

AN ANALYSIS OF THE DEMAND FOR CERTIFIED SEEDS OF MAIZE
AND RICE IN ONDO STATE, NIGERIA.

By *

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ABSTRACT

This study was undertaken to provide baseline information on the socio-economic characteristics and buying habits of farmers purchasing certified seeds of maize and rice in Ondo State; identify sources of supply of the certified seeds to the State; estimate the factors which influence the demand for the certified seeds in the State in 1993 and 1994; examine the constraints limiting increased use of the certified seeds by farmers in the State and offer suggestions towards increased use of the two types of seeds in the State.

Data collected from 196 growers chosen through multi stage random sampling were analysed using frequency distribution, simple proportions and multiple regression analysis. Results showed that the mean age of the growers was approximately 52 years, while more than 70.0% of them had field sizes less than 2.0 hectares for both crops. Rice was generally grown sole while maize was mixed cropped with other food crops such as cassava and yam. They ranked improved seeds higher than any other input and had buying habits such as buying the quantities of improved seeds needed in one season and planting the progeny thereafter, purchasing the quantities at the time of planting and storing them over time for planting as a hedge against inavailability or inadequate supply of certified seeds during the planting season. Late and inadequate supply of improved seeds and inadequate finance to purchase these seeds constituted constraints to increased demand for them.

Regression results showed that the hypothesized regressors; own-prices of seeds; prices of substitute/complement; farm sizes, distances travelled (to purchase certified seeds) and expected outputs of seeds explained 66.6% and 64.0% of the variations in the quantities of maize purchased. A similar set of

regressors explained 54.5% and 50.8% of the variations in the quantities of rice demanded in 1993 and 1994 respectively. The demand for both seeds was inelastic with respect to own-price. However, the cross price elasticity of demand indicated that the price of rice was elastic with respect to the quantity of maize demanded in 1994 while that of maize was elastic with respect to the quantity of rice purchased in 1993. The demand for both seeds *was* complementary except in 1993 when the demand for rice appeared competitive with that of maize.

Suggestions towards increasing the demand for the certified seeds in the State include increase in farm size; timely supply of the seeds and complementary inputs such as fertilizers and herbicides; the encouragement of young school leavers to go into farming and the private sector to participate more in the production, processing, marketing and distribution of certified seeds of maize and rice.



CERTIFICATION

I certify that this project work was carried out by Foluso O. Osundare of the Department of Agricultural Economics and Extension, Federal University of Technology, Akure.



Dr. Esan A. Aderinola.

Supervisor.

Date: 16 March 1998



DEDICATION

This project work is dedicated to my mother Mrs. Fasinmiwa Osundare for her love and understanding during the course of this study.



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I am grateful to the Almighty God for sparing my life and for giving me the courage and patience to complete my Masters degree. To Him be the glory and adoration.

I am particularly grateful to my supervisor Dr. Esan A. Aderinola who by his painstaking supervision and general involvement despite his commitments as the ASUU Chairman, provided the much needed academic guidance that made this study a success. I pray that God will prosper him in all his undertakings.

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TABLE OF CONTENTS

	PAGE
Abstract	i
Certification	iii
Dedication	iv
Acknowledgement	v
Table of contents	vi
List of tables	viii
List of figures	x
CHAPTER ONE	
1.0 Introduction	1
1.1 Problem statement	1
1.2 Certified seeds and increased food crop output	5
1.3 Importance of maize and rice in Nigeria's food economy	7
1.3.1 Maize (<u>Zea-mays</u>)	7
1.3.2 Rice (<u>Oryza sativa</u>)	10
1.4 Justification for the study	12
1.5 Objectives of the study	13
CHAPTER TWO	
2.0 Literature Review	14
2.1 The Theoretical background of input demand	14
2.2 Review of empirical studies	17
CHAPTER THREE	
3.0 Research methodology	24
3.1 Sampling procedure and data collection	24
3.2 Methods of data analysis	26

CHAPTER FOUR

4.0	Production, supply and distribution of certified seeds in Nigeria	30
4.1	Historical background	30
4.2	Processes of certified seed production	32
4.3	Distribution of certified seeds	37

