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APPRAISAL OF SMALLHOLDER INFORMATION NEEDS FOR FOOD CROP PRODUCTION EXPANSION AND MARKETING: A CASE OF CASSAVA IN IMO, NIGERIA

A Dissertation

Presented for the

Doctor of Education

Degree

The University of Tennessee, Knoxville

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August 1981

3053728

ACKNOWLEDGEMENTS

The author would like to express his deep gratitude to his major professor, Dr. George W. Wiegers, Jr., for his understanding, guidance, and advice throughout the author's graduate work at the College of Education.

Special thanks go to the author's former advisor, Dr. David W. Brown, Department of Agricultural Economics and Rural Sociology, for his continuous encouragement throughout the author's graduate work at The University of Tennessee, Knoxville. Immense gratitude is expressed to other members of the author's committee, Dr. Carroll B. Coakley and Dr. David G. Craig, for their cooperation and constructive suggestions for this dissertation.

The author expresses gratitude to the National Root Crops Research Institute, Umudike, for the financial support of his graduate program.

Sincere appreciation goes to Dr. Joe A. Martin, Department of Agricultural Economics and Rural Sociology, for making financial support available to the author through A.I.D. Title XII strengthening programs and related sources.

Finally, the author remains indebted to his wife, Matilda, for her love and moral support when life seemed bleak, and to his four children, Chinenye, Nkechinyere, Emenike, and Chijioke, for their understanding and long years of endurance.

ABSTRACT

The purpose of this study was to improve the effectiveness of smallholder decision-making in food crop production and marketing through education that helps local people to gather relevant information and to use simple budgets in assessing the alternatives available to them. The specific objectives of the study were:

1. To identify the smallholders' existing crop enterprises, farm practices and resource constraints,
2. To assess the feasibility of the different crop enterprises and farm practices when improved technology replaces the traditional methods,
3. To identify factors that are limiting the use of improved technology and the implications for designing local education programs, and
4. To suggest educational programs that would help improve smallholder skills in information gathering and analysis for rational decision-making in crop production and marketing.

The empirical components of this study focused on a random sample of 115 smallholders in four local government areas in Aba Division of Imo State, Eastern Nigeria. Data were collected from the farms for a period of 12 months during the 1980-1981 farming season. Questionnaires and personal interviews were used to obtain information regarding existing practices, farm resource constraints, input-output data on crop production

practices, farm attitudes towards change, perceived obstacles to change, and other characteristics of the smallholder.

The data analysis centered around:

1. Descriptive tabulation of the survey results, and
2. Budgeted estimates of likely impacts of changes in cassava systems on representative smallholder production and incomes.

The results of this study showed that it would be preferable for the smallholder to grow cassava/maize mixture than cassava alone. The crop mixture is better grown on ridges or on mounds, using improved practices, than on flats with traditional methods. Specialization is not the answer for increasing cassava production and income. For the smallholder to grow cassava alone might require raising the present price of ₦60 per ton by more than three times as much. The low demand for cassava as a food item and the nature of its atomistic supply preclude such high prices in the foreseeable future, unless alternative processing and marketing outlets are developed.

The results indicated that growing cassava/yam/maize mixture gave the highest net increases in farm income. This was due to high yam prices. This crop enterprise mix may not be feasible and acceptable to the smallholder with limited resources.

While most farmers used improved cassava varieties, there was a strong prejudice against fertilizers. Low quality of processed cassava, low storage quality of crops, and the unacceptable taste of crops were among other factors responsible for the limited use of fertilizers.

Farmers depended on the local agricultural agents for information on improved technologies. Farmers' general and agricultural education

were low. Not many belonged to farmers' organizations, and they were unaware of alternative crop processing methods and marketing outlets.

The results of this study necessitate do-it-yourself educational programs for the small farmer and the suppliers of farm inputs. The programs would include training in record-keeping, farm budget analyses, food crop processing, marketing processes, and the role of farmers' organizations in production.

Interdisciplinary research is needed in food crop storage quality, processing, and marketing alternatives. Further research in smallholder farming systems is vital to food crop production expansion.

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CHAPTER I

INTRODUCTION

The growth of human population and the inadequate food production to meet the pressure in the developing countries of Africa remain a national as well as international concern. Nigeria, with its current estimated population of over 74 million people, shares this problem.[1]

For instance, Nigerian population is said to be growing at three percent per annum, while its historical food production growth rate has been only one-half percent per annum. Its food demand growth rate was estimated at 3.1 percent per annum (Kolfsky, 1978:23; and Awa, 1974:2). Thus, with the existing traditional method of smallholder food production in Nigeria, the problem of feeding the increasing population continues to plague national policy makers.

Nigerian agricultural policy in the 1950's and 1960's focused on the expansion of commercial crops such as cocoa, rubber, oil palm, cotton, and groundnuts, which yielded foreign exchange. Food crop production was left to develop without any aid. However, more recent policy has indicated national awareness of the need to assign priority to food production, as shown in Table 1.

The policy of self-sufficiency in food production and that of improvement in the diet of the people of any nation causes social as well as economic problem. Improvement in the standard of living, of

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[1]Source: The World Almanac and Book of Facts, New York: Newspaper Enterprise Association, Inc., 1981, p. 564.

TABLE 1

AGRICULTURAL DEVELOPMENT EXPENDITURE, 1970-1974,
IN MILLIONS OF NIGERIAN NAIRA[a,b]
(₦ MILLION)

Year	Export Crops	Food Crops
1970-1971	0.92120	0.88480
1971-1972	2.48920	1.09760
1972-1973	1.81720	0.70840
1973-1974	0.89880	0.59600
Total	6.12640	3.20040

[a]One Nigerian Naira (₦1.00) is equal to U.S. $1.75 at the time of writing, 1981.

[b]Source: Second National Development Plan 1970-74, Federal Ministry of Information, Lagos, Nigeria, p. 115.

necessity, goes along with the improvement in people's purchasing power. To raise the income per capita, the productivity of the available resources of the people must increase. The technology of the "green revolution" was introduced during the past three decades to help increase resource productivity, as well as to improve the food production situation in the less developed countries (LDC's) of Africa and Asia.

The green revolution packages favored large-scale farmers who produced grain crops--rice, wheat, maize, and other grains. The main target farm population--the poor smallholder farmers who are less educated, less informed, and cannot afford the needed inputs--remains a

disadvantaged group. For the root crop smallholder producers, the problem is more complex. The technology of the green revolution is not well developed for African root crops. In most cases, the smallholder farmer cannot irrigate his crops as a part of the requirements for green revolution packages. He has no access to credit and lacks the financial security that would enable him to risk adopting new and less reliable seed varieties.

If the route of mankind to increased food production is by advanced technologies, the smallholder farmer's knowledge about the new technologies holds the reins for development in the LDC's. The former World Bank President, Robert McNamara, in his September 1972 address to governors in Kenya, said:

> Without rapid progress in smallholder agriculture throughout the developing world, there is little hope either of achieving long-term stable economic growth or of significantly reducing the level of absolute poverty.[2]

This is not only a statement of fact about the situation; it is also an acknowledgement of the role of smallholder farmers in the economic and social growth of the developing nations of Africa in particular. The address summarized the importance of providing relevant information and education that would enable the smallholder farmer to participate actively in development through food production and exchange. Conservative as the farmers are, world over, only convincing information on the economic differences between their traditional practices and the new

---

[2]Robert S. McNamara. Address to the Board of Governors, Nairobi, Kenya, September 1972. International Bank for Reconstruction and Development (World Bank, Washington, D.C.), p. 14.

technologies would have impact on their farm decisions to produce more food for exchange.

The agricultural experts are responsible for collecting and analyzing the relevant input-output data to assist the smallholder farmer in his farm plans. The farmer is both profit maximizer and risk averter (Dent and Anderson, 1975); therefore, he needs adequate information on the new practices if he is to benefit from the present national drive for accelerated food production in Nigeria.

The General Organization of Smallholder Farming in Nigeria

Traditional agriculture in most of the LDC's of Africa stems from its deep-rooted affection for its tribal organization and the security it offers. Whereas there are the landlords and the landless in some world economies, in most African countries, including Nigeria, such inequitable distribution of land for cultivation is absent. In the Nigerian tribal setting, everybody is his own brother's keeper. This tribal and family affinity gave rise to the small size of farm lands available to individual farmers in their community. With so many farmers in the business of food crop production, the individual producers' priority goal is for family maintenance and subsistence. Production expansion in excess of family needs is secondary to the smallholder farmer with limited farming resources.

These farmers are noted for their ability to adjust their production to seasonal changes in climate, marketing conditions, and labor availability. Within their small-scale operation, they diversify their cropping activities by interplanting two or more crops with varying feeding and growing habits in the same plot.

This practice may seem very irrational for any person outside the tribal communal system and who is used to the nuclear family system of living. To the smallholder farmer, more is better for less, as far as self-sufficiency in family food provision is concerned. Growing more crops is better than specializing in one crop. For security purposes, this practice is socially and economically rational for the smallholder farmer. With the exchange economy, the emphasis is upon large-scale operation and specialization. However, such large-scale operation requires large capital investment in machinery, equipment, and management.

Traditional farming involves a lot of brute force and arduous work. Where the family labor force works so hard but consumes less nutritious food with low caloric intake, one would not expect an easy change of attitude on the part of smallholder farmers from the way their forefathers farmed.

Traditional farming in Nigeria is also characterized by scattered farm lands for its varied crop production. Farmers do not live on their farms but travel from their homes in the rural villages to and from their farms. The distance of the farms from the main market and lack of means of transportation constitute production and marketing problems.

The bulky nature of most of the farm products induces the smallholder to sell the products on the farm through contract sale. This method of product sale reduces the price which the farmer could have gotten by hauling the produce to distant markets, where higher prices could be obtained. Alternatively, the root crops are harvested and sold when desired by the farmer.

Some economists have asserted that smallholder traditional farmers in Africa do not behave as economic men and are not responsive to price incentives in their productive activities (Jones, 1960). Despite this general statement about African farmers' behavior, there is evidence to show that these farmers are as much economic men as their counterparts in the developed world (Helleiner, 1975; and Normal, 1974). The behavior of the Nigerian cash crop growers demonstrates the long-term expectation on investment and planning for the future in contrast to smallholder food crop growers who seek immediate gains.

Traditional smallholder farmers have problems in their daily agricultural production decisions, as do farmers in the developed economy. These farmers behave rationally to the extent of their resource availability, farm skills, and existing knowledge of the new technologies.

This statement does not imply that the system is very efficient and does not need improvement. On the other hand, it means that given the opportunity, better understanding of the new technologies relative to the smallholder situation and resource availability, the farmer could be persuaded to respond to any changes that may improve his social and economic well-being.

Problem

In Nigeria, carbohydrate foods form the major caloric intake of the people. Grains and root crops are the main sources of the carbohydrates. The grain crops of maize, millet, sorghum, wheat, and rice are grown mostly in the northern states. The southern states specialize in growing root crops of yams, cassava, cocoyams, sweet potatoes, platains,

and bananas. In the southeastern states, where land is scarce, the production expansion of any of these crop mixtures creates problems.

Generally, food crop production in Nigeria is organized as quasi-commercialized farming on small farm holdings. The strictly defined subsistence system of farming is not presently the way of life of the smallholder farms, even though farm operations are not mechanized.

The smallholder farmer in Imo and most developing countries lacks the relevant information about the full implications for the use of the recommended new technologies for food crop production expansion and marketing, considering his existing resources, farming system, and managerial ability.

If one considers, for example, the fact that Nigerian farmers rarely ever use fertilizers for growing food crops, despite more than 25 years of research and agricultural extension services, then it is not out of place to assume that information is lacking somewhere in the farmer's education process.

The smallholder's crop yield is very low compared to the yields obtained from experiment stations in Nigeria. For example, cassava yields under the traditional practices vary from 4-7 tons/ha as against 15-25 tons/ha realized from improved practices on experiment station farms (Ekanem, 1965).

While the smallholder farmer grows many crops on the same piece of land during the same season, without crop rotation, experiment stations report yields on crops grown singly, without intercropping and with rotation. The smallholder farmer in Nigeria rotates his land and not his crops. This system creates land management problems.

The smallholder does not use any heavy machinery or farm equipment; instead, he uses simple hand tools--hoes, knives, axes, and diggers--for most of his land preparation, planting, and harvesting. Thus, crops are planted on either "flat soil," on "mounds," and less on ridges, which require extra labor. This practice is compatible with his resource base and subsistence way of production.

Under the existing market conditions in Nigeria, where there is much atomistic competition in food crop marketing and falling farm prices, the smallholder would not be expected to produce more than a family's needs for survival, plus a little more for sale to provide for other family needs. The problem is compounded when market information is lacking and the farmer depends on the whims of the middleman for his farm inputs and credits, which are normally tied to the farmer selling his produce to the middleman.

Purpose of Study

The purpose of this study was to improve the effectiveness of smallholder decision-making in food crop production and marketing through education that helps local people themselves to gather relevant information and to use simple budgets for assessing the alternatives available to them. The specific objectives were:

1. To identify existing crop enterprise mixes, farming practices, and resource constraints.
2. To assess the feasibility of the different crop enterprise mixes and planting practices by replacing the traditional with improved technology.

3. To identify factors that prevent the smallholder from applying improved technology in food crop production and marketing, as well as the implications of these factors for designing educational programs.
4. To suggest new educational programs for improving smallholder and local people information-gathering and analytical skills for efficient decision-making in crop production and marketing.

Justification

Several research findings on how to increase crop yield have been recommended to farmers for adoption but with little success. State and federal governments of Nigeria have mounted programs of food crop expansion and have established food crop prices, without enough facts, hoping that the move would induce change in smallholder production attitudes. The results so far are not encouraging.

1. This study is meant to help the farmer, the change-agent, and administrators take a realistic look at smallholder farm production problems as far as costs and returns are concerned and in developing efficient credit programs and other production incentive programs.
2. It will demonstrate to the farmer and the change-agent an approach for making rapid assessment of enterprise selection and change. It will show the need for simple farm record-keeping.
3. It is expected that the agricultural researcher would be reminded of the need for providing relevant facts

about the new findings, through cooperative research efforts, that would facilitate trial and adoption by farmers.

Definition of Terms

The definitions of the following terms were made in the context of usage in this study:

Change-agent: A professional who influences innovation decisions in a desired direction (Bennis, 1965).

Enterprise: A subdivision of a farm devoted to producing one kind of crop or livestock (Brown, 1979:12). In this study, a crop enterprise consisted of one or more crop mixtures.

Flat planting: The traditional practice of planting crops on shallow tilled soils or shallow holes.

Green revolution: A term used to describe the package of seeds and technology that were intended to modernize Third World agriculture.

Hectare (ha): A unit of surface measure in the metric system, equal to 100 square meters (2.471 acres).

Infrastructure: The basic installations and facilities on which the continuance and growth of a community, state, nation, etc. depends, such as road transportation and communication systems (Webster's Dictionary).

Man-day (M/D): Represents the amount of labor used and paid by the day in carrying out different operations on the farm.

Mixed cropping: The traditional farm practice of growing more than one crop on the same piece of land during the same cropping season.

Mound: Top soil heaped into a circular form for planting of crops. Mound form is in contrast with a ridge with length and width.

New technology or improved practices: Two terms used synonymously to include improved seeds, chemical fertilizers, pesticides, weedicides, irrigation techniques, and other methods for increasing crop yields.

Nuclear family: An immediate conjugal unit of a husband and wife plus the children they identify as their own and for whom they assume the role of parent (Betrand, 1973:257).

Shifting cultivation: The traditional system of land rotation as against crop rotation. The farm land is cropped for one year and allowed to fallow for four to five or more years before the land is returned to cropping.

Smallholder or small farmer: One who cultivates an amount of land equal to or slightly above what is needed to provide for his immediate family subsistence (Morss et al., 1978).

Sole cropping or mono-cropping: The practice of growing one crop on a piece of land during one cropping season.

Subsistence farmer: A term used interchangeably with small farmer. One who cultivates enough for his family maintenance but with little surplus for sale to provide for other family needs.

Traditional agriculture: The art of cultivating the soil, producing crops, and raising livestock as the forefathers did without any change in practices. Schultz (1964) describes the practice as one where the state of the art remains constant.

Assumptions

The problems of the smallholder farmer in food crop production expansion and marketing and his reluctance to adopt new farm practices that were recommended to him for higher crop yields gave rise to the following assumptions:

1. Given adequate and relevant information regarding costs and returns on different farm practices, the smallholder farmer would be able to make better decisions on the use of improved farm practices to expand crop production.
2. The high production and marketing costs and low farm prices would have an adverse effect on incentive to produce more than the family maintenance.
3. The absence of adequate marketing channels and information for the smallholder would limit the use of new farm technologies.
4. Low levels of farmer education and lack of skills in the use of new technologies would limit smallholder production activities.
5. The more farmers belonged to farm organizations, the more they would be able to gather farm information, as well as have input on farm policy that affects their operations.

Limitations

1. The study was limited to the major "staple food crops" production and marketing problems of the smallholder

farmer, with special emphasis on cassava production in Imo State.

2. The degree of smallholder cooperation in responding to the questionnaires and personal interviews, the interviewers' comments, and the author's personal experience in the field were vital in the analysis and interpretation of data for the study.
3. The sample representing smallholder farms was limited to the population of smallholder farmers who were subsisting by cultivating small land holdings in the African context and not large-scale farmers.
4. The concepts used were limited to those found in agricultural economics and educational research literature.

Preview of the Study

This chapter has surveyed the problems of Nigerian food needs and the traditional systems of production, the production problems faced by smallholder farmers, the purpose of the study, and the objectives and merits of those objectives.

Chapter II describes in some detail the characteristics of the study area in Imo State of Nigeria in relation to problems of food crop production and marketing.

Chapter III looks at related studies on small farm production problems, as well as the different approaches used in those studies.

Chapter IV describes procedures for estimating the potentials of proposed farming improvements, techniques for analysis, sources of data, and method of collection.

Chapter V presents the enterprise and partial budget analyses results on methods for enterprise selection and assessment of the feasibility of replacing old practices with the new. The limitations for production and marketing are also discussed.

Chapter VI discusses the suggestions for educational programs to promote better farming practices--what programs are necessary, for whom, and when and where to provide the programs. The existing local and divisional resources, added educational components, and strategies for educational programs are discussed.

Chapter VII summarizes, concludes, and suggests the implications for the study results for smallholder, change-agent, policy-maker, researcher, and other LDC's.

CHAPTER II

DESCRIPTION OF IMO STATE AND FOOD CROP PRODUCTION SITUATION

Introduction

It is believed that the reader would benefit from a descriptive background of agriculture in Eastern Nigeria and in the state of Imo. This chapter presents a brief description of physical features and farming conditions in Imo State.

