source of income, the Gini coefficients associated with farm and off-farm incomes were greater than aggregate income, reflecting a supplementary relationship between the two income sources. The greatest degree of income inequality was found for non-agricultural income per resident (Gini coefficient = .6097).

It was concluded that socio-economic characteristics of the farming environment in the survey area effectively reduce the potential for a wider range in incomes. These characteristics include: 1) available surplus land, 2) a relatively egalitarian land tenure system, 3) the general absence of a class system based on ethnic criteria, 4) predominantly traditional agricultural production systems, and 5) an inheritance system which effectively limits permanent assets accumulation between generations.

2.2.3.2. Determinants of Income Differentials

The effects of four sets of exogenous factors on inter-household income differences were examined. These included: 1) village location, 2) attributes of the entire household (ethnic group, family structure, size and dependency ratio), 3) attributes of the household head (age, literacy, and political status), and 4) the quantity and quality of land holdings.

The individual effects of these factors on income were identified by means of a regression model fitted separately to household data taken from the bottom and top halves of the income distribution. It was found that among lower income households only a minor proportion of variation in income per consumer could be explained by location, by attributes of household structure and composition, and by characteristics of the household head. Size of land holding per resident was a more significant factor in determining income differences. The most significant explanatory factors were land and labor productivity.

Among households in the top half of the income distribution, village location variables were found to be more important in explaining income variation than among poorer households. This was attributed primarily to differences between villages in the demand for non-agricultural goods and services. Higher income households enjoyed sufficient levels of cash surplus to engage in non-farm trading activities to exploit these potential markets. Among the household and head attributes, only status--as reflected in inclusion among the village political elites--was a significant explanatory factor. Land holdings per resident were found to be somewhat more important in explaining differences in the high compared to the low income range. As with lower income households, however, differences in land and labor productivity were the most important determinants of income differentials.

Three factors which might account for variation in the productivity of land and labor inputs were examined: 1) selection of crop mix, 2) levels of use of complementary inputs, especially organic and inorganic fertilizers, and 3) differences in the skill with which factors are combined.

Only relatively minor variation in crop mix were found among income strata. And after controlling for differences in crop mix, substantially lower returns to factors were still observed for low income farmers.

Factors underlying differences in farm production efficiency between income classes were examined through budgeting and production function analyses. It was found that differentials in farm incomes were primarily attributable to management differences. Despite relative land shortage, poorer households farmed their fields less intensively with respect to both labor and non-labor inputs and realized lower average and marginal returns to both land and labor. Low and highly variable skills in the practice of essentially traditional farming methods were found among low income compared with middle and high income producers. This was reflected in coefficients estimated for management and specialty crop dummy variables as well as in relatively higher unexplained variation in production functions fitted to data of low income farmers. The precise nature of these management differences were not identified in the present analysis. Familiarity with the traditional farming systems suggests that these would include variation in timing of operations, the selection of optimum crop mixtures and rotations, the allocation of crops between fields showing micro-soil variation, etc.

The low levels of household labor applied to the fields of poorer farmers could not be entirely attributed to either low marginal returns to labor in farm work nor to competition with off-farm sources of employment which were pursued by poor farmers to provide a continuous supplemental source of cash. Although the marginal return to labor on fertilized fields was lowest among low income farmers, on their unfertilized fields the marginal return was in fact highest of the three income classes. Further, total employment levels

of low income adult males as measured in terms of daily hours worked were found to be consistently less than employment levels for middle income males, and approximately equal those of high income males during the entire year. During June, the month of peak farming activity, low income adult males worked an average of only 3 hours per day at all occupations, farm and off-farm. This was 67 percent below the average level recorded for middle income males, and 25 percent below the level for high income males.

Calorie shortage may have provided a partial explanation to the lower hours worked by poor farmers. The poorest quintile of households were estimated to have suffered an approximate 20 percent shortfall from minimum standards. It is possible that the magnitude of this deficit was sufficient to substantially lower both the productivity and work duration of low income family labor independent of motivational differences.

2.2.3.3. Factors Which Constitute a Low Income Poverty-Trap

A set of relationships were examined which were hypothesized to constrain a family from improving its welfare once it has fallen into extreme poverty. Low income households were found to experience a relative cash shortage year round which was particularly acute during the pre-harvest period. The set of poverty-trap relationships were posited on this cash shortage. These relationships were hypothesized to operate through: 1) choice of crop mix, 2) use of complementary farm inputs, 3) timing of crop sales, 4) choice of off-farm occupations and level of off-farm activity, and 5) need for and cost of credit.

Choice of Crop Mix

As mentioned above, only minor differences were found regarding choice of crop mix across income strata. The following patterns, however, were observed.