Chapter five

5.0	Results and discussion	43
5.1	Socio-economic characteristic of the respondents	43
5.1.1	Age distribution and household sizes	43
5.1.2	Major occupation, farm sizes and proportion of annual income from farming	44
5.1.3	Farming experience and cropping system used	47
5.2	Sources of information and supply of certified seeds in ondo state	48
5.3	Buying habits and ranking of farm inputs	54
5.4	The varieties of maize and rice seeds grown by the respondents	56
5.5	Reasons for growing certified maize and rice seeds	58
5.6	Problems encountered in the use of certified seeds	60
5.7	Estimated demand models	63
5.7.1	Maize demand models	63
5.7.2	Rice demand models	65
5.7.3	Cross-price elasticity of demand	66

Chapter Six

6.0	Summary of major Findings, Policy Implications and Recommendations	68
6.1	Summary of major findings	68
6.2	Policy implications of major findings and recommendations	69
	References - - - - -	73

LIST OF TABLES

TABLES	PAGE
1. Actual and Potential Yields of Cereals and Tuber Crops in Nigeria	8
2. The Distribution of the Respondents	25
3. Foundation Seed Production by National Seed Service	34
4. Certified Seed Production by ADPS/SSMUs in Nigeria	36
5. 1992 Foundation Seed Distribution in Nigeria	40
6. Age Distribution of Growers of Certified Maize and Rice Seeds in Ondo State	43
7. The Distribution of Respondents' Household Sizes	44
8. Frequency Distribution of the Respondents' Major Occupation...	45
9. Frequency Distribution of the Proportion of Respondents' Annual incomes earned from farming	45
10. Frequency Distribution of Respondents' Maize Farm Sizes in 1993 and 1994	46
11. Frequency Distribution of Respondents Rice Farm Sizes in 1993 and 1994	46
12. Foundation Seed Supplied to Ondo State in 1992 and 1993	48
13. Ondo State ADP Foundation Seeds of Maize and Rice Requirement, 1992	49
14. Quantity of Certified Seeds of Maize and Rice Supplied and Demanded in Ondo State from 1991-1994	50
15. Quantity of Certified Maize and Rice Seeds Supplied to Ondo State AISC from 1992-1994	51
16. Frequency Distribution of Sources of Improved Seeds to Respondents	52

17.	Sources of Information on Availability of Certified Seeds of Maize and Rice in Ondo State	52
18.	Frequency Distribution of the Respondents Reason for Growing Traditional Seed Varieties	53
19.	The Buying Habits of Growers of Certified Maize and Rice Seeds in Ondo State	54
20.	Frequency Distribution of the Respondents' Reasons for Storing Certified Seeds	55
21.	Order of Ranking of Improved Seeds and Supplementary Farm Inputs by Respondents	56
22.	Frequency Distribution of the Varieties of Maize Seeds Grown by the Respondents	57
23.	Frequency Distribution of the Varieties of Rice Seeds Grown by the Respondents	58
24.	Frequency Distribution of Respondents' Reasons for Growing Certified Seeds of Maize and Rice	60
25.	Frequency Distribution of the Constraints to the Acquisition and Use of Certified Seeds	61
26.	Estimated Demand Models for Certified Maize Seeds in Ondo State Nigeria, 1993 and 1994	63
27.	Estimated Demand Models for Certified Rice Seeds in Ondo State Nigeria, 1993 and 1994	65
28.	Cross-price Elasticity of Demand for Certified Maize and Rice Seeds in 1993 and 1994	67

LIST OF FIGURES

1. Trends in Per Caput Production of Food and Cereal Crops
in Nigeria, 1980-'95 2
2. Secular Pattern of Growth in Nigeria's Total Value of Food
Imports, 1970-1990 2a &b
3. The Flow of Improved Seeds to Nigeria Farmers 43

CHAPTER ONE

1.0

INTRODUCTION

1.1 Problem Statement

Nigeria's inability to feed her teeming population has remained an intractable problem for almost three decades! Although, there has been no major famine, the country has failed to produce food in adequate quantity and quality to feed her populace. In realization of this problem, the authors of the fourth National Development Plan (1981-85) claimed that the country's domestic food production was growing at 1.0% while population (that is food demand) was growing at over 3.5% per annum.

According to FAO (1986), Nigeria's population and food production growth rates (between 1980 and 1986) were approximately 3.4% and 3.0% per annum respectively. More recent information show that the food situation has not improved either. Imoudu (1992) claimed that Nigerians could be said to be starving because the rate of domestic food production had continued to fall below population growth rate, thereby creating a situation of food shortages and scarcity.