Imo State is one of the four states carved out of the former Eastern Nigeria (Anmbra, Imo, Southeast, and River States). Eastern Nigeria covers an area of 76,353 square kilometers, with a population of 12,394,463 according to the 1963 national census. This region is one of the most densely populated regions in Nigeria, as well as in Africa as a whole. It has about 124-451 persons per square kilometer. The region extends from latitude 4°15' north to 7°15' north and from 5°32' east to 9°16' east latitude in the humid region of tropical Africa.[1]

Imo State is identified with the former provinces of Owerri and Umuahia and consists of Aba, Bende, Okigwi, and Orlu Divisions, plus Afikpo Division.

Imo, with an area of about 12,689 square kilometers, had a population of 3,658,125 based on the 1963 census.[2] The state lies between

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[1]Barry Floyd. Eastern Nigeria: A Geographical Review. New York: Frederick A. Praeger Publishers, 1969.

[2]Imo State Government. Introducing Imo State. Aba: Cynako International Press Ltd., 1977.

the coastal plains and the northern highlands of the Nsukka-Udi Plateau, in Anambra State.

Soils

The soil types range from the pale-brown loam soils of the Niger delta to the deep porous red soils and the sandy deposits of the lowland areas of Aba and Umuahia. These are the acid sands, with naturally low fertility. The minerals consist of quartz, ion oxides, and kaolin. Very few rivers originate within the flat plains because of their high permeable strata.

Climate

The whole Eastern Nigerian region experiences high temperature during the entire year. Mean temperature is between 25°C and 29°C. The hottest months are February and March. July, August, and September are the coolest months of the year. A short dry spell is experienced in the month of August. While the high temperature allows for all year-round plant growth, the lack of all year soil moisture, due to runoffs, is responsible for the seasonal pattern of cropping and its irrigation problems. Runoffs, high evaporation, and transpiration prevent underground water formation which could be tapped for dry land farming.

Vegetation

The original tropical forest cover has given place to the cleared bush of the southern areas of Aba, Owerri, and Umuahia and the derived savannah of Okigwi, Orlu, and Afikpo. The original forest vegetation that is still noticeable is the area covered by the wild oil palm trees. However, the undercover has lost its natural vegetation through cultivation.

Farming Systems

The traditional farming system is referred to as the "slash and burn" agriculture (Okogbo, 1976:158). The system involves the clearing of the underbrush and setting it on fire before planting. Crops are grown without deep cultivation of the soil. Within this cropping pattern are shifting cultivation and attendant mixed cropping.

Shifting cultivation. Shifting cultivation involves the rotation of cropping land as against crop rotation. A plot of farm land is cropped for a year or two and allowed to fallow for three to five or more years before the land is returned to cropping. The practice is the traditional way of regenerating soil fertility.

Other factors, such as the source of building materials and household sources of energy, are never mentioned in the literature of traditional farming systems but are important in deciding the length of fallow period. Through selective destruction of trees on the farmlands and by allowing for a long fallow period, the farmer maintains a continuous supply of stakes and firewood for his household energy. Building construction is done mostly with wood stakes cut from the regenerated trees or bush fallows. The practice is by design and not by accident that the farmer preserves his source of energy and building material when he cannot afford modern building materials and energy. Figure 1 shows the traditional systems of cultivation in Eastern Nigeria.

Mixed cropping. Mixed cropping goes with shifting cultivation. The farmer wants to get all he can from his small farm holding within one cropping season. He plants more than one crop on the same plot the

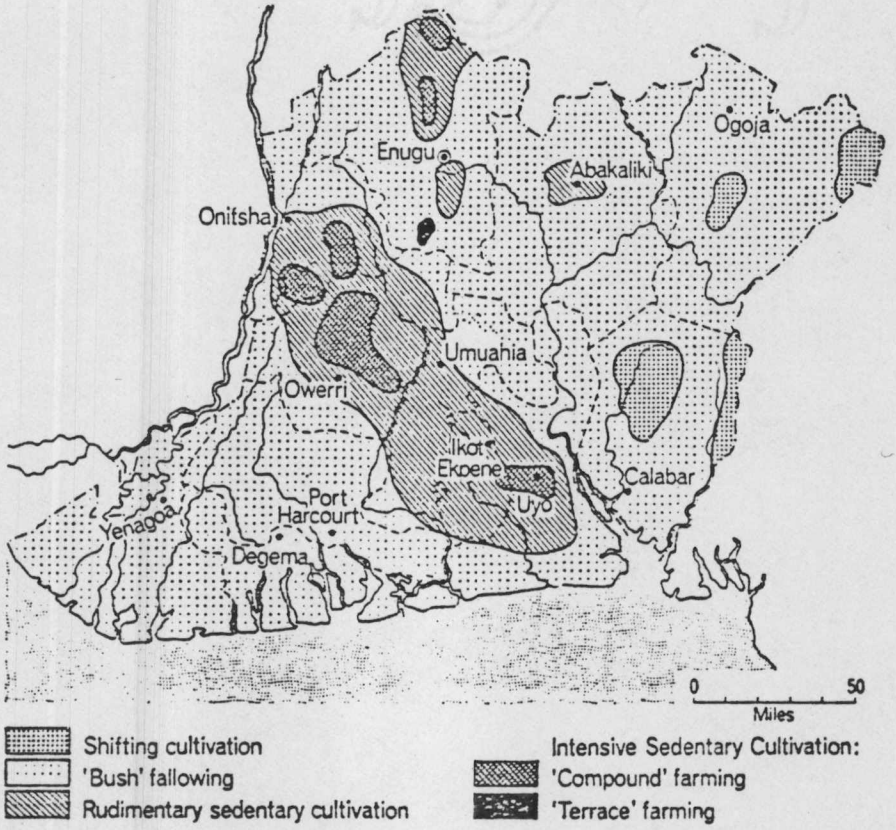

Figure 1. Traditional Systems of Cultivation in Eastern Nigeria.

Source: Barry Floyd. Eastern Nigeria: A Geographical Review. New York: Frederick A. Praeger Publishers, 1969, p. 173.

same season. Crops of cassaya, yams, cocoyams, maize, and vegetables could be mixed-planted, depending on the type of soil. Plantains and bananas may be planted on the same plot as annuals.

The smallholder farmer grows these crops on either flat soil (shallow tilled), mounds, or ridges. Mounds are used more in areas that have a high water table or are waterlogged, especially in clay soils. However, availability of labor, financing, and ease of carrying out farm operations determine which planting practices a farmer adopts in any year. Planting on flats is practiced by most farmers in the State.

Figure 2 shows the different crop combinations that are common in Eastern Nigeria. It is usual to find such major crop combinations as yams/maize/cassava, cassava/maize, and cassava/cocoyams/maize. Any of these combinations would include various vegetables and beans. The decision to adopt any of the crop combinations depends on the nature of the soil fertility, the family's year-round food needs, and cash requirements for daily maintenance.

Crops Grown

The major food crops grown are yams, cocoyams, cassava, and maize.

Yams (Dioscorea sp.). There are several species of yams grown in the area, but D. rutndata, D. cayanesis, D. alata, D. dumentorum, and D. eculenta are the most common. Of all the root crops grown, yams are considered a highly prestigious food. They are very expensive as a food item, and their growing cost continues to increase yearly.

Yams require good and fertile soil. They do well in sandstones and well-drained, loamy soil. Yams could be grown on flat soils, mounds,

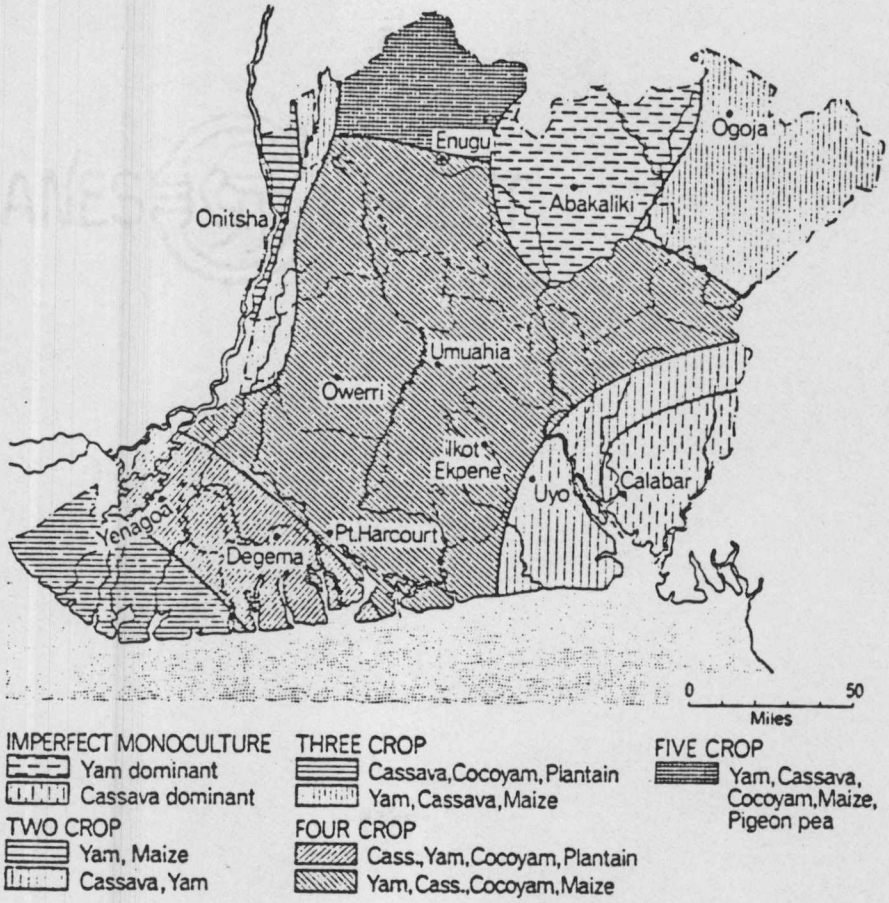

Figure 2. Crop Combinations in Eastern Nigeria (After Uzozie).

Source: Barry Floyd. Eastern Nigeria: A Geographical Review. New York: Frederick A. Praeger Publishers, 1969, p. 187.

and ridges. However, labor demand for each practice varies, and yields are observed to differ.

Cocoyams. Cocoyams grown in the area are of the genera "Colcasia" and "Xanthosoma." The Xanthosoma sagittifolum and Colocasia esculentia are the major varieties and commonly grown and eaten in the region (Onochie and Nwana, 1979). Cocoyams do not require well-drained soil like the yams. While yams require good sunlight, cocoyams could thrive under the shade. They grow well under oil palm and cocoa trees. Labor requirements for cocoyam cultivation are lower than for yams because of lower maintenance after planting.

Cassava (Manihot esculenta). Cassava is one of the root crops grown in the region, both as a mono-crop and in mixture. Unlike yams, cassava adapts to different soil types and fertility levels. It could be grown all year round, provided there is some soil moisture at the planting time for the "stem cuttings" to sprout and root firmly in the soil.

The farmer grows cassava because of its low labor requirements and drought resistant characteristics. Cassava roots could remain unharvested for 24 months without losing much of their food qualities. As a famine crop, it is harvested when desired.

Maize. Maize grows well in the region, especially on the lateritic and loamy soils. However, maize cultivation is not carried out on as large a scale as with cassava and cocoyams. Some of the maize varieties grown are the "local white" (Okpontu), yellow maize, and E.S.I. supplied by the Ministry of Agriculture.

Maize competes with yams for soil nutrients. Even though maize can withstand drought, it requires good soil moisture and warmth for its early germination and growth. Two crops of maize could be grown in the Aba Division where the rainfall and soil moisture are adequate. However, only one crop is grown mainly in other areas of Imo State.

Compound farming. Compound farming is another practice that the smallholder farmer adopts to provide additional food for the family. This practice is more than the usual "backyard gardening." The same crop combinations used in growing food crops in long-distance farmland are adopted. Compound farms are intensively cropped under mixture. Soil fertility is maintained by utilizing household refuse, livestock manure, and poultry droppings. The soil is usually treated with wood ash.

Labor Requirements

The family farms in Imo are small in size. The area cropped each year ranges from 0.2-5.0 hectares. Farm operations are carried out mainly by the family labor--head of the family, wife, and children. Hired labor, as well as communal labor, supplements family labor when the task involved in certain operations is more than the family can accomplish within a given period.

During the peak period of land preparation--bush clearing, weeding, and harvesting--labor is usually scarce. This is contrary to what advocates of African surplus labor theory would expect. While migrant labor may be available, the cost to hire may be excessive--from ₦3.0-₦6.0 ($5.25-$10.50) per day, excluding the customary feeding costs.

It should be understood that in the Nigerian context, there is a division of labor in farming enterprises. The women play a major, if not the greatest, role in food production. The men are mainly involved in the initial land preparation; thereafter, the women take over control of the crop management until harvest time.

Yam cultivation is the one crop that demands more men's labor. Cassava, cocoyams, maize, and other vegetable production are reserved for female labor. Children's labor is used part-time and during school holidays.

The seasonal nature of farming in Nigeria and the lack of major farming activities during the slack months of July, August, December, and January give the impression that family labor is not fully utilized or is idle. However, it should be noted that the small farmers are involved in harvesting and storing cocoyams, harvesting and processing the previous year's cassava crop. This is the period when oil palm harvesting and processing are at their peaks. The men, if not engaged in small trading business, use the slack period for preparing yam barns and house repairs.

Marketing the Food Crop

Marketing of the food crop is not done by "Marketing Boards," as with cash crops of cocoa, oil palm produce, and rubber. Food crop marketing is the concern of the smallholder farmer, the middleman, and their agents. While rice production and marketing could be organized by farmers' cooperatives, smallholder root crop producers depend upon the middleman, who sells inputs to them and buys their farm products. More often, the purchase of farm produce is tied to farm credit

arrangements with the middlemen. This type of arrangement is used also in marketing cash crops.

The result of such marketing arrangements is the loss of farm earnings by the smallholder-producers who have little or no information about what can be obtained in the city markets. On the other hand, the poor farmers are protected from the high costs of marketing their crops due to poor transportation and communication.

Transportation Facilities

Smallholder farming is carried out in the remote and rural areas of the country. Road transportation facilities are poor and inadequate. Consequently, only the wealthy middlemen and their agents can penetrate and carry out business with the small farmers. The middlemen render useful services to the smallholder farmers, even though they dictate the prices they pay for farm produce.

Farm Credit Availability

The smallholders in Imo rely on friends, the thrift and loan society (Isusu), and their own resources for financing their major farm operations. Commercial banks and the Nigerian Agricultural Development Banks have continued to discriminate against the smallholder farmers in granting farm loans.

For the smallholder to obtain small loans from the thrift and load society at an interest rate of five percent, he has to be a member or he has to have a relative who takes the responsibility for obtaining the load on his behalf. While cash crop producers may decide to get loans at any price, smallholder food crop producers cannot and would not

want to risk their family possessions for any loans on account of expanding their food production for cash income.

Land Tenure System

The land tenure in Imo State, and in Eastern Nigeria in general, is unique. In principle, all lands belong to the community. Individuals hold their land rights on the approval of the family and the community in which they belong. The community has the first right to decide on the use of any lands irrespective of any individual's land holdings. Transfer of ownership by outright sale is considered immoral, even though some of these mores are dying out. Families and individuals could sell portions of their lands to relatives and neighbors, but not to aliens.

Land Transfer

The common ways of temporary land transfer are by pledging (mortgaging) and land renting. A landlord could transfer his land to a neighbor for a determined sum of money by pledging his piece of land. The mortgagee can continue to cultivate the land until the mortgagor redeems his land by paying back the money owed or borrowed.

Two conditions for the arrangement are that the mortgagee cannot plant any permanent crops on the land, and the mortgagor may not redeem the land the same season or year the land is due for cultivation. The amount owed could be paid back, but the mortgagee has the right to cultivate the land that particular year. The only alternative to this arrangement is for the mortgagor to pay equivalent rental fees to the mortgagee if he desires to cultivate the land the same year.

Annual land renting is commonly practiced. It is another way smallholder farmers could increase their farmland for growing food crops. The rental fees vary within different areas of the state. The densely populated areas of Owerri, Orlu, and Umuahia Divisions have high rental fees because of land scarcity. It is usual for good fertile land to rent for about ₦160 ($280.00) per hectare.

Land Fragmentation

Land fragmentation is an outcrop of the land tenure system. Every adult male in a family has a right over his father's portion of the community land holdings. In addition, each adult male's share of the family land must comprise the different pieces of fertile lands which are located at various farming sites. This type of equity in land distribution gives rise to the land fragmentation and its problems. Thus, a farmer may own one to five hectares of farmlands, but they are scattered in different sites.

CHAPTER III

LITERATURE REVIEW

Theoretical Base of Enterprise Choice

Economic principles of production attribute some of the problems of low income to factors that are beyond the control of the producers, such as natural elements, government policies, and marketing methods. Yet, other factors could be controlled by the producer--the efficiency of resource allocation, crop selection, methods of production, and marketing strategies (Rae, 1977:1-3).

The producer employs his resources to the extent that each unit of resources earns the greatest return (the principle of comparative advantage). Whether to concentrate on the production of one crop (specialization) or produce more than one crop (diversification) is a judgment which the producer makes based on the limitations of his resources and expected returns. Enterprises may be supplementary, in which case they do not compete for resources. They could be complementary, in the sense that one supports the other and contributes to farm income.

The smallholder farmer using traditional agricultural practices in his crop production mix needs information on the relative prices of the farm crops to be able to choose the most profitable crop combinations and improved farm practices. He needs to calculate the returns to most limited resources based on the enterprise or crop combinations selected. Can he do this?

The problem of the smallholder farmer in LDC's is the ability to understand and use these complex economic principles of crop selection and production. The principles must be translated in a pragmatic way that could be used by the farmer and his change-agents. The farmer's response to food crop production expansion may depend on how well the facts of the production principles are associated with his known farming practices and goals. The goals may include obtaining income, independence, and a sense of meaningful social belonging.

Many studies about the factors responsible for the lack of supply response in food production highlight the smallholder's lower level of aspiration and strong reliance on fate and the lack of deferred gratification. Rogers's observations of Mexican village farmers supports the view held by some social scientists that traditional farmers are not economic men (Rogers, 1969:19-60). Farmers in at least some places are observed not to have venturing spirits and, therefore, do not hope for future gains.

On the contrary, smallholder farmers have been known to be rational in their farm decision-making based on the available information and known profitable alternative enterprises (Okurume, 1973:92-93; Krauz, 1974:14-16; and Idusogie and Oauyede, 1973:23). However, these farmers are poor and do not have any need for long-term investment gains. If returns to their short-term investment is low, there can be no incentive for the farmers to acquire credit for additional food crop production (Schultz, 1965:17).

Price disparity between village markets and long distance markets in the former Eastern Nigeria was found to constitute disincentives to

increased production. Poor roads and lack of public transport to the rural farm plots were also cited as responsible for the conservative way farmers behaved in the use of improved farm practices (Smock, 1966: 10-13).

A study of peasant rice farmers in Thailand showed that these farmers took into consideration their expected yields per unit area planted and the expected prices per unit output in deciding whether to increase the area planted (Behrman, 1966:182-187; 1968b:155-158). The results of the study point to the fact that smallholder farmers would act only when they are satisfied with the outcome of the new practices they are supposed to adopt.