Higher income households were able to give somewhat greater emphasis in their farming systems to specialty crops which required higher levels of purchased inputs. These crops, in particular sugar cane, onion, and pepper, ranked highest among the major crops of the area with respect to returns to land, and low with respect to perceived yield variability. In contrast, the poorer households were seen to be too poor to even attempt a food self-sufficiency farming objective. A higher level of food grain consumption among the poorest decile was made possible through the production and sale of groundnut and subsequent grain purchases than would have been possible through the direct production of grains. This was true since groundnut realized higher returns to both labor and land than the food grains. And among the most profitable crops in the area, groundnut was associated with the relatively lowest use of purchased inputs. Due to the disproportionate emphasis given to the low cash requirement but highly profitable cash crop groundnut therefore, the welfare of the extremely poor households was found to be highly dependent upon and sensitive to grains supplied to the market by surplus producers.

Differences in Use of Purchased Inputs

A similar disadvantage was seen regarding levels of use of purchased inputs, especially fertilizer. High income farmers applied an average of 40 percent more inorganic fertilizer per hectare than low income farmers on all upland fields. Because familiarity with the use of inorganic fertilizer was equally distributed among income strata, and particularly since the returns to fertilizer use were in fact highest on the fields of low income households, non-use was directly attributed to low cash availability during the months of purchase and application. Unprofitably low organic manure applications were also observed among poor farmers. This was due to a shortage of cash as well as their smaller holdings of livestock relative to cultivated hectares.

Timing of Crop Sales

Under pressure to generate cash for the repayment of debts incurred during the pre-harvest months and to pay taxes, lower income households tended to market somewhat greater proportions of their total crop sales in the months immediately following harvest. For most crops these early sales coincided with periods of low market prices. Losses in sales revenue attributable to timing differences were limited to lower and middle income households. These relative losses were greatest for the subsistence grains. In absolute terms, however, the resulting impact on incomes was relatively minor. Compared to the average crop sales timing pattern for the entire large sample, it was estimated that a mean loss in net annual income of only 2.7 percent was experienced by households in the poorest decile due to early sales. In comparison, households in the richest decile were estimated to have increased their annual incomes by only 1.2 percent through a more advantageous timing of sales.

Off-Farm Occupations

Differences among income strata, also closely related to surplus cash availability, were observed with respect to the types of off-farm occupations pursued and the resulting returns to labor. Service occupations requiring little or no cash outlays and resulting in low returns to labor characterized the off-farm employment of low income households. This contrasted with a higher frequency of more cash-using occupations which resulted in higher returns to labor among middle and particularly high income households.

Income Transfers Within the Local Credit System

It was hypothesized that borrowing by poor households combined with exorbitant interest charges would constitute an important mechanism through

which incomes would be transferred from low income to higher income creditor households. However, no association was found between either the number or mean value of cash loans received and household income status. Only a small proportion of all cash loans which were repaid in cash contained an interest component. Though marked by high variance, the average annual interest for all such loans was calculated to be only 11.4 percent. Significantly, no interest payments were reported on cash loans repaid by the poorest 40 percent of households. Thus although local sources of credit did not supply sufficient cash to relax significantly the cash constraint of poorer households, access to such loans as reflected in the value of loans actually received and the resulting credit charges were not found to be biased against poor households.

2.2.3.4. Participation in Agricultural Extension Programs

While uniformly low, awareness and participation rates in government agricultural programs showed no consistent relationship with the household's income status. Rather the strength and sign of the association varied from program to program. Strongly positively associated with income were membership in farmers' councils formed for the purpose of group buying of fertilizer and for obtaining tractor hire services. Inversely related to income status were amounts of drought relief seed and improved groundnut seed received from the state ministry. The relative effectiveness in targeting the poorest households in these latter programs was attributed to the major role played by village officials in the distribution process at the village level.

Extremely high involvement in most programs was recorded among a small group of village elites, involvement which in several instances reflected substantial abuse of the input distribution system. An estimated 16-18 percent of the total volume of seed and fertilizer channeled into the affected

villages through state programs were diverted for the personal use or resale by these elites. This offset in part the otherwise "need-focused" pattern of inputs distribution which resulted from delegating input allocation decisions to these same village leaders.

2.2.3.5. Policy Implications

It was concluded that for relatively homogenous rural populations, typical of the three villages sampled, the current distribution of rural income as such is not a problem of immediate policy importance in the north of Nigeria. Within the highly variable and harsh ecological environment of the north of Nigeria, the observed distribution was believed to reflect to a large degree inter-personal differences in aptitude and work motivation. Current farming systems were not sufficiently profitable, cash using, or technically complex to permit wide disparities in agricultural incomes attributable to a minority of extremely high income households. These factors were reinforced by the continued availability of surplus land and a relatively egalitarian land tenure system. Furthermore, rural demand for nonagricultural goods and services was not deep enough to generate an important rural non-farm or trading class.

Although severe welfare problems among the poorest strata were documented, it was concluded that for policy purposes these problems are improperly framed in a distribution context. The problem rather is one of the generally low levels of income overall. Since in any given year the average level of income is not greatly in excess of minimum subsistence requirements, the distribution of skills, work preferences, and misfortune among the population will perforce result in some extreme poverty incidence.