Figure 1 gives a bird's eye-view of Nigeria's food problem. The figure shows that per caput food and cereals production had negative trends and fluctuated widely from 1980 to 1995. The mean annual growth rates for food and cereal crops' production during the 1980 to 1995 period were approximately 0.9% and 0.6% with standard deviations of 5.8% and 14.4% respectively. The sharp decline in food and cereal crops production from 1983 to 1984 could be attributed to the discontinuation of the food production programme (the Green Revolution Programme) of the Civilian Government during the Third Republic by the Military Government which toppled the former in December 1983.

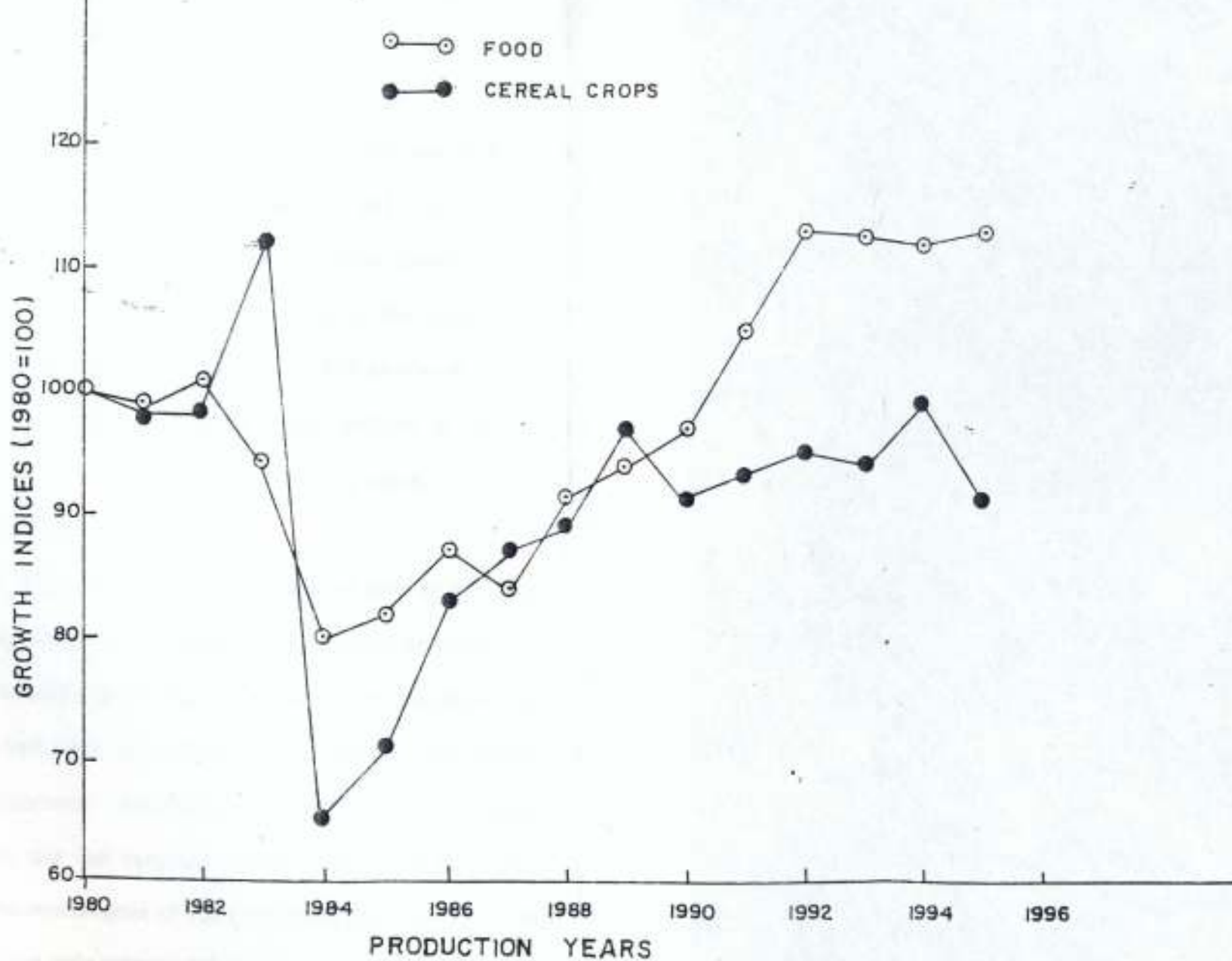


FIGURE 1: TRENDS IN PER CAPUT PRODUCTION OF FOOD AND CEREAL CROPS IN NIGERIA, 1980-95
(1980=100)