For the smallholder farmer to improve his techniques and expand his range of production activities, he needs a meaningful incentive structure; he needs to be informed on new and profitable crops and potential local markets (Forster, 1965:159; Schultz, 1965:17; and Roumasset, 1979:48-67). Such information is part of the smallholder agricultural education. It helps to fill the gap in farmers' managerial skills, which is one of the missing factors in agricultural production of the farmers in developing nations (Schultz, 1978:25).

Others obstacles mentioned for increased food production were the difficulties of translating new technologies into farming systems which are economically attractive and socially acceptable to the farmer (Martin, 1974:17-19). Even if the new ideas acceptable to the farmers are found, the problem of setting up marketing information systems that are conducive to effective and efficient farm operation remains to be solved. The absence of such infrastructural support systems and a

discriminatory credit system have been found to be dominant constraints in food production in the eastern region of Nigeria (Awa, 1980:14).

A study of dairy farmers in California showed that these farmers' productivity was affected by the different amount of relevant information they received (Muller, 1974:730-738). Farmers' education, age, and current information on enterprises facilitate enterprise selection for Indian farmers (Muller and Shapiro, 1977:293-310). If a farmer is able to analyze the situation to determine why his yields are low, he will be in a better situation to go to the extension agents to get additional information for any practices that would improve his yields (Herbst, 1980:3).

In a developed agriculture, the high percentage of fixed costs motivates a farmer to strive for higher production in order to distribute these costs over more units of products. The smallholder farmer owns little fixed costs. The hoes and machetes are the only form of fixed capital which have other uses than farming. Therefore, there is no incentive to acquire additional knowledge which is costly and does not appear to be worth the effort of the smallholder.

Information on cultural farm practices, crop varieties produced in any traditional system, and the level of management available have bearing on the possibilities of helping farmers increase their yields. The pioneering study on mixed versus sole farming in three Zaria villages in Northern Nigeria (Norman, 1974:3-21) was an effort to gather valuable information that could help farmers and change-agents make rational decisions. The findings showed that returns from mixed cropping were higher than returns from sole cropping, even though yields from sole

cropping were higher. If the results are translated and communicated to the farmers at their level, it could improve their farming information and knowledge and help change their enterprise selection behavior.

A progressive economy places priority on information and information processing and dissemination to its farmers (Finis, 1978:269-277). Levels of farmers' education and the farm size are related to information-gathering and level of production. Finis sees this as an important factor in deciding what could be done to help the smallholder in his role in economic development of an economy dependent on agriculture as the engine of growth.

Economists content that in addition to literacy rates, per capita income, the acquisition of agricultural knowledge, and the involvement of small farmers in project implementation were important for project success (Morss, Katch, and Sweet, 1976:90). On the other hand, they contend that subsidized inputs, the provision of social services, and farm size have negative association with small farmer resource commitment. This finding by Morss was congruent with the situation in Imo. Despite years of extension services and continued subsidized fertilizers and improved seeds, farmers have not commercialized cassava production.

The Role of Education in Farm Decision-Making

The conventional economic theory that assumes that farmers have accurate knowledge of their production function (input-output) does not apply in a backward economy. Their knowledge about the range of potential techniques is inaccurate (Leibenstein, 1965:54-60). In support of this view, other social scientists (Huffman, 1974:85-97; and Rogers, 1962:172-1972) have contended that smallholder farmers need additional

information for better understanding of their enterprise operations. They emphasized the importance of educational level of the farmer in allocative efficiency and scale economies that exist in utilizing information.

Not only are the education and information level of the farmer considered vital for production expansion, but also the education of those indirectly serving the farmers, such as businessmen and manufacturers who buy and sell inputs to the farmers, and the education of agricultural policy makers in any society (Wharton, Jr., 1965:202-204). While smallholder participation in decision-making is essential for project success, studies suggest that overall smallholder action would be greater if there is an effective two-way information system between farmer and change-agent, if the small farmer participates in groups, and if the information provided by change-agents is crop-specific rather than general (Morss, Katch, and Sweet, 1976:41).

These findings support the need for investigating specific potentials of new technologies to the smallholder crop production efforts, determining means through which smallholder farmer and change-agent could communicate ideas, identify problems, and find common solutions.

Cassava Production and Demand Studies

Research on the demand and production of root crops, particularly cassava, in Trinidad showed that income and satisfactory prices for the crop depended on the extent and level of demand. The demand was directly affected by the consumer preferences and indirectly by limited methods of preparation, marketing, product quality, and high wastage in preparation (Allexander, 1969:45-56). Allexander contended that to

improve demand in areas where plantains, bananas, and rice are consumed, it is important to develop improved ways of using starchy roots. Smallholders in Imo produce such substitute crops and could have the same demand problems.

The demand for cassava as a human food, as an animal feed ingredient, and for industrial purposes has increased. A survey showed that the demand for cassava products in European Economic Community (EEC) countries could increase in the 1980's (Phillips, 1973:14). Therefore, emphasis needs to be placed on production and processing of cassava.

The results of cassava research conducted at the University of Georgia (Athens, Georgia) indicated that limited agronomic technology and market instability were the major factors restricting cassava production. Other factors, such as high price of chemicals, machinery, and other capital items and poor processing technology, impeded output levels (Hendershott, 1979:255).

In cassava production, there is the simultaneous pressure of subsistence and semi-commercial decisions. This dichotomy introduces discontinuity into prices, which is responsible for added rigidity in the production pattern (Mellor, 1966:196-212). In Imo State, this dichotomy in cassava production is the main practice and, as such, may affect cassava production and price patterns.

CHAPTER IV

PROCEDURES FOR ESTIMATING THE POTENTIALS OF PROPOSED FARMING IMPROVEMENTS

Introduction

The general procedure of this portion of the research was to utilize a simple analytical tool--farm budgeting--to accomplish the main purposes of this study, which were:

1. To improve the effectiveness of smallholder decision-making in food crop production and marketing, and
2. To help local people, themselves, to gather relevant information and use budgets for assessing the alternatives available to them.

Such a tool must be understood by both parties.

Agricultural business, like any other enterprise, requires constant measurement. Such business measurements involve records or bookkeeping. Most smallholder farmers in Nigeria do not keep farm records. Despite this shortcoming, one can still learn more about the smallholder's business activities by asking the right questions (Stanton, 1977:1).

Analytical Approaches

Some of the techniques that researchers use in appraising smallholder crop production problems are linear programming (LP), production function, regression, and budgeting analyses. For this study, "enterprise" and "partial" budget analyses were used for appraisal of viable

production possibilities. Descriptive statistics were used in identifying constraints in land, labor, and capital that needed to be taken into account in the budgeting process and educational programs.

Budgeting is defined as a detailed statement of expected costs and returns from proposed changed in resource use over a given time period. For this study, the changes were the shifts from non-use to the use of fertilizers, pesticides, and improved planting materials for food crop production. In addition, the contemplated changes from planting on flats or mounds to planting crops on ridges were considered.

Budget analysis is useful for assessing the profitability and feasibility of changes in farm practices. It provides information on crop production costs and returns that guide a farmer in choosing the type of crops and farm practices to adopt in his production activities.

The technique is handy, simple, flexible, and generally used for crop production analysis (Heady and Johnson, 1965:67-81; James and Stoneberg, 1979:145; and Hardaker, 1975:20). For group or individual educational approaches in agricultural extension, budgeting analysis is the method often used in educating farmers on how to assess proposed changes on farm business (Upton, 1973:269).

Complete budget. A complete budget is necessary when comparing or estimating the financial implications of major changes in a whole farm system. In this respect, total input costs and total output prices and revenues are calculated. To determine long-range financial effect on farm operations, the differences between total costs and revenues are found. Decisions are then made based on these results and other facts.

Partial budget. On the other hand, a partial budget is a time-saving approach for estimating the financial effects of proposed changes that affect only part of a farm system. That is, marginal increases or decreases in net farm income resulting from the planned changes are considered (Rae, 1977:109 and Brown, 1979:25).

A partial budget is used when a farmer wants to try new technologies such as fertilizers, pesticides, improved cassava cuttings, or corn seeds in his crop enterprises. A partial budget is also used when a farmer wants to know the extra costs and extra returns which are involved when the new inputs and practices are introduced. A farmer may wish to find out the reduction in present costs and increases in income which will result from, for example, the substitution of new varieties of cassava for the old and for planting on ridges instead of planting on flats and mounds. The models of this study made use of partial budgeting.

Partial budget and linear programming could be used to arrive at the same maximum profit solution, but there would be no guarantee that the maximum profit solution has been obtained when partial analysis are used. Several partial budgets have to be calculated and compared for maximum profit. On the other hand, linear programming would provide the maximum profits after necessary iterations.[1]

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[1]Linear programming as a mathematical tool for selecting the "best" alternative enterprise could be used for this study but is rather complex for the less educated farmer and change-agent to understand and use. The linear programming technique examines "total" rather than "partial" effects on enterprise selection, which was more important for this study. Partial budgets need information only about the costs and returns that change. Fixed costs and enterprises not affected do not need estimation.

Data Processing

The processing of survey data was carried out with a hand calculator. The data analyses centered around: 1) descriptive tabulation of survey results, and 2) budgeted estimates of likely impacts of changes in cassava systems on representative smallholder production and income.

Partial Budget Model[2]

To evaluate the net increases and decreases in income from proposed changes and from traditional to new technological packages for expanding crop production, there was the need to calculate:

1. ΔTR_N = additional revenue from sale to output through use of new techniques.
2. ΔTR_T = revenue foregone due to the use of traditional technology.
3. ΔTVC_N = additional variable costs that have to be incurred due to the replacement of new technology.
4. ΔTVC_T = traditional variable costs that have to be incurred for the marginal crops.

The partial budget equation which gives the net benefit of the proposed change from traditional to new technology is:

$$\begin{aligned}\text{Partial Budget} &= (\text{additional revenue} + \text{foregone costs}) \\ &\quad - (\text{additional costs} + \text{foregone revenues}) \\ &= (\Delta TR_N + \Delta TVC_T) - (\Delta TVC_N + \Delta TR_T).\end{aligned}$$

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[2]Adapted from Allen H. Rae. Crop Production Economics, London: Crosby Lockwood Staples, 1977, p. 119.

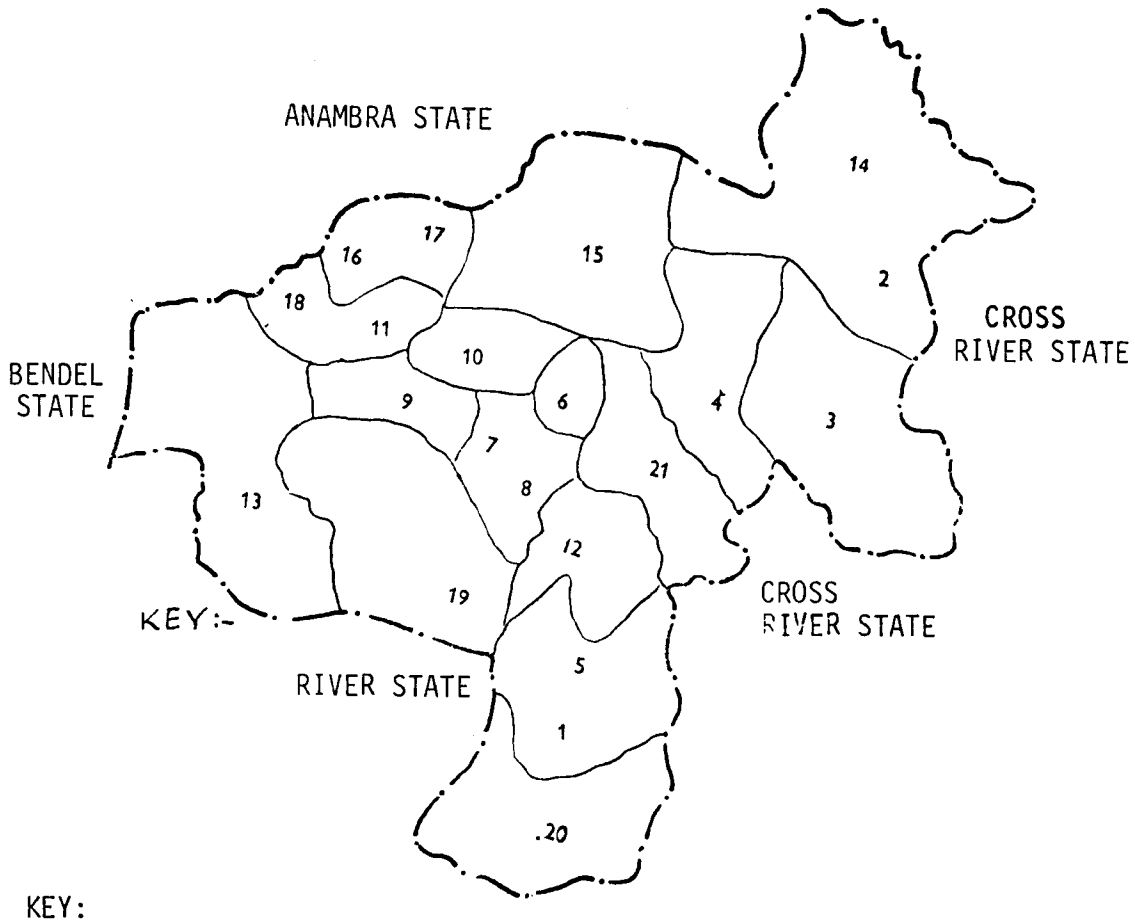
Source of Data and Method of Collection

To accomplish the set objectives of this study, two approaches--the case study and representative farm approaches--were open for use.

In a case study approach, a single farm is selected to represent a population of farms for a detailed investigation. The situation of an actual farm is used as an analytical base. Generalization of results is usually limited, since the farm selected may not be typical in all aspects. Moreover, the case study approach requires consistent and reliable record-keeping from selected smallholder farm units, under close study. Such farm units were not available and could not be set up for the study.

The representative farm approach involves a study of a number of sample farms' data as a basis for defining a composite situation. Ideally, the representative farm approach assumes homogeneity of variables such as farm size, capital, labor, soil type, topography, and climate for the farm units and areas of study. The definitions and classifications of such major resources for use in the analysis presented problems of specification and aggregation. These problems limit the usefulness in assessing smallholder farm resource use in improving traditional farming practices of crop production. Despite these apparent problems, it was possible to adopt the representative farm approach in data collection and analysis of smallholder crop production.

Data sources. The population for the study was the smallholder farmers in four local government areas of Aba, Isialangwa, Obioma Ngwa, and Ukwa in Imo State, as shown in Figure 3. Much of the cassava, yam, and maize is produced in these areas. Supplementary data were collected



KEY:

1.	Aba	8.	Umunnato	15.	Isuikwuato/Okigwe
2.	Afikpo	9.	Mbaitoli/Ikeduru	16.	Orlu
3.	Arochukwu/Ohafia	10.	Mbano	17.	Ide-ato
4.	Bende	11.	Nkwerre/Isu	18.	Oru
5.	Obioma Ngwa	12.	Isialangwa	19.	Owerri
6.	Etiti	13.	Ohaji/Egbema/Oguta	20.	Ukwa
7.	Ahiara/Ekwereazu	14.	Ohaozara	21.	Ikwuano/Umuahia

Figure 3. Local Government Areas in Imo State.

Source: Imo State Government. Introducing Imo State. Aba: Cynako International Press Limited, 1977, p. 7.

from the National Accelerated Food Production Project (NAFPP) and the National Root Crop Institute, Umudike.[3]

Sampling method. The 115 farms surveyed were selected from a population of smallholder farms through simple random sampling. The villages in each of the four local government areas were randomly selected, and the 115 farms were also randomly selected to represent the farmers in each area. After the farms were selected, it was necessary to replace any farmers who proved uncooperative in the survey. In making such replacements, interviewing officers used their judgment. This process was necessary because the collection of reliable data required repeated visits with willing farmers by the officers responsible for the interviews. Only such cooperating farmers would be willing to give information on their farming activities.

Method of collection. The data for this study were collected through questionnaires and personal interviews of smallholder farmers in the four local government areas. The combined approaches were to ensure accurate information gathering from farmers who did not keep records but depended on personal memory and recollection.

The officers who carried out the survey had previous training and experience in the Ministry of Agriculture's farm surveys. The officers had lived and worked in the local government areas they surveyed.

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[3]The National Accelerated Food Production Project was a creation of the federal government of Nigeria to coordinate the "Operation Feed the Nation Compaign." The division is responsible for demonstrating and supplying improved technologies to the farmers in all the states of Nigeria.

From the officers' knowledge of the farmers and the cropping systems in the area, they were able to make relevant and constructive comments on farmers' responses to the questionnaires and others' observations vital for the study.

The instrument used as shown in Appendix A was developed by the author. The instrument was pretested in Aba, Imo State and further modified in the final data collection.

Farm size. The determination of farm size and the area planted was rather difficult. However, the agricultural officers were able to estimate the land holdings and calculated area planted, using land chains. The farmers, although not highly educated, were knowledgeable about their farm plots. They described their farm plots by the traditional measure, "oji."[4] Any farmer knew the number of his farm plots and how many "ojis" they consisted of. The traditional land measure may appear crude, but it was useful in making good estimates of farm holdings and the areas when the sophisticated aerial and land survey methods were not feasible.

Yield data. To collect yield data from any farm, it was necessary to mark out one-tenth of an acre (0.04 hectare) of the crop planted area before harvest. The area was then harvested and yield recorded. The procedure was necessary if cassava yields were to be determined when the farmers had not started their indiscriminate harvesting.

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[4]"Oji" is the "Igbo" traditional unit of land measure. One oji is about one-eighth of an acre, or 0.05 hectare.

Farm input-output prices. The prices of fertilizers, pesticides, seeds, and cassava cuttings supplied by the Ministry of Agriculture did not vary during the survey period. Product prices were taken from the weekly and monthly summary of village market prices collected by the Ministry of Agriculture in Imo State in 1980.

Labor rates used were the average of what the farmers paid in 1980. The rate varied from ₦3-₦5 ($5.25-$8.75) per diem inclusive of free meals. The official government labor wage of ₦2.40 per diem does not represent what the farmer paid in hiring labor for his farm operations.

The same labor rate of ₦4 was used for both male and female labor. Child labor, when used, was paid half the adult rate--₦2.

Available labor. For most of the farm operations, family labor was used. Hired labor was necessary for some farmers at the peak preparatory and planting operations in the months of January to May. Hired labor was also used by some farmers in yam harvesting and transporting. These operations could not have been completed on time without hired labor, especially for more-than-average farms.

Labor unit measure. Most research uses labor-hours instead of man-days (M/D) in measuring costs of operation. This system of labor measures may be appropriate with a unit farm approach study. Even though traditional subsistence farmers work more than eight hours a day at certain seasons and operations, measuring costs on an hourly basis would still be misleading in small farm enterprise analysis. Man-days were used throughout the study in farm budgeting analysis to prevent the possible distortions.