The study identified trends, however, which point toward a likely widening of income disparities in the future. These indicators were seen particularly with respect to major technological changes. It was seen that use of chemical fertilizers was substantially greater among higher income households. As increased supplies of chemical fertilizers become available, the current pattern of adoption would ensure that the observed distribution of incomes will worsen. This pattern will continue unless the price of fertilizer is maintained at levels low enough to allow purchase by poor farmers, and/or unless delivery and credit systems are designed to effectively target the poor.

With the development of additional new technologies these trends are likely to accelerate. If the new technologies require substantial cash investment, entail a higher labor input, or are technically more complex relative to existing practices, successful early adoption will almost assuredly exclude the poor.

3. Work Completed During the Period, June 1976 to June 1977

3.1. Sierra Leone

Much of the initial period of the Sierra Leone project component has been spent reorganizing and cleaning data into a form suitable for the analysis of household incomes and technical change. This represents a major programming task in assembling data for each household from a range of files on employment, output, capital, etc. used in the representative firm analysis under the African Rural Employment Project (see Spencer and Byerlee, 1976).

Two main data files are being constructed (see Tables 4 and 5). One assembles data on individual household members, particularly labor inputs in

TABLE 4
FILE I: HOUSEHOLD DATA FILE

Demographic	Size Number of children Age of head Education of head
Land	Acreage Age of bush } By enterprise
Capital	Farm tools Tree crops Animals Land improvement } Stocks and Flows
Inputs	Hired labor (value) Fertilizer Seed Tractor hire } By enterprise
Hired labor	Male Female Children Total by enterprise } By month
Family labor	Male Female Children Total by enterprise } By month
Output	Output value Sales value Labor sold out } By enterprise
Prices (Location specific)	Price output by enterprise Wage rate
Consumption	Cash expenditures by committees
Other	Extension contacts Participation in developing projects Political leadership Rural-urban remittances Perceived constraints Sources of information

TABLE 5
FILE II: HOUSEHOLD MEMBER DATA FILE

Demographic	Age Sex Last place lived Place birth Place moved to (for outmigrants) Fertility - no children - ages of children (women only)
Education	Arabic English Present school attendance
Occupation	Primary Secondary
Labor	Hours worked - Agriculture - Processing - Hunting, fishing, livestock - Small industries - Other nonfarm - Labor sold out - Total } By month Total days worked by month Total hours worked - Brushing - Clearing - Land development - Land preparation (planting) - Weeding - Pest control - Harvest - Nonfarm
Per capital household income	

TABLE 6
HOUSEHOLD PRODUCTION ENTERPRISES

Annuals	Rice - Upland (intercropped with maize, millet, sorghum, etc.) - Inland swamp - Boliland (hand and mechanical) - Mangrove swamp - Riverain (hand and mechanical) Groundnuts Fundi Cassava Vegetables Fruit Other
Tree crops	Oil palm - wild Oil palm - plantation Cocoa Coffee
Animal husbandry	Hunting and gathering Fishing Cattle
Home processing	Rice Oil palm
Nonfarm	Tailoring Carpentry Blacksmithing Other nonfarm Trading
Off farm	Labor sold out

order to analyze labor supply.[1] The second data file assembles data by household and is being used to analyze income distribution and to test hypotheses about household behavior. Both data files are now completed.

Work completed to date and its relationship to the objectives of the project are summarized in Table 7. Initial analysis has been conducted to identify major production systems and income and labor allocated in those systems. Income distribution measures have been estimated for national, regional and village samples. For example the estimated Gini ratio on a national sample is about .38 while for individual villages it generally ranges from .20 to .35. These measures indicate relative uniformity in income distribution in rural Sierra Leone. Analysis has also been conducted to identify the major determinants of differences in income among households. Significantly the most important explanatory variables appear to be resource productivity (particularly for labor) rather than resource use. However family work effort, hired labor and available land were all significant determinants of income. Finally demographic variables particularly the dependency ratio were also important. Budgets for major crops and nonfarm enterprises have been constructed in order to identify sources of income and the extent to which differences in income sources are the result of differences in farming systems and participation in nonfarm work.

Analysis of labor information has continued with respect to total labor inputs and labor allocation by household members. Profiles of labor use are being constructed to identify major sex, age, and regional differences in labor use. This work is continuing with emphasis on factors affecting sexual

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[1]This file is also being utilized to examine female labor force participation under AID/afr-C-1364.