Attempts to solve the country's food crisis consist of two approaches namely, importation of essential food commodities as a short-term measure and increased domestic food crops' production as a long-term solution. Available data show that Nigeria's food import bills rose rapidly from 1970 to 1990. The observed drop in the value of total food for the country from 1981 to 1984 was due to the economic depression experienced by the country since 1981. Although the importation of food commodities such as maize, rice and wheat (which could be produced locally) was banned from 1985 to 1996, the value of the country's total food imports commenced another round of increases in 1985 as shown by figure 2. The total food import bills of Nigeria rose from N58 millions in 1970 to a colossal sum of N3,764 billions in 1990 with a mean annual value of N1,038.67 billions and a standard deviation of N881.74 million.

However, the relatively high nominal total food import bills of the country from 1986 to 1990 were influenced by the devaluation of the National Currency—the Naira. The high food import bills of Nigeria was a big drain on the country's scarce foreign exchange earnings which were needed for the importation of capital goods needed for economic development. According to Aderinola (1983), Nigeria's reliance on food importation did not only distort her agricultural economy, it exposed her unwittingly to the misfortunes of the food exporting countries. Thus, Aderinola (1983) opined that the only rational solution to the problem of providing a long-term solution to food shortage in the country lied in speeding up the rate of domestic food production.