Conceptualization of Model for Gauging Income: Effect of Proposed Farming Changes

Figure 4 presents the processes for assessing feasibility of acceptable crop enterprise mixes and practices; identification of obstacles preventing adoption of improved practices; and needed educational programs to improve smallholder skills and information-gathering and analysis. The first stage involved the collection of economic and biological data for analysis. Economic data included the traditional farm practices for growing food crops--planting on flats, mounds, and ridges. Data on farm resources--land, labor, and capital--were also collected. Biological data used for the model were new technologies or improved seeds and planting materials, fertilizers and plant protection chemicals, and their appropriate rates used for different crops' production.

In the second stage of the process, the data which were collected were passed through enterprise and partial budget analyses. The data were the inputs used in calculating both the gross profits and marginal increases or decreases in profits resulting from proposed changes (outputs).

During stage three, the results of the partial budget analysis were used in identifying obstacles that prevent the smallholder from using improved technologies for increasing food production and income. The short- and long-term implications of the results of the changes made and any future changes in farm resources, prices of inputs, and outputs were evaluated. The result of the evaluation formed the basis for farm advising and educational programs.

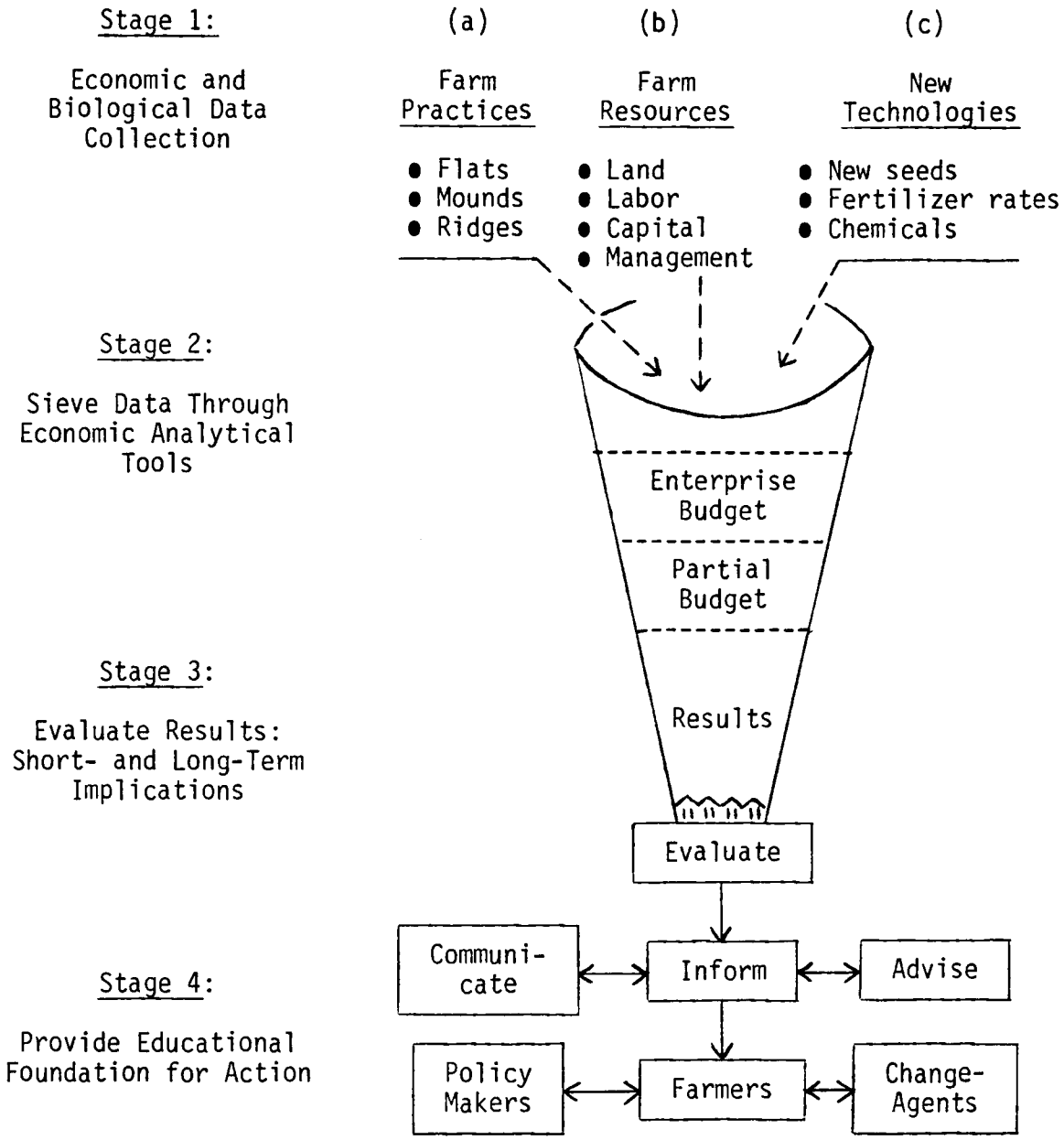

Figure 4. Conceptualization of Study Model for Gauging Income Effects of Proposed Farming Changes.

At stage four of the analysis, the findings were used in suggesting educational programs for the farmers, youths, agricultural agents, and non-agricultural agents serving the farmers.

Why Enterprise and Partial Budgets

Enterprise budget analysis. Enterprise budgeting is a listing of estimated costs and returns of any farm enterprise (Kay, 1981:61). Enterprise budgeting provides the basis for deciding on which enterprise to add, expand, or eliminate, based on estimated enterprise profits (Brown, 1979:6,25). Such estimated profits may be misleading, because any changes in the level of any inputs would change the input price, the expected output, and, therefore, expected returns. Moreover, the inclusion of all input costs--owned and hired--plus the opportunity costs of working capital may result in wrong decision-making. A wrong enterprise may be eliminated or added as a result of miscalculation and misinterpretation of results. Variable costs and not fixed costs are the basis for farm business decision-making.

Enterprise budgeting, however, formed the basis for developing partial budgets of this study. It provided the necessary input-output coefficients for calculating the partial budgets for the crop enterprise mixes and the different farm practices.

Partial budget analysis. Partial budgeting was explained above as useful for determining whether small changes in the existing farm practices under various enterprise mixes would be profitable. Partial budgeting differs from enterprise budgeting in that several enterprises could be considered in any proposed changes (Kay, 1981:68). Also, for

partial budgeting, only the added costs and added returns, as well as reduced costs and reduced returns, were calculated in arriving at net increases or decreases in farm income.

The partial budget analyses of this study were made in the context of whole farms representive of smallholder farm holdings, labor, capital, and management ability. Two representative farm holdings--a one-hectare and a 0.2-hectare holding--were used in the partial analyses.

CHAPTER V

FEASIBLE AND ACCEPTABLE FARMING CHANGES

Introduction

Farm planning techniques which are meant to answer questions on feasibility and acceptability of certain crop enterprises and technologies need to consider, among other things, economic profitability, agronomic conditions, social values, risks, technical capacity, and markets for farm output.

Economic gains. To assess the extent of economic gains of an enterprise, the data of farm operation and resources available to the farm family for its enterprise have to be evaluated pragmatically. The farmer may have certain constraints that could limit his operations and choice of gainful enterprises. Changes in the prices of inputs and outputs must be evaluated. Budgeting analysis brings these data together.

Agronomic feasibility. For the assessment of economic gains, there is the need to consider the agronomic feasibility of the farm project. The nature of the soil, climate, cropping patterns, or systems of the farm family must be given consideration in making any changes that are considered to increase farm profits. For instance, certain crops may do better in certain soils, climate, and under different planting systems.

Social values. Certain farming communities value certain crops, animals, and farm practices with some affection. For instance, white

maize may be preferred to yellow maize. White maize may taste better, but yellow maize may give higher yields. A farmer may prefer planting on flat soils to ridging, based on tradition. Social values rather than economic profitability alone become paramount in determining enterprise feasibility and acceptability.

Risk and uncertainty. While the models for this study were not geared to determine the degree of small farming risks, the illustration on social values of the farmer gave some indication that farmers avoid crop failure which jeopardizes family maintenance and security. Hence, the type of crop mixture and planting system employed in crop enterprises is vital in feasibility assessment. This study tried to utilize the existing situation in assessing impact of feasible changes in small farm enterprises.

Technological divergences. Effective adoption of new technology that is supposed to give higher yields than the traditional technology requires that the new be built upon the old. The model used in this study attempted to make minor changes on the old. Feasibility was assessed by applying new and improved technological packages on small farm enterprises and planting systems which may equally result in acceptability.

Characteristics of Farm Resources and Use

Farm size. The survey data of Table 2 showed that over 71 percent of the smallholder farms were less than one hectare in size. About 28 percent of the farms were between one and two hectares. Only 0.9 percent

TABLE 2

FARM SIZE: CROPLAND HARVESTED IN 1980
(n = 115)

Hectares Harvested	Number of Farms	Percent of Total	Cumulative Percent
<0.20	2	1.7	1.7
0.20-0.29	26	22.6	24.3
0.30-0.39	22	19.1	43.4
0.40-0.59	19	16.5	59.9
0.60-0.79	13	11.3	71.2
0.80-1.19	17	14.8	86.0
1.20-1.39	5	4.4	90.4
1.40-1.79	7	6.1	96.5
1.80-1.99	3	2.6	99.1
2.00+	1	0.9	100.0

Note: Mean = 0.61; mode = 0.25.

of the farms were two hectares and above. The mean for all farms (n = 115) was 0.61 hectare. The modal farm was 0.25 hectare.

Crop enterprise. The cropping pattern relative to the farm sizes as indicated in Table 3 showed that 64.4 percent of the farms were engaged in cassava/maize (CAM) enterprise, 24.3 percent in cassava/yam/maize (CAYAM), and 11.3 percent in cassava as a sole crop (CAS).

TABLE 3

FARM SIZE AND CROP ENTERPRISE MIX
(n = 115)

Crop Enterprise Mix	Farm Size Cultivated in Hectares										Total Farms	Percent of Total
	<0.20	0.20-0.29	0.30-0.39	0.40-0.49	0.50-0.79	0.80-1.19	1.20-1.39	1.40-1.79	1.80-1.99	2.0+		
CAM	2	16	12	15	7	11	4	5	2	0	74	64.4
CAYAM	0	7	4	4	3	6	0	2	1	1	28	24.3
CAS	0	2	6	1	3	0	1	0	0	0	13	11.3

Note: CAM = cassava/maize; CAYAM = cassava/yam/maize; CAS = cassava (sole).

Planting systems. The planting systems of Table 4 showed that 46 percent of the farms grow crops on flat soil, 29.6 percent on ridges, and 24.4 percent on mounds.

TABLE 4

FARMERS' PLANTING SYSTEMS IN 1980
(n = 115)

Planting Practices	Number of Farms	Percent of Total
Flat	53	46.0
Ridge	28	24.4
Mound	34	29.6

Small farm working capital. The distribution of small farm working capital varied in the areas studied. Table 5 shows that about four percent of the farms had less than ₦250; 23.5 percent had between ₦250 and ₦500; 63.4 percent had between ₦501 and ₦1000; and 13 percent of the farms had over ₦1000. The mean for all farms was ₦716, and the modal farm working capital was ₦625.

Sources of smallholder working capital. The survey showed that 35.7 percent of the smallholder farmers operated with their personal funds, 33.9 percent supplemented their personal funds with loans from thrift and loan societies, 14.8 percent borrowed money from friends,

TABLE 5

DISTRIBUTION OF SMALL FARM WORKING CAPITAL
(n = 115)

Range in (₦)	Number of Farms	Percent of Total	Cumulative Percent
<250	4	3.5	3.5
250-499	23	20.0	23.5
500-749	39	33.0	56.5
750-999	35	30.4	86.9
1000-1249	9	7.8	94.7
1250-1499	5	4.4	99.9
1500+	1	0.9	100.0

Note: Mean = ₦716; mode = ₦625

13.9 percent got loans from the Agricultural Bank, and about two percent borrowed from money lenders. Commercial banks were not sources for small farm working capital.

In general, as indicated in Table 6, about 84 percent of the smallholder working capital came from sources which do not require any form of collateral for loan services. Agricultural and Commercial banks required some form of conditions to be fulfilled and/or collateral to secure farm loans.

TABLE 6

SOURCES OF SMALL FARM WORKING CAPITAL
(n = 115)

Sources	Number of Farms	Percent of Total
Personal	41	35.7
Thrift and Loan Societies	39	33.9
Friends	17	14.8
Agricultural Banks	16	13.9
Money Lenders	2	1.6
Commercial Banks	0	0.0

Enterprise Budgets

Nine farm enterprise budgets were developed in this study as a factual basis for appraising the profitability of changes in cassava practices. Costs and returns were estimated for three crop enterprise mixes--cassava/maize (CAM), cassava/yam/maize (CAYAM), and cassava sole (CAS)--each with three cultivation techniques--planting on flat soils (flats), plants on mounds (mounds), and planting on ridges (ridges). Thus, a 3 x 3 configuration (nine separate techniques) was developed for feasibility analysis of the traditional and improved technologies.

Interest on borrowed capital was calculated for six months at eight percent per annum, on variable costs. It was assumed that the farmer used the borrowed money for short-period operations which he could not cover with his initial working capital.

Results of the enterprise budget. The enterprise budget of Table 7 measures the economic profit to be derived from one hectare of cassava/maize (CAM) enterprise under three alternative planting methods. The results of the enterprise budget showed that all three farm practices resulted in losses when traditional methods were used. Planting on mounds gave the highest enterprise loss of ₦458.4. Planting on ridges yielded the next highest loss of ₦410.7.

The highest cassava yield of 6.8 tons per hectare was obtained by planting the crop mixture on ridges. There was no difference in yield between cassava/maize mixture planted on flat soil and mounds.

Maize yields of 1.8 tons per hectare were highest when planted on flat soil rather than on mounds or ridges. However, maize yields were higher on mounds--1.45 tons--than on ridges.

The enterprise budget of Table 8 examined the extent of "pure" profit to be expected from replacing old practices with new technological packages of growing cassava/maize (CAM) under three planting practices--flat soil, mounds, and ridges. The results of the enterprise budget showed that there was a loss of ₦191.8 for growing CAM on mounds. There was a gain of ₦105.8 from growing the crops on ridges.

The highest cassava yield--17.6 tons per acre--was obtained from growing crops on ridges. Growing cassava on flat soil gave the next highest yield of 11.1 tons per hectare.

The maize yield of 2.93 tons per hectare obtained from ridges was the highest. The yields of 2.75 tons and 2.6 tons per hectare from planting on mounds and ridges were very close.

TABLE 7

ENTERPRISE BUDGET FOR ONE HECTARE OF CASSAVA/MAIZE USING TRADITIONAL METHODS

Item	Unit	₦ Price/ Unit	Alternative Planting Methods					
			Flat Soil		Mounds		Ridges	
			Number of Units	₦ Amount	Number of Units	₦ Amount	Number of Units	₦ Amount
Operations:								
Land Preparation	Man-days	4.0	43	172	43	172	43	172
Making Mounds	Man-days	4.0	-----	-----	40	160	-----	-----
Ridging	Man-days	4.0	-----	-----	-----	-----	50	200
Weeding	Man-days	4.0	20	80	20	80	30	120
Harvesting	Man-days	4.0	25	100	25	100	45	180
SUBTOTAL			133	552	178	712	218	892
Material:								
Cassava Cuttings	Bundles	1.0	32	32	30	30	32	32
Maize Seeds	Lbs	1.0	30	30	30	30	30	30
SUBTOTAL				62		62		62
Interest on Variable Cost, 8% for 6 Months				2.4		2.4		2.4
GRAND TOTAL				616.4		776.4		956.4

TABLE 7

(Continued)

Item	Unit	₦ Price/ Unit	Alternative Planting Methods					
			Flat Soil		Mounds		Ridges	
			Number of Units	₦ Amount	Number of Units	₦ Amount	Number of Units	₦ Amount
Revenue								
Cassava Yield	Tons/ha	60.0	4.5	270.0	2.5	150	6.8	408
Maize Yield	Tons/ha	120.0	1.8	216.0	1.4	168	1.25	138
TOTAL				486.0		318		546
Enterprise Profit (Loss)				(136.4)		(458.4)		(410.4)

TABLE 8

ENTERPRISE BUDGET FOR ONE HECTARE OF CASSAVA/MAIZE USING IMPROVED TECHNOLOGY

Item	Unit	₦ Price/ Unit	Alternative Planting Methods					
			Flat Soil		Mounds		Ridges	
			Number of Units	₦ Amount	Number of Units	₦ Amount	Number of Units	₦ Amount
Operations:								
Land Preparation	Man-days	4.0	43	172	43	172	43	172
Making Mounds	Man-days	4.0	-----	-----	40	160	-----	-----
Ridging	Man-days	4.0	-----	-----	-----	-----	50	200
Planting	Man-days	4.0	20	80	20	80	30	120
Fertilizer Application	Man-days	4.0	18	72	18	72	20	80
Chemical Application	Man-days	4.0	4	16	4	16	4	16
Weeding	Man-days	4.0	50	200	50	200	55	220
Harvesting	Man-days	4.0	55	220	55	220	70	280
SUBTOTAL			190	760	230	920	267	1,088
Materials:								
Cassava Sticks	Bundles	1.0	63	63.0	63	63.0	63	63.0
Maize Seeds	Lbs	1.0	25	25	25	25	25	25
Fertilizers	Kg		400	60	499	60	400	60
Aldrin Dust	Packets	0.6	36	21.6	36	21.6	36	21.6
Lindene	Packets	1.2	30	36	30	36.0	30	36
SUBTOTAL				205.6		205.6		205.6
Interest on Variable Cost, 8% for 6 Months				8.2		8.2		8.2
GRAND TOTAL				973.8		973.8		973.8

TABLE 8

(Continued)

Item	Unit	₦ Price/ Unit	Alternative Planting Methods					
			Flat Soil		Mounds		Ridges	
			Number of Units	₦ Amount	Number of Units	₦ Amount	Number of Units	₦ Amount
Revenue:								
Cassava Yield	Tons/ha	60	11.1	666	10.2	612	17.6	1,056
Maize Yield	Tons/ha	120	2.6	300	2.75	330	2.93	351.6
TOTAL				966		942		1,407.6
Enterprise Profit (Loss)				0.40		(191.8)		105.8

The enterprise budget of Table 9 considered the gains to be expected by growing one hectare of cassava/yam/maize (CAYAM) by the traditional method and under the three planting systems. The budget result indicated a gain of ₦886.6 from planting on ridges. Planting on flats and mounds resulted in money losses. The loss was greater for planting on mounds (₦1010.5) than for planting on flats (₦923).

Cassava yield was highest on ridges--7.4 tons per hectare--rather than planting on mounds--4.0 tons--or flats--3.5 tons. There was not much difference in yields by planting on flats and planting on mounds--0.5 tons per hectare. Yams yielded best on ridges--4.6 tons per hectare. Yields on mounds of 2.3 tons per hectare and 2.1 tons per hectare on flats were obtained.