Table 7. Summary of Work Completed and Work Planned Under Each Objective of the Poor Rural Household Study --Sierra Leone

Objective	Work Completed	Work Planned
1. Compare and contrast production systems, use of time, participation in labor markets and family incomes.	Major production systems identified and labor allocation and family income described.	Further analysis of labor inputs and allocation with particular emphasis on sexual differentiation, and participation in off-farm employment. (Gunther)
2. Analyse sources of income and differences in income of poor rural households.	Analysis of income sources by farm and nonfarm. Estimation of measures of income distribution by region and village. Determinants of income differences as a function of ecological variables, demographic factors (e.g. dependency ratio), access to resources, and resource productivity.	Further analysis of income differences in terms of factors affecting land and labor use such as land tenure status and sexual differential in labor use. Examination of differences in resource productivity through choice of enterprise and production technique. Production function analysis for the household and major enterprises. (Jarrett) Factors determining income distribution in rural and urban areas.
3. Analyse the rural labor market with respect to demand/supply behavior, efficiency of the labor market and migration.	Analyse of choice of techniques in major rural sectors--agriculture, small industry, fishing and processing--and the effect on demand for labor. Analysis of age, sex, regional, seasonal and secteral differences in rural wages. Determinant of rural-rural and rural-urban migration.	Household-firm model of labor supply to farm and nonfarm activities. (Lindmalm-Smith) Further analysis of rural wage rates and the decision to buy and sell labor.
4. To analyse barriers to the increased participation of landless workers in the development process	Not relevant -- not class of landless laborers	
5.&6. Analyse constraints to the adoption of new production technology and to develop and test models to measure the impact of technical change on output, income and employment of poor rural households.	Use of LP model disaggregated by region and farming system to analyse the impact of pricing policy and technical change on output and incomes.	Analysis of resource allocation decisions on the basis of cash requirements, seasonal labor use, and factor productivity, to determine the choice of farming systems. Implications for the adoption of improved technologies. (Franzel)
7. Develop and test policy models for analysis of aggregate impacts of trade, taxation and domestic agricultural policies.	LP models constructed to investigate interactions between rural and urban sectors with emphasis on labor market interactions. The relationship between income distribution and factor intensity and locational linkages of rural consumption patterns.	None
8. Identify policy and institutional changes to increase the participation of the rural poor in, and their benefits from, the development process.		Assemble results from all components of the research to make policy recommendations with emphasis on promotion of new technologies' access to government programs, and pricing policy.

differentiation in labor use. This analysis will serve as the basis for the specification of a household-firm model to estimate family labor supply to farm and off-farm activities.

During the year an aggregate LP model of the Sierra Leone rural economy has been completed to analyse the effects of agricultural pricing policy and new technologies on output and income (Rose, 1977). This model is disaggregated by resource region with 2-5 farming systems in each region. Major constraints incorporated into the model are labor by season and land of various types.

Finally a detailed analysis has been conducted of the relationship between income distribution and consumption patterns in order to evaluate the indirect effects of income distribution policies operating through consumer expenditures. King and Byerlee (1977) have shown that income elasticities and marginal propensities to consume for some commodities do vary with incomes. Some basic commodities, such as rice, root crops, fish, and kerosene, show a declining marginal propensity to consume while "luxury" items, such as meat, imported condiments, transport, wood work and services, have an increasing marginal propensity to consume. However, these effects are usually not large; and as a result, income level has only a small impact on the labor, capital and foreign exchange requirements of additional consumer expenditures. Nonetheless low income households do tend to consume more labor intensive and less capital-foreign exchange intensive commodities.

Significantly at all income levels the great majority (75 percent) of consumer expenditures are directed toward rurally consumed commodities. About 15 percent of consumer expenditures are for imported items while less than 10 percent of expenditures are for urban produced goods. The indirect

effects of increased rural incomes therefore will largely be concentrated in rural areas.

3.2. Nigeria

Since joining the project in April of this year, Peter Matlon has concentrated on facilitating the integration of Sierra Leone and Nigerian studies. A complete set of the Nigerian data has been transferred to East Lansing. Copies of all relevant questionnaires, cards, and summary tape files have been duplicated and sent to Cornell University to support continuing research efforts which are making use of that data there. Points of similarity with respect to data and further analysis between the Sierra Leone and Nigerian studies have been identified. These similarities as well as the initial results of the Nigerian study have assisted in devising the plan of work for further analysis of both data sets. The objective has been to maximize the amount of comparability between each area study so as to derive a greater level of generality with regard to major conclusions. The effort at integration has also served to familiarize Matlon with the Sierra Leone data files to facilitate the transfer of project leadership following Byerlee's departure.

4. Plan of Work, July 1977 to June 1978

4.1. Sierra Leone

The major areas of concentration of work for the next twelve months are: (a) further analysis of income sources and income distribution, (b) analysis of resource use, (c) analysis of resource productivity, (d) household-firm models and the analysis of labor supply and (e) constraints on adoption of

new technologies. The relationship of these topics to each of the objectives of the Poor Rural Household's project are shown in Table

4.1.1. Further Analysis of Income Sources and Income Distribution

Regional variation has been shown to be important in explaining income differences. This variation will be explored further in order to identify transportation, locational, ecological and institutional variables that account for this variation. Furthermore an attempt will be made to explain variations in income distribution between survey sites as a function of such variables as village size, location, transportation, population density, presence of agricultural projects, incomes, etc. Finally rural-urban differences in income will be carefully examined since it is hypothesized that rural-urban income disparities are larger than intra-rural disparities.