Attempts at finding long-term solutions to food demand shortages in the

2b

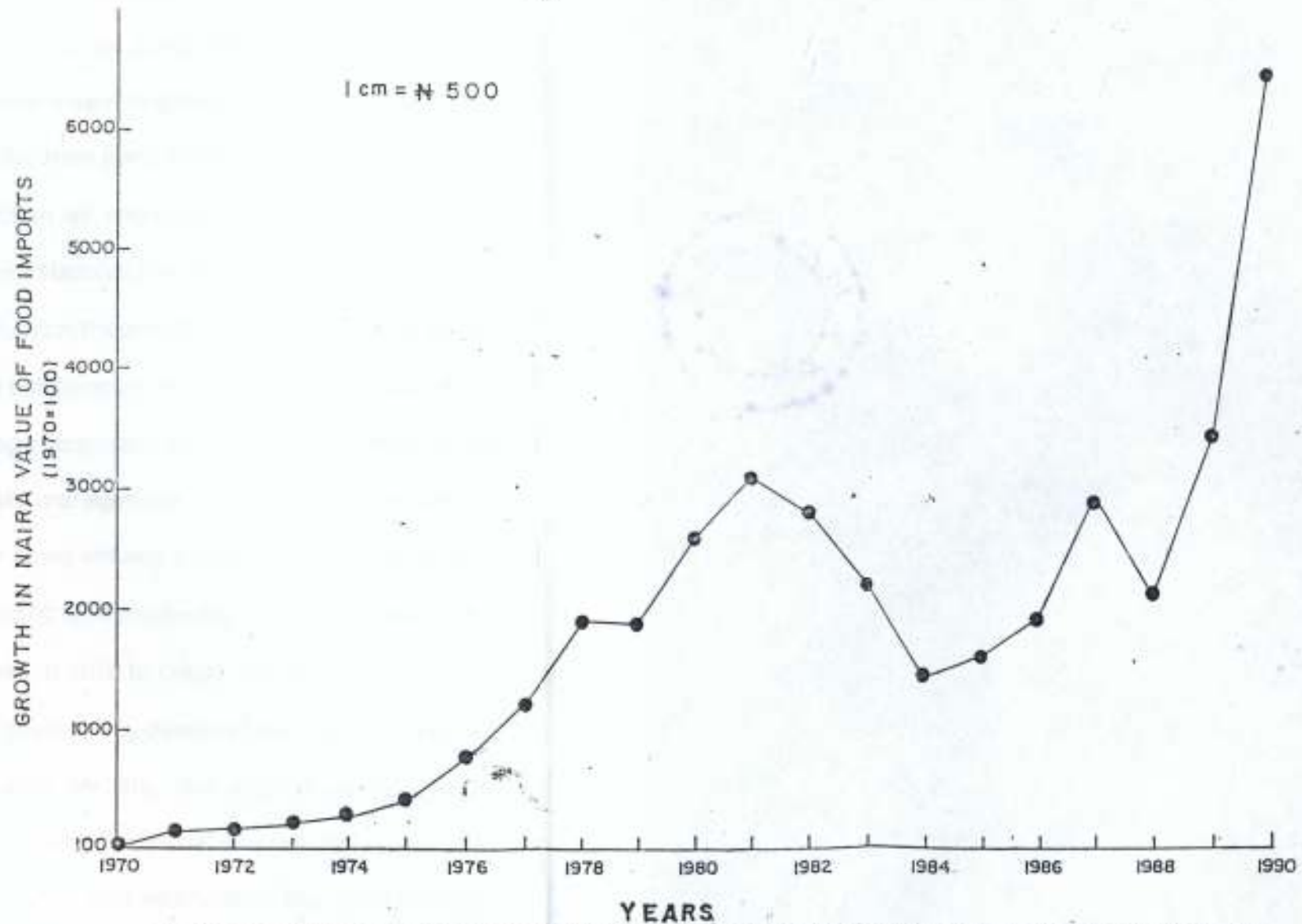


FIGURE 2: SECULAR PATTERN OF GROWTH IN NIGERIA'S TOTAL VALUE OF FOOD IMPORTS, 1970-1990
(1970=100)

country included the National Seed Multiplication Scheme (NSMS), the Nigerian Agricultural and Cooperative Bank (NACB) and the River Basin Development Authorities (RBDAS). Launched during the second National Development Plan (1970-74), the NSMS was aimed at multiplying and distributing improved seeds of maize, rice, cassava and pulses to farmers throughout the country. On the other hand, the NACB was established to provide production credits to farmers at affordable costs while the RBDAS were meant to provide irrigation water for food crops production, especially in the Northern parts of the country. Continuing the objective of increased food production as enunciated in the Second National Development Plan (1970-74), the Third National Development Plan (1975-80), had the National Accelerated Food Production Project (NAFPP) as a cardinal strategy for the achievement of Nigeria's self-sufficiency in domestic food production. The NAFPP was designed as a package approach to bring high - yielding seed varieties, fertilizers, credit and better management to farmers. Nine additional RBDAS were established in 1976 to cover virtually all States in the country at that time. Other strategies to boost domestic food production were the Operation Feed the Nation (OFN) which was launched in 1976 to create awareness of the need to use available land to produce food, even by city-dwellers; the establishment of the Agricultural Credit Guarantee Scheme (ACGS); the Agricultural Development Projects (ADPs); the Agricultural Insurance Scheme and the Green Revolution Programme (GRP). According to Adesimi and Aderinola (1983), the GRP used a package approach of land clearing services, the RBDAS, credit, massive fertilizer imports, Commodity Boards and Agricultural Insurance Services to boost food production.

Still pursuing the goal of "self-sufficiency" in food production, the country's National Development Plans in the late 1980s and the Rolling Plans of the early 1990s to date had also embarked on many projects towards increasing the output of food crops nation-wide. The importation of maize, rice and wheat was banned in October 1985 to pave way for increased local production while the exchange rate of the Naira was deregulated "to make Nigerian's exports more competitive" in the international market.

Other measures were the dissolution of Commodity Boards, the promotion of agricultural exports, the dissolution of the Directorate for Food, Roads and Rural Infrastructures (DIFFRI), the Agricultural Programme of the National Directorate of Employment (NDE) and the establishment of the National Agricultural Land Development Authority (NALDA) which is meant to provide land preparation and extension services to farmers throughout the country.

Notwithstanding, the efforts narrated above to help achieve sustainable increases in Nigeria's food output, the problem of food supply shortages has remained largely unresolved. The seemingly untractable problem of food supply shortages in the country could be traced to a number of inter-related factors. They include lack of dramatic break-through in agricultural production in which entrepreneurs can profitably invest (Adesimi, 1976a, Idachaba, 1980 and Aderinola, 1983); unwillingness of the entrepreneurial class to devote organizational abilities to food production (Aderinola, 1983); inefficient storage, marketing and distribution system (Ilori, 1967 and Adesuyi, 1976); urban-in-migration of rural youths (Olayide, *et al* 1972; Adesimi, 1976b); low status accorded farmers in the Society (Aderinola, 1983); lack of political commitment of government to agricultural (food) and rural

development as well as high population growth rate coupled with higher rate of urbanization in the absence of a coherent population policy to support development policy (FAO, 1986) and unstable political system and food production programmes (Aderinola, 1989).