The enterprise budget of Table 10 estimated profits from producing one hectare of CAYAM by replacing the traditional practices with new technological packages under the three planting systems. The highest estimated profit was realized from planting on ridges (₦6,049.2). Planting on mounds yielded ₦3,958.6, and planting on flats yielded ₦2,316.4 estimated profits respectively.

Cassava yields were highest when planted on ridges (9.6 tons per hectare) followed by 6.3 tons per hectare by flat planting. The highest yam yield of 11.3 tons per hectare was obtained by planting on ridges. The yields of 8.9 tons and 6.5 tons were obtained from planting on mounds and flats. Maize yield was highest on flats--2.5 tons--and ridges--2.2 tons. The yield on mounds was the lowest--2.0 tons per hectare.

Planting single cassava with and without new technologies was also considered under three different planting practices to assess its

TABLE 9

ENTERPRISE BUDGET FOR ONE HECTARE CASSAVA/YAM/MAIZE USING TRADITIONAL METHODS

Item	Unit	₦ Price/ Unit	Alternative Planting Methods					
			Flat Soil		Mounds		Ridges	
			Number of Units	₦ Amount	Number of Units	₦ Amount	Number of Units	₦ Amount
Operations:								
Land Preparation	Man-days	4.0	43	172	43	172	43	172
Making Mounds	Man-days	4.0	-----	-----	40	160	-----	-----
Ridging	Man-days	4.0	-----	-----	-----	-----	50	200
Planting	Man-days	4.0	30	120	30	120	35	140
Weeding	Man-days	4.0	55	220	55	220	60	240
Staking Yams	Man-days	4.0	15	60	16	60	20	80
Training Yams	Man-days	4.0	50	200	50	200	73	292
SUBTOTAL			203	812	243	972	291	1,164
Materials:								
Cassava Sticks	Bundles	1.0	16	16	16	16	18	18
Yam Seeds	Tons	784	2.5	1,960	2.5	1,960	2.5	1,960
Maize Seeds	Lbs	1.0	30	30	30	30	30	30
Stakes/Ropes	Bundles	6.0	6	36	18.5	111.0	18.5	111.0
SUBTOTAL				2,042		2,117.0		2,119.0
Interest on Variable Cost, 8% for 6 Months				81.6		84.7		3,367.8
GRAND TOTAL				2,935.6		3,173.7		3,367.8

TABLE 9

(Continued)

Item	Unit	₦ Price/ Unit	Alternative Planting Methods					
			Flat Soil		Mounds		Ridges	
			Number of Units	₦ Amount	Number of Units	₦ Amount	Number of Units	₦ Amount
Revenue:								
Cassava Yield	Tons/ha	60.0	3.5	210	4.0	240	7.4	444
Yam Yield	Tons/ha	784.0	2.1	1,646.4	2.3	1,803.2	4.6	3,606.4
Maize Yield	Tons/ha	120.0	1.3	156	0.8	120	1.7	204
TOTAL				2,012.4		2,163.2		4,254.4
Enterprise Profit (Loss)				(923.0)		(1,010.5)		886.6

TABLE 10

ENTERPRISE BUDGET FOR ONE HECTARE OF CASSAVA/YAM/MAIZE USING IMPROVED METHODS

Item	Unit	₦ Price/ Unit	Alternative Planting Methods					
			Flat Soil		Mounds		Ridges	
			Number of Units	₦ Amount	Number of Units	₦ Amount	Number of Units	₦ Amount
Operations:								
Land Preparation	Man-days	4.0	43	172	43	172	43	172
Making Mounds	Man-days	4.0	-----	-----	40	160	-----	-----
Ridging	Man-days	4.0	-----	-----	-----	-----	50	200
Planting	Man-days	4.0	30	120	30	120	33	140
Fertilizer Application	Man-days	4.0	20	80	20	80	22	80
Chemical Application	Man-days	4.0	5	20	5	20	5	20
Weeding	Man-days	4.0	55	220	55	220	55	220
Staking Yams	Man-days	4.0	15	60	16	60	20	80
Training Yams	Man-days	4.0	10	40	10	40	10	40
SUBTOTAL			253	1,012	293	1,172	331	1,324
Materials:								
Stakes/Ropes	Bundles	6.0	6	36.0	18.5	111	18.5	111
Cassava Sticks	Bundles	1.0	16	16.0	16	16	18	18
Yam Seeds	Tons	784	2.5	1,960	2.5	1,960	2.5	1,960
Maize Seeds	Lbs	1.0	30	30	30	30	30	30
Fertilizers	Kg	1.5	400	60	400	60	400	60
Aldrin Dust	Packets	0.6	36	21.6	36	21.6	36	21.6
Lindene	Packets	1.2	30	36	30	36	30	36
SUBTOTAL			2,159.6		2,234.6		2,234.6	

TABLE 10

(Continued)

Item	Unit	₦ Price/ Unit	Alternative Planting Methods					
			Flat Soil		Mounds		Ridges	
			Number of Units	₦ Amount	Number of Units	₦ Amount	Number of Units	₦ Amount
Interest on Variable Cost, 8% for 6 Months			86.4		89.4		89.5	
GRAND TOTAL			3,258.0		3,505.0		3,650.0	
Revenue:								
Cassava Yield	Tons/ha	60	6.3	378	4.1	246	9.6	576
Yam Yield	Tons/ha	784	6.5	5,096	8.9	6,479.6	11.3	8,859.2
Maize Yield	Tons/ha	120	2.5	300	2.0	240	2.2	264
TOTAL				5,774		7,463.6		9,699.2
Enterprise Profit (Loss)				2,516.4		3,958.6		6,049.2

relative profitability. Table 11 shows the cassava enterprise budget with the traditional method under the three planting practices. The results indicate monetary losses under all three planting systems. The greatest loss of ₦509.2 was from planting on mounds. Planting on flats indicated a loss of ₦335.2, and the loss for ridges was ₦273.2. Cassava yields of 4.5 tons, 4.3 tons, and 11.2 tons per hectare on flats, mounds, and ridges, respectively, appeared high under the traditional practices, even though losses were shown.

The enterprise budget of Table 12 for replacing one hectare of cassava grown by traditional methods with new technological packages also indicated losses for all three practices, as with the traditional method. However, the losses were lower than those planted without the use of improved farming practices. Planting on mounds indicated a loss of ₦336.0 per hectare, followed by a loss of ₦258.9 on flat soil.

Cassava yield was higher than when planted by the traditional method. The highest yield of 17.8 tons per hectare was obtained from ridges. The second highest was 12.1 from mounds, and 10.4 tons were obtained from planting on flats.

The enterprise budget of Table 13 summarizes the economic gains and losses from the different crop enterprises and planting systems of Tables 7-12. The introduction of new technology in CAM and CAYAM enterprises increased gross profits.

Partial Budgeting of Imo Situation

As noted earlier, enterprise budgets and the estimated profits may be misleading. It cannot really be told how profitable an enterprise would be in any farm situation. Partial budgeting, therefore, is

TABLE 11

ENTERPRISE BUDGET FOR ONE HECTARE OF CASSAVA USING TRADITIONAL METHODS

Item	Unit	₦ Price/ Unit	Alternative Planting Methods					
			Flat Soil		Mounds		Ridges	
			Number of Units	₦ Amount	Number of Units	₦ Amount	Number of Units	₦ Amount
Operations:								
Land Preparation	Man-days	4.0	43	172	43	172	43	172
Making Mounds	Man-days	4.0	-----	-----	40	160	-----	-----
Ridging	Man-days	4.0	-----	-----	-----	-----	50	200
Planting	Man-days	4.0	25	100	25	100	25	100
Weeding	Man-days	4.0	50	200	50	200	55	220
Harvesting	Man-days	4.0	25	100	25	100	55	220
SUBTOTAL			143	572	183	732	228	912
Materials:								
Cassava Sticks	Bundles	1.0	32	32	32	32	32	32
Interest on Variable Cost, 8% for 6 Months				1.2		1.2		1.2
GRAND TOTAL				605.2		765.2		945.2
Revenue:								
Cassava Yield	Tons/ha	60.0	4.5	270		258		672
Enterprise Profit (Loss)				(335.2)		(507.2)		(273.2)

TABLE 12

ENTERPRISE BUDGET FOR ONE HECTARE CASSAVA USING IMPROVED TECHNOLOGY

Item	Unit	₦ Price/ Unit	Alternative Planting Methods					
			Flat Soil		Mounds		Ridges	
			Number of Units	₦ Amount	Number of Units	₦ Amount	Number of Units	₦ Amount
Operations:								
Land Preparation	Man-days	4.0	43	172	43	172	43	172
Making Mounds	Man-days	4.0	-----	-----	40	160	-----	-----
Ridging	Man-days	4.0	-----	-----	-----	-----	50	220
Planting	Man-days	4.0	25	100	25	100	25	100
Fertilizer Application	Man-days	4.0	12	48	12	48	14	56
Chemical Application	Man-days	4.0	3	12	3	12	3	12
Weeding	Man-days	4.0	50	200	50	200	55	220
Harvesting	Man-days	4.0	40	160	45	180	65	260
SUBTOTAL			173	692	218	872	255	1,020
Materials:								
Cassava Sticks	Bundles	1.0	63	63	63	63	63	63
Fertilizers	Kg	63	400	63	400	63	400	63
Aldrin Dust	Packets	1.2	30	36	30	36	30	36
Linden	Packets	60	36	21.6	36	21.6	30	21.6
SUBTOTAL				183.6		183.6		183.6
Interest on Variable Cost, 8% for 6 Months				7.3		7.3		7.3
GRAND TOTAL				882.9		1,062.9		1,210.9

TABLE 12

(Continued)

Item	Unit	₦ Price/ Unit	Alternative Planting Methods					
			Flat Soil		Mounds		Ridges	
			Number of Units	₦ Amount	Number of Units	₦ Amount	Number of Units	₦ Amount
Revenue:								
Cassava	Tons/ha	60.0	10.4	624.0	12.1	726.0	17.8	1,068
Enterprise Profit (Loss)				(258.9)		(336.9)		(142.9)

TABLE 13

SUMMARY FOR ENTERPRISE BUDGET ANALYSIS

Crop Enterprise	Farm Technology	(₦) Enterprise Profits (Losses) for Alternative Planting Methods		
		Flats	Mounds	Ridges
CAM	Old	(136.4)	(458.4)	(410.4)
	New	0.4	(191.8)	105.8
CAYAM	Old	(923)	(1,010.5)	886.6
	New	2,516.4	3,598.6	6,049.2
CAS	Old	(335.2)	(507.2)	(273.2)
	New	(258.9)	(336.9)	(142.9)

more appropriate for making decisions that affect enterprise selection on a farm.

Assumed Whole-Farm Situation

Nine partial budget models were developed for all three crop enterprises and three alternative planting methods to test the marginal increases or decreases in farm income. First, a one-hectare holding was assumed. Second, a 0.2-hectare holding, representative of the modal holding of smallholders in the local government areas studied, was used in the partial budgeting.

The partial analyses considered replacing traditional methods (use of local cassava sticks, maize seeds, planting crops on flats and mounds without fertilizers and plant protection chemicals) with improved technologies (use of improved cassava sticks, maize seeds, fertilizer, and plant protection chemicals).

The constraints on farmers' resources were limited to:

1. Labor--The husband, wife, and four children of estimated 319 man-days for the peak cropping months of January to April and June to September,
2. Working capital of ₦625, and
3. Land holding--0.2 hectare for modal farm and one hectare for above-average farm.

Results of Partial Budgets on One-Hectare Holding

The results of the partial budget of Table 14 considered replacing traditional practices with improved technology on a one-hectare holding of cassava/maize (CAM) on flats. The net marginal increase in income was ₦236.4. The same crop mixture grown on mounds yielded net marginal increase in income of ₦360.4. On the other hand, when these crops were grown on ridges, the net marginal increase in farm income was ₦598.

The partial budget for replacing a one-hectare holding of cassava/yam/maize (CAYAM) under three alternative planting methods with improved technology is shown in Table 15. The results showed that the net increase in farm income resulting from replacing new technology for the traditional method was ₦3,524.0 for growing crops on flats. When the crops were grown on mounds, the net increase in income was ₦4,502.2. For growing the same crop mixture on ridges, the net increase was ₦5,127.2.

TABLE 14

PARTIAL BUDGET FOR ONE-HECTARE HOLDING OF CASSAVA/MAIZE: REPLACING TRADITIONAL METHOD WITH IMPROVED TECHNOLOGY

Item	Alternative Planting Methods		
	Flats	Mounds	Ridges
Additional Cost (₦):			
Fertilizers	60	60	60
Chemicals	57.6	57.6	57.6
Cassava Sticks	63.6	63.0	63.0
Improved Maize	25	25	25
Hired Labor	100	120	120
Reduced Income (₦):			
Improved Cassava	270	150	408
Improved Maize	216	168	138
A--Total annual additional costs and reduced income	791.6	643.6	871.6
Additional Income (₦):			
Cassava	666	612	1,056.2
Maize	300	330	351.6
Reduced Cost (₦):			
Traditional Cassava Sticks	32	32	32
Traditional Maize	30	30	30
B--Total annual additional income and reduced costs	1,028.0	1,004.0	1.469.6
Net Change in Income (B - A)	236.4	360.4	598.0

TABLE 15

PARTIAL BUDGET FOR ONE-HECTARE HOLDING OF CASSAVA/YAM/MAIZE: REPLACING TRADITIONAL METHOD WITH IMPROVED TECHNOLOGY

Item	Alternative Planting Methods		
	Flats	Mounds	Ridges
Additional Cost (₦):			
Fertilizers	60	60	60
Chemicals	57.6	57.6	57.6
Hired Labor	120	180	200
Reduced Income (₦):			
Cassava	210.0	240.0	444.0
Yam	1,646.4	1,803.2	3,606.4
Maize	156.0	120.0	204.0
A--Total annual additional cost and reduced income	2,250.0	2,460.8	4,572.0
Additional Income (₦):			
Cassava	378	246.0	576.0
Yams	509.6	6,479.6	8,859.2
Maize	300	240.0	264.0
Reduced Costs (₦):			
B--Total annual additional income and reduced cost	5,774.0	6,956.6	9.699.2
Net Change in Income (B - A)	3,524.0	4,505.8	5,127.2

The net increases in farm income from growing cassava/yam/maize crop enterprise were higher than for cassava/maize mixture grown under the alternative planting methods. However, other considerations, such as change in price, might affect this marginal change in profit.

Further partial budget analysis for replacing traditional practices with improved technology on a one-hectare holding of a single crop of cassava is shown in Table 16. The results showed that growing single cassava on flat soil resulted in a ₦142.4 net increase in farm income. The same crop grown on mounds yielded a net increase in farm income of ₦256.4. Growing cassava on ridges resulted in a net increase of ₦176.4

Table 17 summarizes the results of partial budgeting for replacing new technology for the traditional methods under the three alternative planting systems--flat soil, mounds, and ridges--on a one-hectare holding. The results showed higher increases in net income for cassava/yam/maize than cassava/maize and sole cassava. Net increases for cassava as a single crop were the lowest.

Results of Partial Budgets on 0.2-Hectare Holding

The results of the partial budget analysis of Table 18 showed that by replacing traditional methods with improved technology, a 0.2-hectare holding of cassava/maize enterprise planted on ridges gave the highest net farm income increase--₦143. The results of Table 19 showed that the net increases in farm income by replacing traditional practices with improved technology for a cassava/yam/maize mixture were highest on ridges--₦1,048--and mounds--₦1,018.7. Growing single cassava resulted

TABLE 16

PARTIAL BUDGET FOR ONE-HECTARE HOLDING OF CASSAVA: REPLACING TRADITIONAL METHOD WITH IMPROVED TECHNOLOGY

Item	Alternative Planting Methods		
	Flats	Mounds	Ridges
Additional Costs (₦):			
Fertilizers	63	63	63
Chemicals	57.6	57.6	57.6
Cassava	63	63	63
Hired Labor	60	60	68
Reduced Income (₦):			
Cassava	270	258	672
A--Total additional costs and reduced income	513.6	501.6	923.6
Additional Income (₦):			
Cassava	624	726	1,068
Reduced Costs (₦):			
Cassava	32	32	32
B--Total annual additional income and reduced costs	656	758	1,100
Net Change in Income (B - A)	142.4	256.4	176.4

TABLE 17

SUMMARY RESULTS OF PARTIAL BUDGETS FOR ONE-HECTARE HOLDING: REPLACING TRADITIONAL METHODS WITH NEW TECHNOLOGY (₦ NET INCREASES IN INCOME)

Enterprise	Alternative Planting Methods		
	Flats	Mounds	Ridges
CAM	236.4 (29.9)*	360.4 (56)	598.0 (58.6)
CAYAM	3,524 (156.6)	4,505.8 (183.0)	5,127.2 (112.1)
CAS	142.4 (27.7)	256.4 (51.1)	176.4 (19.1)

*Numbers in parentheses denote percent increase over traditional methods.

TABLE 18

PARTIAL BUDGETS FOR 0.2-HECTARE HOLDING OF CASSAVA/MAIZE: REPLACING TRADITIONAL METHODS WITH IMPROVED TECHNOLOGY

Item	Alternative Planting Methods		
	Flats	Mounds	Ridges
Additional Costs (₦):			
Fertilizers	12.6	12.6	12.6
Chemicals	11.5	11.5	11.5
Improved Cassava	12.6	12.6	12.5
Improved Maize	5.0	5.0	5.0
Reduced Income (₦):			
Traditional Cassava	54.0	30.0	81.6
Traditional Maize	43.2	33.6	27.6
A--Total annual additional costs	139.0	105.2	150.8
Additional Income (₦):			
Improved Cassava	133.2	122.4	211.2
Improved Maize	60.0	66.0	70.3
Reduced Costs (₦):			
Traditional Cassava	6.4	6.4	6.4
Traditional Maize	6.0	6.0	6.0
B--Total annual additional income and reduced costs	205.6	200.6	293.9
Net Change in Profit (B - A)	66.6	94.8	143.1

TABLE 19

PARTIAL BUDGETS FOR 0.2-HECTARE HOLDING OF CASSAVA/YAM/MAIZE: REPLACING TRADITIONAL METHODS WITH IMPROVED TECHNOLOGY

Item	Alternative Planting Methods		
	Flats	Mounds	Ridges
Additional Cost (₦):			
Fertilizers	12.6	12.6	12.6
Chemicals	11.5	11.5	11.5
Cassava	6.4	6.4	6.4
Maize	5.0	15.0	15.0
Reduced Income (₦):			
Cassava	42.0	48.0	88.8
Yams	329.3	360.6	721.3
A--Total annual additional costs and income	438.0	483.1	901.4
Additional Income (₦):			
Cassava	75.6	49.2	115.2
Yams	1,019.2	1,395.4	1,771.8
Maize	60.0	48.0	52.8
Reduced Cost (₦):			
Traditional Cassava	3.2	3.2	3.6
Traditional Maize	6.0	6.0	6.0
B--Total annual additional income and reduced costs	1,164.0	1,507.8	1,949.4
Net Change in Profit (B - A)	726.0	1,018.7	1,048.0

in the lowest net increases in farm income. Cassava planted on mounds had the greatest net increase in farm income--₦63.9 (Table 20).