4.1.2. Resource Use by Income Class

Further analysis of resource use will disaggregate access to land by upland of varying qualities and swamp land. Land tenure arrangement will also be related to income class. Labor inputs by income class will be further disaggregated into factors relating to (a) the dependency ratio, (b) the work effort of different age-sex groups in the household and (c) the use of hired labor to supplement family labor resources.

Initial analysis suggests that capital inputs may not be related to income status perhaps because of the very low capital investment of Sierra Leone farmers. Further work will disaggregate capital inputs to determine if certain types of capital e.g. fish equipment, tree crops, livestock are related to income status.

4.1.3. Resource Productivity

Major emphasis is being placed on differences in resource productivity among Sierra Leone rural households. One dimension of the analysis will deal with the extent to which differences in enterprise combination explain variations in resource productivity. Further work will then identify factors related to income status which explains choice of farming systems and participation in nonfarm activities. A second major area of emphasis is variation in production technique as a factor explaining resource productivity. Production technologies vary in Sierra Leone due to variations in traditional practices such as the amount of weeding or the extent of intercropping and also the use of improved technologies on a few farms particularly mechanization and fertilizer. These results will be supplemented by production function analysis to estimate differences in productivity by income group, region and enterprise.

4.1.4. Models of Household-Firm Decision Making and Labor Supply

In the first year of the project models have been developed for use in studies of labor supply and demand and of food consumption choices of rural households in Sierra Leone. These models integrate various decision making processes (a) production of farm and nonfarm goods, (b) buying and selling of farm and nonfarm goods, and (c) buying and selling of factors of production particularly labor. One specific model focuses on household allocation of time by labor type (male and female) between farm and nonfarm activities. It combines features of the two good models of Hymer and Resnick (1969) with household models such as Youtopolous and Lau (1974). During the coming year these models will be empirically estimated using Sierra Leone data.

4.1.5 Constraints on the Adoption of New Technologies

The identification of factors affecting choice of farming systems will be used to analyse the likelihood of adoption of new rice technologies available in Sierra Leone in terms of the compatability of these technologies with seasonal labor constraints, sexual differences in labor inputs, cash requirements, access to markets etc. Moreover the profiles of different farming systems will be used to determine which types of technologies should be developed to be compatible with that system. This will be supplemented by an analysis by income group of the knowledge of new technologies and access to agricultural extension workers.

4.2. Nigeria

During the next year work will be directed to summarize existing results and to conduct complementary analyses where such additional analyses increase comparability with the Sierra Leone study. Several areas of further analysis are presented below. In Table 8,each of these areas are related to the objectives of the Poor Rural Household's project.

4.2.1. Further Analysis of Sources of Income

An examination of inter-household cash and food flows has already shown that often substantial levels of gift transactions occur. The timing and direction of such transfers across income strata will be examined further to determine the extent to which such a traditional informal welfare system is need focused. A closer analysis of the inter-relationships between farm and nonfarm income sources will also be conducted to determine household and village level factors which affect the relative importance of each. Possible labor and cash complementarities between these two household sectors will also be examined. Finally, the approximate contribution of female occupations

Table 8. Summary of Work Completed and Work Planned Under Each Objective of the Poor Rural Household's Study --Nigeria