Table 21 summarizes the partial budgets of Tables 18-20. Planting cassava/maize mixture resulted in about 95 percent net increase in farm income over traditional methods, while planting cassava/yam/maize mixture resulted in about 211 percent net increase in farm income over the traditional methods. Growing single cassava on mounds resulted in 78 percent increase in farm income over traditional methods. Growing cassava on flats gave the second highest net increase in farm income over the traditional method (45 percent).

Marketing Farm Produce

Production is never complete unless the produce has been transferred to the ultimate consumer. The knowledge of the consumer's preferences or the signals sent back to the producer in the way of market prices for his produce is one of the factors determining product behavior. For the smallholder farmer, the market signal is an indication of how much to produce for family consumption and for the market.

To determine smallholder farmers' behavior, Imo survey respondents were asked to state the proportion of their farm produce consumed and sold. For a cassava crop, 33 percent of the farm families consumed one-half, 18.3 percent consumed three-fourths, 4.6 percent consumer one-fourth, and 2.6 percent consumed all they produced (Table 22). As shown by Table 23, 44.5 percent of the farmers consumed one-fourth of their yams, 39 percent consumed one-half, and 16.5 consumed three-fourths of their yam produce.

TABLE 20

PARTIAL BUDGETS FOR 0.2-HECTARE HOLDING OF CASSAVA (SOLE): REPLACING TRADITIONAL METHODS WITH IMPROVED TECHNOLOGY

Item	Alternative Planting Methods		
	Flats	Mounds	Ridges
Additional Cost (₦):			
Fertilizers	12.0	12.0	12.0
Chemicals	11.5	11.5	11.5
Improved Cassava	12.6	12.6	12.6
Reduced Income (₦):			
Traditional Cassava	54.0	51.6	134.4
A--Total annual additional costs and reduced income	9.1	87.7	170.5
Additional Income (₦):			
Improved Cassava	124.8	145.2	213.6
Reduced Cost (₦):			
Traditional Cassava	6.4	6.4	6.4
B--Total annual additional income and reduced costs	90.1	87.7	170.5
Net Change in Profit (B - A)	40.7	63.9	49.5

TABLE 21

SUMMARY RESULTS OF PARTIAL BUDGETS FOR 0.2-HECTARE HOLDING: REPLACING TRADITIONAL METHODS WITH IMPROVED TECHNOLOGY (₦ NET INCREASES IN INCOME)

Enterprise	Alternative Planting Methods		
	Flats	Mounds	Ridges
CAM	6.6 (47.9)*	94.8 (90.1)	143.1 (94.8)
CAYAM	726.0 (165.8)	1,018.7 (210.9)	1,048.0 (116.3)
CAS	40.7 (45.2)	63.9 (72.9)	49.5 (29.0)

*Numbers in parentheses denote percent increase over traditional methods.

TABLE 22

CASSAVA: METHOD OF DISPOSAL (n = 115)

Proportion Consumed	Number of Farmers	Percent of Total
One-Fourth	53	46.1
One-Half	38	33.0
Three-Fourths	21	18.3
All	3	2.6

TABLE 23

YAMS: METHOD OF DISPOSAL
(n = 115)

Proportion Consumed	Number of Farmers	Percent of Total
One-Fourth	51	44.5
One-Half	45	39.1
Three-Fourths	19	16.5
All	0	0.0

Most of the maize produced was consumed rather than sold, as indicated in Table 24. About 55.6 percent of the farmers said they consumed three-fourths of their produce, 24.4 percent consumed one-half, and 20 percent consumed one-fourth of their maize crop. Most of the maize crop sold was in the green stage. The actual proportion sold green was not determined.

TABLE 24

MAIZE: METHOD OF DISPOSAL
(n = 115)

Proportion Consumed	Number of Farmers	Percent of Total
One-Fourth	23	20.0
One-Half	28	24.4
Three-Fourths	64	55.6
All	0	0.0

Farmers were also asked to indicate which crops they would grow and in what order if the government opted to buy their excess/surplus produce, as was done with cash crops such as cocoa, palm produce, and groundnuts (peanuts). The response, as shown in Table 25, was that 73 percent of the farmers would grow more cassava as their first choice, 29.6 percent would grow cassava as their second choice, and about three percent would grow it as their third choice.

TABLE 25

FARMERS: CROP EXPANSION INTEREST
(n = 115)

Crop	Number of Farmers			
	1st Choice	2nd Choice	3rd Choice	4th Choice
Cassava	73 (63.5)*	34 (29.6)	3 (2.6)	-----
Yams	14 (12.2)	16 (13.9)	57 (49.6)	38 (33)
Maize	54 (47)	42 (36.5)	19 (16.5)	-----
Others (Cocoyams)	34 (27.8)	11 (9.6)	71 (61.7)	-----

*The numbers in parentheses denote the percent of farmers responding for each crop.

For the yam crop, 12.2 percent would grow more yams as their first choice, 13.9 percent opted to grow yams as a second choice, 49.6 percent would grow them as a third choice, and 33 percent would grow them as a fourth choice. About 47 percent of the farmers would grow maize as their first choice, 36.5 percent as second choice, and 16.5 as third choice. When other crops were included, 27.8 percent of the farmers said they would grow cocoyams as their first choice, and 9.6 and 61.7 percent would grow them as their second and third choices, respectively.

In general, the result was that farmers indicated they would expand the crops in the following order: cassava, maize, yams, and cocoyams. The reasons given for their decisions were that cassava, maize, and cocoyams grow better on their soils and were less expensive

to produce in terms of capital and labor. They said they could grow yams, but that this required special soils, more capital, labor, and management. Lack of good care of vines may result in poor yields. The farmers further explained that a yam crop was difficult to transport from their rural farms to their homes and markets. Cassava and maize could be harvested and sold on the farm. Yams must be transported home before sale.[1] The same transportation problems hold for selling farm produce at distant markets.

Most farmers indicated that in previous years, they had grown different varieties of yams, but that their soils were now "dead." In other words, the soils had lost their fertility. They would prefer to grow crops that would do well on their farms and could be sold to the common man.[2]

Market outlet. The only market outlet reported for smallholder cassava and other farm produce was the local markets. Cassava produce is sold primarily in the raw state for process of "gari" and "eberebee." As discussed in Chapter II, the sale of raw cassava tubers was carried out usually on demand and when desired by the family. There was no wholesale harvesting of crops, as with yams and maize. Cassava starch processing also was carried out only as a byproduct of "gari" processing and not a special industry.

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[1]The average distance from rural farms to the villages was 2.4 kilometers (1.5 miles). The range was 3.24 kilometers (2.0 miles).

[2]The common man (low income groups) cannot afford to buy expensive food items, such as yams, but could buy cassava, maize, and cocoyams, which sell for relatively low prices.

No attempt was made to calculate the costs and returns for the processing of these three cassava products as alternative means of marketing cassava. The problem of marketing cassava and possible methods of promoting demand beyond the family and domestic markets is taken up in Chapter VI.

CHAPTER VI

SUGGESTIONS FOR EDUCATIONAL PROGRAMS TO PROMOTE BETTER PRACTICES

Introduction

In Chapter V, budget analyses were developed to appraise the feasibility of crop enterprises under different planting systems using new technologies. Produce disposal methods and market outlet limitations were discussed. This chapter probes further into:

1. The obstacles that impede smallholders' adoption of those improved production and marketing practices, and, in turn,
2. What these obstacles imply for educational programs.

There was a need to answer such questions as: What educational programs are necessary and effective in inducing change towards better farming practices? For whom should the programs be directed? By whom or through whom should be programs be directed? By whom or through whom should any such educational programs be carried out? Where or what environment is suitable for the delivery of the programs? How should the programs be serviced? What season and time frame would be the best to deliver the planned educational programs?

The "task environment" has important effects on how these questions would be answered. This demands knowledge of the local setting, including characteristics and limitations of the smallholders, capabilities of local agricultural services, and ongoing food production campaign programs in the study area.

The Local Setting

Farmers' age distribution. Farmers in Imo State are composed of married adults, widows, widowers, and young orphans who own some pieces of land by means of inheritance. Therefore, before an individual engages in farming he must reach a stage where he can share in the family and community land, which by custom is no younger than 25 years old. Results of the Imo survey, as shown in Table 26, indicated that 61 percent of the farmers were between 25 and 55 years, and 39 percent were over 55 years. The median age was 30 years, and the modal age was 50 years.

TABLE 26

FARMERS: AGE DISTRIBUTION
(n = 115)

Age Range (years)	Number of Farmers	Percent of Total
25-34	7	6.1
35-44	23	20.0
45-54	41	35.6
55-64	36	31.3
65+	8	7.0

Adoption characteristics of different age groups. To understand how farmers of different ages view new technologies recommended to them for crop production, the farmers were divided into five age groups.

The data on the use of new technologies were analyzed relative to the various age groupings in Table 27.

TABLE 27

FARMER AGE AND ADAPTION CHARACTERISTICS
(n = 115)[a]

Age Range (years)	Number of Farmers Using		
	Fertilizers	Chemicals	Improved Cassava
25-34	4 (57.1)[b]	1 (14.3)[b]	7 (100)[b]
35-44	19 (82.2)	5 (21.7)	21 (91.3)
45-54	24 (58.5)	6 (14.6)	29 (70.7)
55-64	12 (33.3)	3 (8.3)	33 (91.7)
65+	1 (12.5)	0 (0.0)	3 (37.5)

[a]Some farmers reported one or more interests.

[b]Numbers in parentheses represent the percentage of total in each group using specific new technologies.

The survey indicated that 66 percent of the farmers between 25 and 54 years of age use fertilizers, which is almost twice the usage rate of farmers aged 55 years and above (29.6 percent). On the use of chemicals, about 22 percent of those in the 35-40 age range used more agricultural chemicals than the other age groups. The indication was that the farmers 55 years and above used fewer agricultural chemicals

in crop production. The agricultural chemical most in demand was aldrin dust.

Improved cassava varieties attracted the interest of more farmers than did fertilizers and chemicals. All the farmers planted improved cassava varieties. Comments from interviewers showed that farmers usually placed long orders for improved cassava cuttings.

Reasons for non-adoption of fertilizers. To further understand why some farmers have not adopted fertilizers in the production of food crops, they were asked to give their reasons for their behavior. Their reasons are listed in Table 28.

About 49 percent of the respondents stated that yams grown with fertilizers did not store long. Forty percent said that the application of fertilizers takes too much time. Forty-four percent of the respondents commented that they did not have the means to carry the "salt" (fertilizers) to their farms. This does not indicate that they oppose the use of fertilizers.

Other reasons given were that yams grown with fertilizers did not taste as good as the traditionally produced yams (12 percent). Thirty-six percent of the respondents said that cassava grown with fertilizer did not yield good "gari," and 24 percent of the respondents explained that cassava rotted underground when harvesting was delayed.

Some farmers (16 percent) complained that fertilizers killed their crops; three percent said that they did not know how to apply fertilizers well, and they did not have someone to apply them for them (11 percent). About 32 percent of the respondents said that they did not have enough

TABLE 28

FARMERS' REASONS FOR NON-ADOPTION OF FERTILIZERS
(n = 115)

Respondent Reasons	Number of Farmers	Percent of Total
1. Yams grown with fertilizers don't store long	56	48.7
2. Do not have means to transport to farm	51	44.4
3. It takes time to apply	46	40.0
4. Cassava produced does not yield good "gari"	41	35.7
5. Do not have money to spend on fertilizers	37	32.2
6. Cassava rots underground early	28	24.4
7. Killed food crops	18	15.7
8. Yams do not taste as good	14	12.2
9. Nobody to help in the application	13	11.3
10. Do not really need fertilizers	10	8.7
11. Do not know how to apply	3	2.6

money to spend on fertilizers, while nine percent of the farmers said that they did not need fertilizers.

Interviewers commented that the smallholder farmers like to use fertilizers but only on some sections of their farm crops--those which they propose to harvest and sell. Farmers would buy some quantities of fertilizers when it was delivered to their villages, but they were reluctant to travel a long distance to buy. Some farmers would want

free fertilizers or free demonstrations on their farms using government labor.

Further comments were that some farmers have other pressing needs for the use of their limited funds, such as education of their children, so they buy only small quantities of fertilizers. When these farmers did not apply the recommended rates, the potentials for higher cassava yields were not realized. Consequently, the farmers did not realize any difference between growing crops with and without fertilizers.

Farmers' general educational attainment. To understand the smallholders' education background, which might be useful in designing future educational programs, farmers were asked to indicate the level of their educational attainment. The results of the survey of Table 29 showed that about 51 percent of the farmers had no formal education; 9.6 percent of the farmers had elementary (through grade six) and beyond; five percent had the first five elementary grades; 16.5 percent had the first four elementary grades; 9.6 percent had the first three elementary grades; 2.6 percent had the first two elementary grades; and five percent had the first elementary grade. The farmers' mean education attainment was the first two elementary grades, and the modal education was the first four elementary grades.

Farmers' basic agricultural training. Because the Ministry of Agriculture, in cooperation with the Schools of Agriculture, offers free short basic agricultural courses to the needy farmers or their family members and/or employees, farmers were asked to indicate whether they had any basic agricultural training and, if so, the length of this

TABLE 29

FARMERS' GENERAL EDUCATIONAL ATTAINMENT
(n = 115)

Level of Education	Number of Farmers	Percent of Total
Above Elementary 6	2	1.8
Elementary 6	9	7.8
Elementary 5	6	5.2
Elementary 4	19	16.5
Elementary 3	11	9.6
Elementary 2	3	2.6
Elementary 1	6	5.2
No Schooling	59	51.3

Note: Mean = Elementary 2; mode = Elementary 4.

training. In addition, the farmers were asked to indicate how useful the training was to them in making their farm decisions as to what, how, and when to grow crops of their choice, as well as what inputs to use.

The results of Table 30 indicate that three percent of the farmers had four or more weeks' training; 14 percent had one to two weeks' training in farming practices; six percent had three to four weeks' training; 14 percent had one to two weeks' training; 18 percent had less than one week of training; and 59 percent had no agricultural training. When asked how useful their agricultural training was for

TABLE 30

FARMERS' VOCATIONAL AGRICULTURAL TRAINING
(n = 115)

Length of Training	Number of Farmers	Percent of Total
Over 4 Weeks	3	2.6
3-4 Weeks	7	6.1
1-2 Weeks	16	13.9
Less Than 1 Week	21	18.3
No Training	68	59.1

their farm management, as shown in Table 31, one-fourth of the farmers expressed the sentiment that their training was "very useful."

TABLE 31

FARMERS' AGRICULTURAL TRAINING: DEGREE
OF USEFULNESS TO THE FARMER
(n = 115)

Respondent Assessment	Number of Trainees	Percent of Total
Very Useful	28	59.6
Useful	16	34.0
Makes No Difference	3	6.4

Membership in farm organizations. Membership in any farm organization was supposed to increase farmers' knowledge of agricultural production, processing and marketing skills, credit sources, management, and information on product-market outlets. The response shown in Table 32 indicated that 53 percent of the farmers belonged to the "Farmers' Forum," and 46 percent did not belong to any of the farm organizations. It would appear that those farmers who belonged to farmers' cooperatives participated in the Farmers' Forum.

TABLE 32

MEMBERSHIP IN FARM ORGANIZATIONS
(n = 115)*

Type of Organization	Number of Farmers	Percent of Total
Farmer's Cooperative	47	40.9
Farmers' Forum	61	53.1
No Organization	53	46.1

*Some farmers reported involvement in one or two organizations.

Comments from the agricultural officers who carried out the farmer interviews indicated that farmers did not find time to attend meetings even when they enrolled in the Farmers' Forum. Most farmers take it as a status symbol to belong to an agricultural organization, but they were reluctant to travel long distances to make their

contributions for effective and efficient organization. Generally, more farmers attended meetings when scheduled in their villages, on their non-local-market days and preferably on Saturdays. Each village has its own different market day, which is held once in every eight days.

Farmers' agricultural information sources. It was assumed that both membership in farm organizations and Ministry of Agriculture information media would have great impact on the way farmers react to new changes in agricultural production practices. Based on these assumptions, farmers were asked to indicate their sources of agricultural information. The indication in Table 33 shows that all farmers get their information on agricultural practices through the agricultural agents and by listening to farm news. Additional information gained from interviewers' comments indicated that "farm demonstrations" and "farmers' agricultural week" were other major avenues for keeping farmers informed about how new technology could help them increase crop yields.

Agricultural extension resource persons. The Imo State Agricultural Division of the Ministry of Agriculture and Natural Resources is geared to providing enough trained agricultural personnel to run the extension services in the various local government areas. Within its limited financial resources, the Agricultural Division sees that each administrative division or group of local government areas in the state is supervised by a senior agricultural officer, supported by two agricultural superintendents. Under the agricultural superintendents are agricultural assistants, who themselves have had at least two years of general agricultural training.

TABLE 33

FARMERS' INFORMATION SOURCES
(n = 115)*

Information Media	Number of Farmers	Percent of Total
Reading Newsletters	41	35.7
Listening to Agricultural News	56	48.7
Relatives and Friends	38	33.0
Agricultural Agents	45	100.0

*Some farmers reported more than one source of information.

The number of agricultural assistants in each local government area depends on the number of villages and population of the local government areas. One agricultural assistant supervises about two villages of 800-900 farm families.

Extension agents are supposed to help inform and educate farmers on improved technologies and on how to plan production, but their efforts are concentrated on distribution services. However, the hold group meetings with farmers to discuss demonstration programs, crop production targets for each year, and farmers' problems on their farming activities.

Food production campaign program. The National Accelerated Food Production Project (NAFPP) is a federal Nigerian institution set up to coordinate all the aspects of food production in the country. In each state, the NAFPP, in cooperation with the various National Crop Research

Institutes and State Ministry of Agriculture, tests new varieties and makes recommendations on fertilizers, insecticides, and seed rates appropriate for each farming area.

The NAFPP is responsible for carrying out on-the-spot manpower training, arranging for zonal substation seed and cassava multiplication for supply to farmers. New technological packages are demonstrated on selected farmers' plots. The division is also charged with giving credit and marketing information to the farmer.

The NAFPP in each state is required to develop programs to educate farmers on the various new technologies and their benefits. To accomplish these objectives, staff specialists in the fields of agronomy, entomology, economics, and agricultural mechanization are deployed for each state extension service.

The role of the National Crop Research Institute. In planning, organizing, and administering the food production campaigns, the National Root Crops Research Institute has played an important role and should continue to provide needed research leadership. In addition to providing research results (improved crop varieties, fertilizers, and protective chemical dosages for various crops that are recommended to farmers for adoption), the Institute coordinates and provides the supporting materials for multiplication. The multiplication program carried on in NAFPP substations are also supervised by the staff of the Institute.