Objective	Work Completed	Work Planned
1. To compare and contrast production systems, use of time, participation in labor markets, and family incomes.	1. Major farm and non-farm enterprises identified and analyzed to determine purchased inputs requirements, labor inputs, and net returns to factors. 2. Whole farm labor profiles constructed examining differences between income classes as to age-sex employment rates in farm, hired farm labor, and non-agricultural activities by month of year. 3. The levels, sources, types, and distribution of incomes have been analyzed in aggregate and by village.	1. Summarize and conduct complementary analysis where necessary to facilitate comparison with Sierra Leone work. 2. Examine management differences which account for variation in productivity among income classes.
2. To analyze sources of income and differences in income of poor rural households.	1. Income profiles constructed by decile and quintile variation in levels of income (per household, per resident, and per consumer man equivalent), sources (farm, hired labor, and non-agricultural--the latter disaggregated into 47 occupations), and type (cash and in-kind). 2. Several measures calculated to describe distribution of income by source, village and recipient. 3. An econometric income generating model estimated to evaluate the determinants of income differences.	1. Summarize and conduct complementary analysis where necessary to facilitate comparison with Sierra Leone work. 2. Examine informal welfare system as reflected in cash and food gift flows. 3. Analyze factors determining balance between farm and nonfarm income and inter-relationships between them. 4. Estimate average savings rates by income class. 5. Estimate female earnings by income class.
3. To analyze the rural labor market with respect to demand/supply behavior, efficiency of the labor market, and migration.	1. Employment profiles constructed showing average hours worked by month for seven age/sex classes in three employment categories (farm, hired farm labor, and non-agricultural) disaggregated by income class. 2. The demand for labor in upland and lowland farming systems analyzed through budgets and production functions. 3. Allocative efficiency examined through comparison of farm MVPs with average annual farm wage rates, disaggregated by income class.	1. Describe and analyze determinants of seasonal wage movements. 2. Analyze differences in seasonal migration behavior among income classes. 3. Estimate labor supply functions.
4. To analyze barriers to the increased participation of landless workers in the development process.	None (Survey area lacks a landless laborer class.)	None
5. To analyze the constraints to the adoption of new production technology.	1. Adoption constraints examined as effect of cash requirements, managerial competence, and access to extension assistance.	1. Compare with budgets developed by Norman indicating cash and labor requirements of three improved crop technologies currently available in study area. 2. Analyze farmers perceptions as to major problems and assistance needs.
6. To develop and test models to measure the impact of technical change on output, income, and employment of poor rural households.	None (Only minimal technical change observed; and inability to identify crop-specific technical coefficients)	None
7. To develop and test policy models for analysis of aggregate impacts of trade, taxation, and domestic agricultural policies.	None (Requires a broader regional data base than was obtained in the present study)	None
8. To identify policy and institutional changes to increase the participation of rural poor in development process.	1. Effect of changes in groundnut marketing board pricing policies on incomes of households stratified by income examined within a static framework. 2. Access to government programs of seed and fertilizer distribution and extension assistance during last five years examined by village and income strata. 3. Factors influencing awareness of and participation in extension programs examined. 4. Leakage of credit inputs to village elites determined for two government programs.	1. Summarize existing results.

will be identified, and average savings rates will be estimated by income class.

4.2.2. Further Analysis of Production Systems

After controlling for differences in enterprise combination, significant differences in both marginal and average returns to factors were found among households disaggregated by income class. These differences were directly related to household income status. A closer examination of the farm input-output data will be made to determine more precisely those differences in essentially traditional management techniques employed by high income farmers which made them more efficient producers.

4.2.3. Constraints to Technical Change

The very limited range of improved technologies currently adopted restrict most kinds of *ex post* analysis of factors constraining the use of improved inputs. Subjective data exploring a range of farming problems as perceived by household heads, as well as their assessment of assistance needs, were obtained. These data will be analyzed and related to empirical results which have identified differences in farming efficiency, resource availability, and cash shortages across income classes.

Dr. David Norman, while at Ahmadu Bello University, analyzed three improved crop technologies under farmers' conditions and has constructed budgets for each system. The incremental cash and labor requirements of each system will be related to seasonal cash and labor profiles already constructed to infer differences in compatibility with current farming systems by income class.

4.2.4. Rural Labor Market Analysis

Seasonal off-farm wage movements will be described and their determinants analyzed. These will be related to observed differences in patterns

of off-farm employment among income classes to derive implications regarding the distribution of off-farm labor earnings.

Seasonal migration patterns will also be analyzed to identify major determinants and implications with respect to income distribution. In addition to considering the income derived from migratory employment, the effect of temporary seasonal absences (i.e., a reduction in household consumption) on grain stocks of low income households will be examined.

If time permits and it is decided that the Nigerian data can be usefully examined within the framework of the household firm model which is being constructed for Sierra Leone, this model will be adapted to the Nigerian context to estimate labor supply functions.

5. Phasing of Work During Years Two and Three of the Project

It is anticipated that four masters theses employing the Sierra Leone data will have been completed or will be nearing completion by June of 1978. These are focussed respectively on (a) an analysis of income sources, distribution, and major determinants; (b) the relationship between income and seasonal/sexual labor allocation patterns; (c) current farm resource use and productivity as related to income, and (d) factors affecting enterprise choice and implications for technological change. In addition the household-firm models will have been constructed and preliminary analysis initiated. It is also planned that further analysis of income sources and farm production systems, using the Nigerian data, will be completed by June of 1978. A preliminary report for both study areas will be completed at the end of that year.

During year three of the project, final analyses by the MA students will be completed and their theses will be prepared for inclusion into the final report. Additional integrative analyses will be conducted where necessary.

Household-firm analysis will also be completed and written up. Further examination of technical change and rural labor markets in Nigeria will be completed early in year three and combined with Sierra Leone components in the preparation of the final report. Additional limited analyses may be conducted to maximize the complementarity of specific results drawn from the two study areas. A major effort will be made during year three to coordinate with Purdue and Cornell in the preparation of the final integrated report.

6. Financial Administrative Report

6.1. Firm Budget, Poor Rural Households, Period: June 24, 1976 through June 30, 1978

	Estimated First Year 7/1/76-6/30/77	Estimated Second Year 7/1/77-6/30/78	Firm Budget Total Two Years 7/1/76-6/30/78
Salaries	$ 55,984	$ 61,635	$117,619
OverHead	36,949	40,679	77,628
Fringe Benefits	6,490	7,223	13,713
Consultants	1,000	2,000	3,000
Travel/ Transportation	2,800	1,700	4,500
Allowances	2,514	1,314	3,828
Other Direct Costs	15,500	13,500	29,000
Total	$121,237	$128,051	$249,288

6.2. Actual/Estimated Budget and Expenditures, Poor Rural Households, Period: June 24, 1976 to June 30, 1977

Line Item	Estimated Budget 6/24/76-6/30/77	Actual/Estimated Expenditures 6/24/76-6/30/77
Salaries	$ 55,984	$ 52,992
Overhead	36,949	34,975
Fringe Benefits	6,490	5,867
Consultants	1,000	250
Travel/ Transportation	2,800	2,222
Allowances	2,514	--
Other Direct Costs	15,500	19,180
Total	$121,237	$115,486

6.3. Personnel

The following individuals were employed during period June 24, 1976 through June 30, 1977 to carry out the terms of the Contract.

Professional

1. Derek Byerlee, Project Director, Associate Professor, Agricultural Economics
2. Enyinna Chuta, Assistant Professor, Agricultural Economics
3. Carl K. Eicher, Professor, Agricultural Economics
4. Peter Matlon, Assistant Professor, Agricultural Economics

Graduate Research Assistants

1. Steve Franzel
2. Robert King
3. MacIvan Jarrett
4. Frank Rose

Administrative Support

1. Janet Munn, Specialist, Agricultural Economics
2. Bert M. Pulaski, Senior Administrative Assistant, Institute of International Agriculture
3. Keypunchers, Agricultural Economics

Total Person Months Devoted to the Project

	Person-Months
Professional Person Months	15.3
Graduate Research Assistants - 28 months @ 50%	14.0
Secretarial/Administrative	5.0
Keypunching/Data Processing	6.0
Total	40.3

Table 3

Selected Characteristics of Rural Northern Nigerian Households Stratified by Income Per Consumer

Household Characteristic	Decile 1	Decile 2	Quintile 2	Quintile 3	Quintile 4	Decile 9	Decile 10	Total
Average income (in naira)[1]								
Per household	178	234	280	317	419	394	627	347
Per resident	19	28	39	55	68	88	99	52
Per consumer equivalent[2]	28	40	55	77	98	126	169	75
Source of income (in percent)								
Farm	79.9	75.4	77.2	77.3	73.1	60.5	63.4	71.9
Off-farm	20.1	24.6	22.8	22.7	26.9	39.5	36.6	28.1
Non-agricultural	11.6	20.5	18.8	18.2	25.9	35.6	35.4	25.0
Hired farm labor	8.3	4.1	4.0	4.5	1.2	3.9	1.2	3.1
Percent of income generated in or converted into cash	60.4	49.8	35.7	50.8	58.7	57.8	56.0	53.0
Number of residents	9.3	8.3	7.3	5.8	6.2	4.5	6.3	6.7
Number of consumer equivalents	6.4	5.9	5.0	4.1	4.3	3.1	3.7	4.6
Consumer to worker ratio[3]	2.4	2.6	2.2	2.3	2.3	2.0	2.7	2.4
Cultivated hectares								
Total	2.2	2.4	2.2	2.4	2.9	2.7	3.2	2.5
Per resident	.24	.29	.30	.41	.47	.60	.51	.38

[1]The official exchange rate during 1974-75 was ₦1 = US $1.64.

[2]Consumer equivalents were determined by converting the residents in each household to man equivalents using approximate F.A.O. caloric requirements tables and age-sex criteria.

[3]The number of workers in a household was defined as those persons who engaged in weeding, the farm labor bottleneck activity, converted to approximate productivity man equivalents based on age-sex criteria.

Table 7. Summary of Work Completed and Work Planned Under Each Objective of the Poor Rural Household Study --Sierra Leone