The Institute is responsible for training NAFPP and extension personnel working with the smallholder farmers in food production programs. In addition, the Institute's specialist staff provides subject

matter advice on various crops and problems to the NAFPP and extension personnel.

Key Educational Components for Improving Cassava Production Practices

Introduction. For the past 30 years, the means by which farmers received any farm training has been through method demonstrations, meetings, and agricultural film shows. Field trips were rarely used as a means of educating farmers as to what happens around them, especially in research stations.

Farmers have been informed of the potentials of new technologies. They have not been informed about the differences in their soils, how to know their soil types, and what crops and new technological combinations are best for their soils. Farmers have not been educated on how to assess the benefits and losses of producing cassava and other crops when they use various doses of fertilizers and pesticides.

In marketing cassava and other crops, farmers and the local middlemen and traders in agricultural inputs and services are not educated on how and when to buy and sell for gain. Processing and storage information are yet under study.

Farmers' educational needs. The general characteristics of Imo smallholder farmers with respect to their formal education, agricultural training, extent to which they use new cassava varieties and fertilizers, membership in farm organizations, and the various reasons given for their behavior calls for additional educational programs to increase and sharpen their decision-making skills. To this end, providing farmers with specialized training on the basics of farm management

techniques would be useful and would add to what experiences farmers have had on the job. Such training would include simple, everyday arithmetic, record-keeping, farm measurement, purchasing, and selling produce and farm inputs. Knowledge of credit sources, methods of obtaining credit, and managing credit are essential for the smallholder farmers who produce cassava and other crops. Farmers need to be educated on how to collect soil samples of their farms for analysis in experiment stations.

Knowledge of soil types is closely related to conservation methods suitable to different soils. Therefore, educational programs geared towards helping farmers understand the need for maintaining their soil fertility would promote more interest among different farmers' age groups in the use of fertilizers for cassava production.

Special training for agricultural assistants. The agricultural assistants are the people close to the level of the farmers in the villages. These staff members of the Ministry of Agriculture have had general training in agricultural practices. For the farmers to have the needed training at their own levels, selected numbers of the agricultural assistants need specialist training in basic farm management, including basic agricultural marketing principles. They need training on market potentials for cassava products, which they would pass on to the farmers.

Training for agricultural traders. Now that the nation has realized the importance of free enterprise, private businessmen and traders in farm products and supplies can effectively handle agricultural

inputs, supplies, and product distribution with less government bureaucratic intervention. The traders could enlarge their business to serve other areas than Imo State.

In order to assist in the development of these traders who have potentials for providing useful services, plans are needed to provide distributive education. Such education programs need to include basic purchasing and marketing functions, with some necessary legal knowledge for dealing with foreign and domestic markets. They also need information on improved seeds, fertilizers, and plant protection materials which they handle. It is necessary to start now to teach those who would be agricultural input suppliers on how to carry out improved cassava multiplication.

Farmers' clubs. The State Ministry of Agriculture helped initiate Farmers' Forum with the idea that it would serve as a farmers' meeting point for discussing their common problems and find possible solutions. The results of this study indicated that farmers have not utilized this government-imposed forum.

In addition, farmers' cooperatives have not been fully utilized as an association where farmers give and receive information on agricultural business organization, marketing, and credit management.

Despite the limiting factors that most crops produced in Imo State are yet to be processed in a storable condition, the small farmers could be introduced to a different perspective of the function of agricultural cooperatives. Knowledge of crop grading and quality maintenance is important to the export trade. For instance, cassava products marketed in West Germany and France have to meet certain quality standards.

Education for agricultural cooperatives should be as associations for cooperation in production and marketing as a theme, rather than as savings and loan associations, per se. Cooperative associations also serve as a medium through thich extension workers and other change-agents can meet, discuss with, and inform large farmer groups about the latest developments in their area of concern.

Smallholder farmers need to form their own style of association to support or replace the Farmers' Forum. To stimulate farmers, they need education on the benefits of such associations (social, economic, and political benefits).

Information media for farmers. Several information mass media have been used to make the farmers aware of improved farming technologies. Agricultural newsletters for those who can read, agricultural radio programs for those who have radio and would care to listen, and agricultural agents are among the media for improving the level of smallholder farmer awareness of progressive agricultural techniques.

When considering the low level of small farmer education and his cares and worries about earning a living, it might be necessary to try additional ideas for informing farmers about improved farm practices and skills. The proposed additional ideas include use of regular film shows and posters in villages and schools. Newsletters and agricultural radio programs could still be supporting information media. Farmers may read and listen but forget what they read and hear. However, films and posters provide entertainment and lasting impressions in farmers' minds.

Farm demonstrations have been located at the so-called strategic and "eye-catching" places, which are removed from the villages. Additional test demonstration points need to be sited in or close to the villages.

Education for farmers' wives. The role of women in food crop production was discussed in Chapter II. Women participate actively in cassava production. They carry out the major cassava processing--"gari" and "abacha." Other food preparation involving the use of cassava is done by women. Therefore, they need to be involved in all the farm training given to the men, as their time permits them.

More important in their added training would be the provision for educational programs that would make them aware of any new uses of cassava for the household. Teaching the housewives how to prepare different dishes with cassava fortified with protein additives like soybeans, meat, fish, and eggs might help stimulate demand and supply of cassava and cassava products.

Training for local bank managers. Smallholder farmers have had problems getting production loans from local commercial banks because these farmers are considered potential bad risks for bank loans. The future of these small farmers relative to social and economic development of the country needs a change of behavior and understanding by the bank managers. The change could be effected through education.

It is obvious that special training seminars for bank managers would be needed. Such seminar programs could include ideas on how to supply needed credit to farmers and arrangements on how the farmers would repay the loans in stages--both in kind and in cash.

Further ideas would include how banks could participate in cassava production, processing, and marketing. This is more important because countries like Thailand, Brazil, and Togo export cassava products to West Germany and France with profits.

Educational program stages.

STAGE 1: The first stage is to provide educational information to the public about proposed vocational adult education programs to be offered in rural villages and convenient places in the cities. The state government information division, in cooperation with the Ministry of Agriculture, the NAFPP, and the National Root Crops Research Institute, could sell to the public a proposed plan to initiate pilot small-scale agricultural business management educational programs at division and local levels. The idea is to help determine private individuals' needs for the proposed training. It might also help the institutions and organizations involved in food production campaigns plan for the action stages of the programs.

STAGE 2: The specialist staff of the Ministry of Agriculture, the NAFPP, and the National Root Crops Research Institute would develop program goals and objectives, as well as special curricula to meet the needs of the trainees--farmers,

agricultural assistants, and private individuals. Also, the development of instruction materials, space, staff assignments, and financial budget preparation could be accomplished. Arrangements for sources of funding for the educational program would be made at this stage.

STAGE 3: A predetermined number of local agricultural assistants would be selected to serve the village farmer. Arrangements for pilot villages in different local county areas would be made. Survey of interested farmers in the pilot localities would be conducted to help determine where to locate the specially trained agricultural assistants. The training of the staff assistants could be at the State School of Agriculture, Owerri, or at the Federal School of Agriculture, Umudike. The determination of training location will depend on the arrangements among the three agencies involved in Stages 1 and 2.

STAGE 4: TRAINING OF SMALL FARMERS AND YOUTHS. At this stage, the agricultural assistants would be ready to move into the villages to train farmers and others interested in farm business management. To attract good attendance, the proposed training would be better carried out at the village level in any convenient local church or schoolhouse.

> Vocational training could be carried out one or two evenings a week. The time, duration, and days for evening classes could be determined through mutual arrangement among the divisional supervisors, subject matter specialist, agricultural assistants, and interested farmers. The training should be free and open to adults of all sexes, as well as to youths who may benefit from the training.

While the major education program objective is to teach farmers the basics of farm record-keeping, budgeting, and decision-making, the existing local and village farm demonstration plots could serve for practical training in farm bookkeeping, simple farm analysis, and farm skills. School farms, where available, could afford an additional laboratory for training the small farmers and interested individuals. The high school head teachers could become part of the community's resources for teaching arithmetic. However, this could be on special arrangement.

Training of agricultural traders. The private individuals who have different training needs (farm supplies and product distribution, legal aspects of trade and communication) could be trained initially at the Federal School of Agriculture until additional needs and increases in enrollment demand the provision of evening classes at selected divisional locations. At the early stage of agricultural traders' training, the government could subsidize their training costs. What token fees these individuals should pay may rest with the state government.

Summary

To induce smallholder farmers to adopt new and improved technologies effectively, there is a necessity for special training to enable them to assess the situation and decide on what crops to grow in order to maximize their profits. They need training on how to buy and market farm supplies.

To be able to take the initiative in farm plans, the smallholder farmer has to understand the simple techniques of data collection and recording his operational activities and costs. He needs this basic training from someone he can relate to with ease--the agricultural assistant.

The farming activities of the farmers do not allow them time to participate actively in time-consuming programs held a long distance from their homes. However, farmers could be induced to participate in educational programs that are brought to them at their village environment and conducted at a convenient time and location.

Farmers also need a new perspective on cooperative associations and farm clubs to enable them to coordinate their production and marketing efforts and information-gathering.

To train farmers, local agricultural assistants need special farm management training to help the farmers understand their management roles and farming skills.

Private agricultural traders who supply and buy from farmers deserve training to enable them to become competent in distribution services. Training on how to relate to their farmer customers is desirable.

Much has been done by the extension personnel to educate farmers through group contact--demonstrations, field weeks or shows, meetings, and trips. However, the use of film shows and posters in rural areas and schools needs to be increased. It would be advisable to use agricultural posters on state highways depicting the crops grown with improved technology.

Training is better brought to the people at their environmental setting and time of choice. The rural schools and farms serve as laboratories for the farmers and their children. Experience in secondary school education in Nigeria has shown that the closer the school is located to the people, the greater the involvement of the community and the greater the student enrollment. This experience could be applied effectively to rural adult vocational education in Imo State.

It should be noted that when farmers' clubs were discussed (p. 99), youth clubs were not mentioned. Based on his experience with rural people in Imo, it does not appear to this author that youth projects in crop production are helpful in increasing adoption of new technologies. Youth activities could be successfully directed towards livestock projects. By involving youth in informal education in basic farm management programs with their parents, the farming family unit as a whole can be reached.

The responsibilities for providing funds and the various training components for the various groups would best rest with the State Ministry of Agriculture. The National Root Crops Research Institute, in cooperation with the NAFPP staff, could provide the needed specialist training materials and advice. The possible added educational programs for all groups involved in cassava production are presented in Table 35.

TABLE 34

SUMMARY OF ADDED EDUCATION PROGRAMS TO PROMOTE CASSAVA PRODUCTION AND MARKETING

Groups to Train	Input Supplies	Cassava Production	Cassava Marketing
Professional Extension Agents	1--General knowledge of farm inputs	1--Principles of farm records and accounts	1--Processing, grading, storage, and marketing farm products
	2--Potentials of farm inputs	2--Budgeting principles	2--Market information and forecasting
	3--Farm credit supply and management	3--Farm measurements	
Agricultural Traders and Middlemen	1--Simple accounting and records	1--Knowledge of production costs and returns through simple budgeting	1--Knowledge of market information and forecasts
	2--Buying and selling agricultural technologies	1--Profitable production practices	2--Legal aspects of domestic/foreign marketing of cassava products
	3--Knowledge of new agricultural technologies		
	4--Legal aspects		

TABLE 34

(Continued)

Groups to Train	Input Supplies	Cassava Production	Cassava Marketing
Bank Managers	1--Problems of small farm credit	1--Small- and large-scale cassava production possibilities	1--Cassava product processing business
	2--Credit supply	2--Possible cassava by-product industries (starch, glue, spirits)	2--Cassava product marketing, domestic and international
Small Farmers	1--How and when to buy farm inputs	1--Knowledge of everyday arithmetic	1--How to process cassava product
	2--Knowledge of fertilizers and chemicals used in production	2--Bookkeeping and accounts	2--Grading, storage, and packaging
	3--Where to buy	3--Farm measurements	3--When to market
	4--Credit measurement	4--Role of cooperative	4--Where to market
		5--Knowledge of soils and sampling	
		6--Conservation measures	

TABLE 34

(Continued)

Groups to Train	Input Supplies	Cassava Production	Cassava Marketing
Farmers' Wives	1--How and when to buy farm inputs	1--Farm records	1--Processing of cassava
	2--Knowledge of fertilizers and potentials	2--Cassava foods and preparation	2--Grading and storage
	3--Bargaining power through farmers' cooperatives	3--How to use farm input fertilizers and chemicals	3--When to sell
			4--Where to sell
Youths	1--Knowledge of farm inputs used in production	1--How to measure farm operations	1--How to process cassava
		2--How to record farm operations	2--How and when to sell cassava products
		3--Advantages of youths' clubs in production	

CHAPTER VII

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Summary

This study viewed the slow progress made by the smallholder farmers in the LDC's in expanding food crop production to feed the increasing population, due to inadequate information on production alternatives and their economic feasibility. Researchers and policy makers have been recommending and pushing the adoption of improved technologies for food crop production without really understanding the smallholder problems of crop enterprise and production method choices. Smallholder farmers have not learned how to make decisions on their own and to take responsibility for what production action they have taken to improve their income and well being by the use of improved technology.

The purpose of this study was to improve the effectiveness of smallholder decision-making in food crop production and marketing through education that helps local people, themselves, to gather relevant information and to use simple budgets for assessing the alternatives available to them.

To provide an analytical focal point, farm cost and return data were collected from 115 Imo small farmers through questionnaire and interview processes. Farm management methods (enterprise and partial budgeting) were then used to investigate the potential of nine different cassava production systems. Three ways to combine cassava with other crops were examined, and three land tillage alternatives were analyzed for each combination.

Descriptive information about the farmers' resource situations, attitudes toward change, and obstacles to improved practices was obtained and tabulated. The results from both budgeting and descriptive analyses were used in suggesting educational programs that would improve the small farmers' management skills, as well as the local people's information-gathering and analysis skills, by the use of simple budgeting.

Survey Results

1. The survey showed that the average cultivated farm size in 1980-1981 was 0.6 hectare, but the modal farm was 0.25 hectare. The size of farm family varied from five to nine persons, and most farm operations were carried out with family labor. The average farm working capital was ₦716, with ₦625 as the mode. Agricultural and commercial banks were not sources of small farm working capital. Farmers depended on their own capital and borrowings from the thrift and loan society (Isusu).
2. When the educational level of the farmer is used as proxy for managerial ability, the survey showed that 51 percent of the farmers had no formal education. Approximately 59 percent of respondents had no form of agricultural training. Less than one-half of the farmers belonged to either farmers' cooperatives or the Farmers' Forum. The respondents mentioned agricultural agents as their main source of agricultural information.

3. The survey showed that 87 percent of the respondents were between 35 and 64 years of age. Most of these respondents (70 percent) planted improved cassava variety (60506), and 64 percent of the farmers planted cassava/maize mixture. Fifty-two percent of the respondents between the ages of 25 and 54 years used fertilizers in crop production.
4. The reasons given by 24 percent of the respondents for their limited use of fertilizers were that cassava grown with fertilizers rotted underground early, and 36 percent of the farmers expressed that the processed cassava did not yield good "gari." Forty-nine percent of the respondents claimed that yams grown with fertilizers did not store long; while 40 percent of the respondents said that fertilizer application takes much of their time.
5. One-half of the respondents (54 percent) sold one-fourth or more of the cassava produced. Two major cassava products were "gari" and "eberebe" (tapioca). The farmers were less informed of other cassava processing and marketing alternatives. As with cassava, many farmers sold a large portion of their yam crops; 51 percent sold three-fourths or more of their yam harvest. In contrast, maize was used largely at home; 55 percent of the respondents consumed three-fourths or more of the maize produced.

Feasibility Assessment Results

1. The results from two partial budgets for a one-hectare holding and a 0.2-hectare, whole-farm (representative farm) holding showed that net increases in farm income were highest when improved technology replaced traditional methods, and the crops were grown on ridges. For cassava/maize mixture, the net increase in income over the traditional method was 58 percent for the one-hectare holding and 95 percent for the 0.2-hectare whole-farm holding. Replacing mounds for flats in cassava/maize mixture gave the second highest net increase in farm income (90 percent).
2. The cassava/yam/maize combination for the 0.2-hectare holding gave the highest net increase (210 percent) in farm income over the traditional methods when mounds replaced flats. Planting on ridges was not superior to planting on flats.
3. Single cassava crop did best when planting on mounds replaced planting on flats. Net increase in farm income over the traditional methods was about 73 percent for the 0.2-hectare holding and 51 percent for the one-hectare holding when cassava was grown on mounds.

Conclusions

The results of the Imo empirical analysis led to the following conclusions:

The smallholders will try and adopt new ideas when it is socially and economically acceptable to them. The smallholders had been accused of seeking immediate gratification for their farm investment and also for depending on fate for their farming activities. The author of this dissertation does not consider this action as a vice, but rather as a virtue. The smallholder use of improved cassava varieties was an indication that smallholder farmers act cautiously in selecting innovations that are risky but profitable.

Some of the reasons the farmers gave for their limited use of fertilizer might appear less important to the sophisticated mind, but they are socially and economically important to the small farmers. Storage problems, quality of processed products, and time spent in fertilizer application should not be taken for granted when recommending the adoption of new practices to farmers. Reduction of any such obstacles would help increase adoption of new ideas.

Most smallholders understand that they do not have all the information they need for adoption of improved technologies in crop production. From the study results, the low membership in farmers' organizations could be associated with smallholder low educational level and lack of agricultural training. The age of farmers does not seem to be an obstacle to membership, nor for adoption of new ideas. Time factors, as well as the location of meetings, were also important.

To enable small farmers to get the information they need for crop production expansion and to motivate them to participate in groups, it would be necessary to provide additional educational programs to those presently offered to farmers. The expressed satisfaction by the few

farmers who had some agricultural training makes it imperative to provide do-it-yourself types of educational programs.

Many individuals and organizations serve the small farmers in different ways. In order for these groups of local people to understand the problems of those they serve, it is necessary to provide some training program for them. Training in simple techniques in agricultural supply management would help their business. This special focus would engender the feeling of responsibility and accountability on the part of agricultural suppliers.

The feasibility results showed that replacing traditional methods with improved technology resulted in high net increases in farm income. From the three possible ways of increasing cassava production under the smallholder whole-farm holding, it would be economically and socially feasible for the farmers to expand cassava production by combining it with maize. Single-crop cassava is not the economical way for expanding cassava production, considering the small farm holding and capital resources.

The cassava/maize mixture would be better grown on mounds, and preferably on ridges, than on flats when improved technology replaces traditional methods. Even though the farmers themselves expressed concern for the low fertility of their soil, it is not advisable or feasible for the smallholders to allocate their limited resources to a cassava/yam/maize combination.

The farmers' ability to choose any one of the alternatives open to them leads to another important conclusion. Farmers need the type of education that would help them make important decisions about

enterprises and improved practice alternatives. The use of simple budgeting analysis for this study is a demonstration that small farmers and local people serving them can use it in making farm decisions. There is, therefore, a need to provide educational programs that would help these farmers and the local people learn how to use simple farm budgeting analysis.

The study results also showed that smallholders, in general, consume less than one-half of what they produce. This is an indication that small farmers are interested in economic gains. They will move into production and marketing if they can get the relevant information on processing and marketing outlet alternatives. This could be done through education.

Broader Implications

Food crop production and marketing problems in the LDC's affect the various gropus involved in different ways. What is good for one smallholder farmer might not apply to another. In other words, each farmer and local change-agent needs to have the ability to analyze his own situation with the help of management techniques. Training in budgeting analysis will provide skills needed for individual farm planning.

Implications for the smallholder farmer. The small farmers act rationally and are able to learn new ideas and use them. For the small farmer to utilize effectively his small holding, labor, and working capital in crop production expansion by applying new technology, his management skills (i.e., his ability to coordinate his available resources) needs development.

The farmer can acquire a better understanding of his crop enterprise and farming practices if he can make the assessment by himself. This study is geared towards helping the small farmer acquire the necessary skills for enterprise assessment. The first step in this educational process is to motivate small farmers to learn how to keep simple records and analyze them for decision-making.

Farmers have not been active in belonging to farmers' organizations. The result of such behavior is the lack of a united front in pursuing smallholder common problems and finding solutions for them. Small farmers need to be informed on benefits that accrue to one who participates actively in farmers' organizations.

Implications for the researcher. More is being done in most research institutions to improve the quality and quantity of crops grown in the different developing countries. More needs to be done to find out the association between:

1. What research says is good for the small farm, and
2. What the farmer considers acceptable under his environment.

Research is needed on local practices as a basis for applying new technologies in crop production.

The improvement in crop quality and practices would survive the change in time and use by follow-up research on how to improve the skills of users of research findings--the smallholder farmers. Research is needed on how to provide the do-it-yourself methods of innovation evaluation.

Research on helping the farmers and their wives find alternative uses for cassava in the local industries and in new food items would help in solving demand and marketing problems. Discovering alternative market outlets for farm crops will help increase adoption of new ideas for crop production expansion.

Implications for the policy maker. Policy makers may be in an awkward situation when called upon to make certain policies that affect farmers and the way they operate. It is important for them to have good knowledge of small farm problems at local levels before deciding on any policies that might have more far-reaching effects on the farmers and the economies at large.

The study suggests the need for closer understanding of the information that is relevant in making agricultural policy decisions. For instance, pushing the expansion of a crop such as cassava might be an economical and rational policy for policy makers. That is, it would help reduce the flight of domestic currency for food importation. However, such a policy could be at the cost of the small farmer who bears the risk of investing in an enterprise without first knowing all the facts about using new technology.

What should be the role of state governments in a farming situation where the poor and illiterate small farmers are skeptical about every new technology recommended to them? The best policy is for the government to initialize fact-finding and attempt solutions, rather than force adoption of ideas.

The economy of most LDC's depends on agricultural development and on the small farmers who carry out the production for consumption and

exchange. Therefore, the government has the first duty to educate the small farmers on how to make decisions and take responsibility for their actions. Funding farmer training programs is important for small farmer skill development in enterprise appraisal.

Implications for other LDC's. What applied to Nigeria might, to some extent, hold for other LDC's of Africa. For instance, in an effort to persuade farmers to produce more food for the country, policy makers and research individuals in a high enough position to make policy recommendations might act with less reflection on the short- and long-term impact on farmers and the potentials of untested technologies.

Different regions of any country respond differently to various innovations which increase crop yields and farm income. One crop might do well in one region but might not in another. Therefore, there is the need to investigate crop enterprise alternatives and innovation potentials before persuading the small farmer to adopt the practices.

Farmers in most developed countries have learned to be cautious in accepting certain innovations and advice. This cautious behavior could be utilized effectively in providing self-help educational programs for the small farmers in enterprise selection and management. Training in farm management would be an asset to smallholders who have the problem of allocating their limited resources to crop production expansion and marketing.

The idea of various government agencies handling farm supplies and distribution to small farmers is economically wasteful. Private local people could handle the purchase and distribution of farm supplies effectively. Moreover, the present system of subsidizing farm inputs

to small farmers would hinder full understanding of farmers' reactions towards improved technological packages. There would be better understanding of small farmers' behavior when they start purchasing the farm inputs at their full market prices from local input suppliers.

To prepare the local input suppliers for their future tasks and their relationship to the small farmers whom they serve, it is equally important that various LDC's consider, as an urgent priority, the provision of distributive education for the would-be farm supply distributors. These local distributors include bankers who may be required to give small farm loans.

Finally, there is a need for full cooperation among smallholders, local people, researchers, and policy makers in providing such relevant information that would:

1. Help small farmers become effective decision-makers, and
2. Enable local people develop skills in information-gathering and analyses through education that emphasizes do-it-yourself approaches.

Research in finding what is agronomically, economically, politically, and socially feasible and acceptable to all involved in crop production expansion and marketing would serve for economic development of the LDC's presently concerned with self-sufficiency in food production.

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APPENDICES

APPENDIX A

FARM INTERVIEW QUESTIONNAIRE

Division _____

Village _____

Name of Farmer _____

Staff Interviewing _____

Introduction

The questionnaire is designed to obtain information about the system of food crop production in the State and the problems farmers are facing in their efforts to make a living. The interest of the farmers is uppermost in making this study. All information given will be treated with due confidence.

Special Instructions

1. Please, if the farmer is unable to answer any question, enter N.A.
2. Do not force answers from any farmer.
3. Record whatever answers the farmer gives.
4. After recording the farmer's answers, please make comments that represent your knowledge of the area, the farming practices, and your assessment of the crops' performance.
5. You would help in this study by making free comments at the back of the questionnaire.

Section A

1. a. Is farming your main source of income? ___ ___
   b. What are your other sources of income?

   _____

   c. Do you receive any help from the government? ___ ___
   d. What form of help?

   _____

2. Suppose the government promises to buy your surplus food crop; will you plant more for sale? YES___ NO___

3. If yes, which crops will you grow?

_____

_____

4. Why do you want to grow any of those crops?

_____

_____

5. a. Do you use fertilizers in growing crops? YES___ NO___
   b. Do you use aldrin dust in growing crops? YES___ NO___
   c. Do you grow any of the cassava cuttings supplied by the Agricultural Extension? YES___ NO___
   d. If yes, which types?

   _____

   e. Do you grow the new types of maize supplied by the Ministry of Agriculture? YES___ NO___
   f. If yes, which types?

   _____

6. If you do not use any of the fertilizers, aldrin dust or other chemicals, or improved cassava and maize, what are your reasons?

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

   f. _____

7. How much money do you have for growing food crops? _____

8. How much income did you get from selling your crops last year? _____

9. How much more money will you need to grow more food crops? _____

10. What is the source of your money for growing your crops?

a. Personal money	___	d. Money lenders	___
b. Thrift and loan society	___	e. Bank loans	___
c. Agricultural Bank	___	f. Friends	___

11. a. How many farm lands do you own? _____
    b. What is the approximate total area? acres: _____ OR ojis: _____
    c. How many of the farm lands did you cultivate this year? number: _____ acres: _____ ojis: _____
    d. How many farm lands did you rent this year? number: _____ acres: _____ ojis: _____
    e. How much did you pay for the rented land? _____
    f. Can you buy more lands in your village? YES___ NO___

12. Please indicate the family, as well as hired labor, used in food crop production during the year from January to December.

	Family Labor	Hired Labor	Rates
Month	Men • Women • Children	Men • Women • Children	Men • Women • Children
JAN			
FEB			
MAR			
APR			
MAY			
JUN			
JUL			
AUG			
SEP			
OCT			
NOV			
DEC			

13. a. Do you pay your hired labor the official government wages? YES___ NO___
    b. If not, how much do you pay? YES___ NO___
    _____

14. Do you have enough labor to hire when you need them? YES___ NO___

15. Please mark an "X" next to your level of educational attainment.

Above Elementary 6 ___	Elementary 3 ___
Elementary 6 ___	Elementary 2 ___
Elementary 5 ___	Elementary 1 ___
Elementary 4 ___	Below Elementary 1 ___

16. a. Have you had any agricultural short courses? YES___ NO___
    b. If so, for how long? weeks: ___ months: ___
    c. What benefits did you derive for your farm work?

    _____

    _____

    _____

17. a. Do you read agricultural newsletters? YES___ NO___
    b. If yes, how useful is it to you?
    c. If not, why?
    _____

    _____

18. a. Do you belong to any farmers' cooperative or union? YES___ NO___
    b. How useful is it for your farm work?

    _____

    _____

Section B

19. Please say more about the crops you plant:

    a. Cassava:

    (1) How many farms did you plant cassava only? _____
    (2) How many farms did you plant cassava with other crops? number: _____ acres: _____

    (3) What is the approximate distance from your home to your farm plot? miles: _____

CASSAVA OPERATIONS AND COSTS

Operations	Labor	Cost	Month	Remarks
Bush clearing				
Burning				
Making mounds/ridges				
Planting				
Fertilizer application				
Chemical application				
Weeding, 1st and 2nd				
Harvesting				
Transporting				

b. Yams:

(1) How many farm plots did you plant yams? number: _____ acres: _____

(2) How many of the plots did you plant with yams and other crops? number: _____ acres: _____

(3) What is the distance of the farm from your home? miles: _____

(4) How many hours does it take you to walk to the farm? hours: _____

YAM OPERATIONS AND COSTS

Operations	Labor	Cost	Month	Remarks
Bush clearing				
Burning				
Making mounds/ridges				
Planting				
Fertilizer application				
Chemical application				
Weeding, 1st and 2nd				
Staking				
Training vines				
Harvesting				
Transporting home				

c. Maize:

(1) How many farm plots did you plant maize only?
number: _____
acres: _____

(2) How many of the plots did you plant maize and other crops?
number: _____
acres: _____

(3) How far is the plot from your home:
miles: _____

(4) How long does it take you to walk to the plot?
hours: _____

MAIZE OPERATIONS AND COSTS

Operations	Labor	Cost	Month	Remarks
Bush clearing				
Making mounds/ridges				
Planting maize				
Fertilizer application				
Chemical application				
Weedings, 1st and 2nd				
Harvesting				
Transporting				

Section C

20. Some farmers plant their crops on flat soil, on mounds, and on ridges. Please indicate in the table below the system of planting you adopt for each of the crops or crop mixtures you grow by marking an "X" in the spaces provided. Please also indicate whether you farm by hand cultivation or by machine.

PLANTING METHODS

Crops	Flats	Mounds	Ridges	Hand	Machine
Cassava					
Cassava/Maize					
Cassava/Yams/Maize					
Cassava/Others					

21. Inputs Used: Please supply the farm inputs of your crops.

INPUTS, RATE AND COSTS

Crops	Fertilizers		Chemicals		Seeds/Cuttings	
	Qty./acre ha	Cost	Qty./acre ha	Cost	Qty./acre ha	Cost
Cassava						
Yams						
Maize						

22. Crop Yields: Please supply the yields of your crops.

CROP YIELDS

Crops	Yield/acre ha	Crop Varieties	Month Harvested
Cassava			
Yams			
Maize			

Section D

23. Most of you consume part of your food crops and sell the remainder. Please mark what proportion of your crops you consume and what you sell.

CROPS CONSUMED AND SOLD

Crops	Proportion Consumed				Proportion Sold			
	1/4	1/2	3/4	4/4	1/4	1/2	3/4	4/4
Cassava								
Yams								
Maize								

24. How do you transport your crops from the farm to your home and the market?

_____

25. What is the distance from your home to the market? miles: _____

26. How much do you receive for your farm crops?

a. Cassava:

(1) Fresh tubers ₦ _____ (approx. 1 cwt) per basket?
(2) Gari (processed): ₦ _____ K _____ per cig. cup?

b. Yams:

(1) Fresh tubers: ₦ _____ (approx. 1 cwt) per basket?
(2) Dried tubers: ₦ _____ K _____ per basket?

c. Maize:

(1) Fresh cobs: ₦ _____ K _____ per cob?
(2) Dried ₦ _____ K _____ per cig. cup?

Section E: Research Station Data

Please supply research information for the following operations and costs.

1. PREPARATORY OPERATIONS

Operations	Labor		Tractor		Remarks
	Man-Days/ ha	Cost/ ha	Hr/ ha	Cost/ ha	
Bush clearing					
Burning/cleaning					
Ploughing					
Harrowing					
Ridging					
Bounding					

2. a. CROPS GROWN AND COSTS--YAMS

Operations	Labor		Tractor		Remarks
	Man-Days/ ha	Cost/ ha	Hr/ ha	Cost/ ha	
Seed Preparation					
Planting					
Fertilizer application					
Staking yams					
Training vines					
Weeding, 1st					
2nd					
Harvesting					
Transporting					
Sorting yams					

2. b. CROPS GROWN AND COSTS--CASSAVA

Operations	Labor		Tractor		Remarks
	Man-Days/ ha	Cost/ ha	Hr/ ha	Cost/ ha	
Cutting preparation					
Planting					
Fertilizer application					
Weeding, 1st					
2nd					
Harvesting					
Transporting					

2. c. CROPS GROWN AND COSTS--MAIZE

Operations	Labor		Tractor		Remarks
	Man-Days/ ha	Cost/ ha	Hr/ ha	Cost/ ha	
Seed preparation					
Planting					
Fertilizer application					
Weeding, 1st					
2nd					
Harvesting					
Transporting					
Shelling					
Drying					
Storage					

3. PLANT POPULATION AND INPUT RATES

Crops	Variety	Seed Rate/ ha	Spacing/ ha	Plant Population/ ha	Fert. Rate/ha	Chem. Rate/ha
YAMS						
CASSAVA						
MAIZE						

4. INPUT COSTS

Items	Yams		Cassava		Maize	
	Variety	Costs/ cwt	Variety	Costs/ cwt	Variety	Costs/ cwt
SEEDS/CUTTINGS						
FERTILIZERS						
DUSTS/SPRAYS						
YAM STAKES						
TYING ROPES						

5. CROP YIELDS

Crop	Variety	Yields/ha (cwt)	Number of Months at Maturity	Remarks
YAMS				
CASSAVA				
MAIZE				

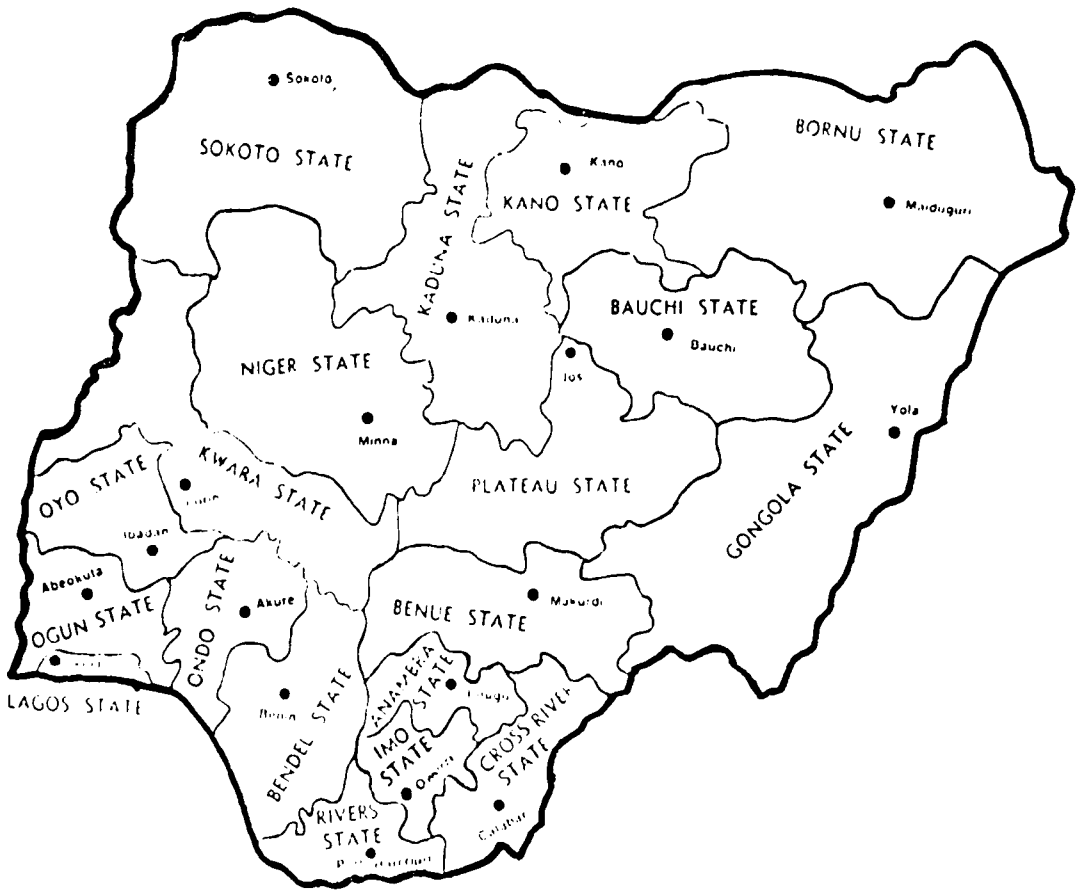
6. CASSAVA STARCH CONTENT AND GARI QUALITY

Variety	Age at Harvest in Months	Starch Content/ cwt Fresh Roots	Gari/ cwt Roots	Quality

APPENDIX B

APPENDIX B

MAP OF NIGERIA SHOWING THE 19 STATES



VITA

Dan James Nwaogbo was born in Ntalakwu Oboro, Ikwuano-Umuahia, Nigeria in April 1930. He attended the Methodist School, Ndoro, and Qua Iboe Mission School, Oloko, Umuahia, before entering Boys High School, Etinan, Uyo, and later Kalabari National College, Buguma, and was graduated from Senior High School in December 1947.

He taught at the Assembly of God School, Ntalakwu Oboro, from January 1948 to September 1949 before joining the Federal Public Service of Nigeria in December 1949. He entered the School of Agriculture, Ibadan, Nigeria in September 1952 and graduate in March 1954 as Agricultural Assistant. After working in various Agricultural Experiment Stations, he entered the School of Agriculture, Umudike in 1960 for an Agricultural Superintendent course. Upon graduation in December 1960, he worked in two farm settlements in Eastern Nigeria.

In May of 1967, he entered the University of Wisconsin, Madison. He graduated with a B.S. degree in Agriculture in January 1970 and an M.S. degree in Agricultural Economics in January 1971.

He taught at the Federal School of Agriculture, Umudike, Umuahia before entering Graduate School at The University of Tennessee, Knoxville in Fall 1976. He received the Doctor of Education degree in Vocational-Technical Education, with a cognate in Agricultural Economics, in August 1981.

He is married to the former Matilda Afuka Ubani. They have two daughters, Chinenye and Nkechinyere, and a set of twin boys, Emenike and Chijioke.