Objective	Work Completed	Work Planned
1. Compare and contrast production systems, use of time, participation in labor markets and family incomes.	Major production systems identified and labor allocation and family income described.	Further analysis of labor inputs and allocation with particular emphasis on sexual differentiation, and participation in off-farm employment. (Gunther)
2. Analyse sources of income and differences in income of poor rural households.	Analysis of income sources by farm and nonfarm. Estimation of measures of income distribution by region and village. Determinants of income differences as a function of ecological variables, demographic factors (e.g. dependency ratio), access to resources, and resource productivity.	Further analysis of income differences in terms of factors affecting land and labor use such as land tenure status and sexual differential in labor use. Examination of differences in resource productivity through choice of enterprise and production technique. Production function analysis for the household and major enterprises. (Jarrett) Factors determining income distribution in rural and urban areas.
3. Analyse the rural labor market with respect to demand/supply behavior, efficiency of the labor market and migration.	Analyse of choice of techniques in major rural sectors--agriculture, small industry, fishing and processing--and the effect on demand for labor. Analysis of age, sex, regional, seasonal and sectoral differences in rural wages. Determinant of rural-rural and rural-urban migration.	Household-firm model of labor supply to farm and nonfarm activities. (Liedholm-Smith) Further analysis of rural wage rates and the decision to buy and sell labor.
4. To analyse barriers to the increased participation of landless workers in the development process	Not relevant -- not class of landless laborers	
5.&6. Analyse constraints to the adoption of new production technology and to develop and test models to measure the impact of technical change on output, income and employment of poor rural households.	Use of LP model disaggregated by region and farming system to analyse the impact of pricing policy and technical change on output and incomes.	Analysis of resource allocation decisions on the basis of cash requirements, seasonal labor use, and factor productivity, to determine the choice of farming systems. Implications for the adoption of improved technologies. (Franzel)
7. Develop and test policy models for analysis of aggregate impacts of trade, taxation and domestic agricultural policies.	LP models constructed to investigate interactions between rural and urban sectors with emphasis on labor market interactions. The relationship between income distribution and factor intensity and locational linkages of rural consumption patterns.	None
8. Identify policy and institutional changes to increase the participation of the rural poor in, and their benefits from, the development process.		Assemble results from all components of the research to make policy recommendations with emphasis on promotion of new technologies' access to government programs, and pricing policy.

Table 8. Summary of Work Completed and Work Planned Under Each Objective of the Poor Rural Household's Study --Nigeria

Objective	Work Completed	Work Planned
1. To compare and contrast production systems, use of time, participation in labor markets, and family incomes.	1. Major farm and non-farm enterprises identified and analyzed to determine purchased inputs requirements, labor inputs, and net returns to factors. 2. Whole farm labor profiles constructed examining differences between income classes as to age-sex employment rates in farm, hired farm labor, and non-agricultural activities by month of year. 3. The levels, sources, types, and distribution of incomes have been analyzed in aggregate and by village.	1. Summarize and conduct complementary analysis where necessary to facilitate comparison with Sierra Leone work. 2. Examine management differences which account for variation in productivity among income classes.
2. To analyze sources of income and differences in income of poor rural households.	1. Income profiles constructed by decile and quintile variation in levels of income (per household, per resident, and per consumer man equivalent), sources (farm, hired labor, and non-agricultural--the latter disaggregated into 47 occupations), and type (cash and in-kind). 2. Several measures calculated to describe distribution of income by source, village and recipient. 3. An econometric income generating model estimated to evaluate the determinants of income differences.	1. Summarize and conduct complementary analysis where necessary to facilitate comparison with Sierra Leone work. 2. Examine informal welfare system as reflected in cash and food gift flows. 3. Analyze factors determining balance between farm and nonfarm income and inter-relationships between them. 4. Estimate average savings rates by income class. 5. Estimate female earnings by income class.
3. To analyze the rural labor market with respect to demand/supply behavior, efficiency of the labor market, and migration.	1. Employment profiles constructed showing average hours worked by month for seven age/sex classes in three employment categories (farm, hired farm labor, and non-agricultural) disaggregated by income class. 2. The demand for labor in upland and lowland farming systems analyzed through budgets and production functions. 3. Allocative efficiency examined through comparison of farm MVPs with average annual farm wage rates, disaggregated by income class.	1. Describe and analyze determinants of seasonal wage movements. 2. Analyze differences in seasonal migration behavior among income classes. 3. Estimate labor supply functions.
4. To analyze barriers to the increased participation of landless workers in the development process.	None (Survey area lacks a landless laborer class.)	None
5. To analyze the constraints to the adoption of new production technology.	1. Adoption constraints examined as effect of cash requirements, managerial competence, and access to extension assistance.	1. Compare with budgets developed by Norman indicating cash and labor requirements of three improved crop technologies currently available in study area. 2. Analyze farmers perceptions as to major problems and assistance needs.
6. To develop and test models to measure the impact of technical change on output, income, and employment of poor rural households.	None (Only minimal technical change observed; and inability to identify crop-specific technical coefficients)	None
7. To develop and test policy models for analysis of aggregate impacts of trade, taxation, and domestic agricultural policies.	None (Requires a broader regional data base than was obtained in the present study)	None
8. To identify policy and institutional changes to increase the participation of rural poor in development process.	1. Effect of changes in groundnut marketing board pricing policies on incomes of households stratified by income examined within a static framework. 2. Access to government programs of seed and fertilizer distribution and extension assistance during last five years examined by village and income strata. 3. Factors influencing awareness of and participation in extension program examined. 4. Leakage of credit inputs to village elites determined for two government programs.	1. Summarize existing results.