1.2 Certified Seeds and Increased Food Crop Output

It is a truism that there cannot be a revolution in agricultural productivity without a break-through in agricultural innovation (preferably endogenous). Such a break-through may be biological, chemical or mechanical or a combination of two or all of these innovations (Aderinola, 1983). For instances, the increases in Japan's agricultural productivity ~~were~~ due to a combination of biological and chemical innovations which resulted in substantial increases in crop output per unit of land, thereby loosening the constraints imposed by land scarcity and high land prices (Essang 1975). On the other hand, the dramatic increases in the United States of America's (USA's) agricultural productivity resulted from the introduction of mechanical power, which being labour-saving, loosened the constrained imposed by labour scarcity and high wages.

Biological innovations as a means of raising land and labour productivities are a result of certain attributes of crop seeds which are certified with the issuance of certificates guaranteeing the attributes by a third party. These attributes consist of improved genetic ^{performances} which may include resistance to disease and pest attacks, better response to fertilizer use, drought resistance, early maturity, day-length neutrality or a combination of two or more of these attributes - all of which lead to higher potential crop yield per unit of land. Although all certified seeds have improved attributes, not all improved seed varieties are certified.

Certified seeds are the most important input for boosting crop production and without them, no country can achieve a revolution in agricultural productivity. According to Usman (1994), the production of certified seeds does not only improve the economy of local seed growers, it is one of the best means of transferring technology. Usman (1994) also claimed that certified seed was not only the cheapest and basic means of increasing crop yield, it was also fundamental to raising the efficiency of other agricultural inputs. In this connection, an efficient agricultural input delivery system must make high quality seeds of improved crop varieties available to farmers at the right time and place and in adequate quantity together with other complementary inputs necessary for the realization of the potentials of certified seeds. Therefore, a strong and viable seed production and delivery system is indeed necessary for self-sufficiency in food production (Edache, 1994). Although, there is a general recognition of the importance of improved seeds as a means of increasing yields by many Nigerian farmers due to the activities of the National Seed Service (NSS); the on-farm Adaptive Research (OFAR) and extension efforts of the ADPs, many farmers have restricted access to certified seeds (Falusi, 1994).

Available information show that considerable achievements have been made in developing, testing and certifying high-yield varieties (HYVs) of seeds for many of our major food crops by various Research Institutes, Universities and Colleges of Agriculture as presented in Table 1. The table shows that there are certified seeds, the potential yields^{1/ha} of which are much higher than the actual yields/ha obtained, *ceteris paribus*. For example, the table shows that the potential outputs/ha of the cereals ranged from 166.7% and 385.7% of the actual yields/ha

Table 1: Actual and Potential Yields of Cereals and Tuber Crops in Nigeria

Crops	Actual Yield (t/ha)		Potential Yield (t/ha)		Potential as % of Actual Yield
	Range	Mean	Range	Mean	
Upland rice*	0.080-120	1.00	1.50-2.50	2.00	2000.0
Lowland rice	1.00-2.00	1.50	2.50-8.00	5.25	350.0
Maize*	1.50-2.00	1.75	3.50-10.00	6.75	385.7
Sorghum	0.50-2.00	1.25	2.00-2.50	2.25	180.0
Millet	0.50-1.00	0.75	1.00-1.50	1.25	166.7
Wheat	0.50-1.00	0.75	1.00-2.00	1.50	200.0
Cassava	11.00-12.00	11.50	25.00-40.00	32.50	282.6
Irish Potato	10.00-12.00	11.00	14.00-15.00	14.50	131.8
Sweet Potato	10.00-12.00	11.00	14.00-15.00	14.50	131.8
Yam	12.00-14.00	13.00	18.00-20.00	19.00	146.2

Note *indicates crops (seeds) of interest to this study.

Source: Usman, I.A. Maini, N. S., Joshua, A & Falusi, A.O. (1992): Strategies for the National Seed Sub-sector Development Plan, National Seed and Quarantine Project Report, National Seed Service, Federal Department of Agriculture, P7.

with those of maize and upland rice being approximately 386.0% and 200.0% respectively. For tuber crops, cassava has the highest potential yield/ha which almost quadruples its actual yield/ha (see table 1). The implication of the above is that, there are available in the country, varieties of cereal crops, the seeds of which are capable of doubling or tripling the outputs/ha obtained at present all other factors remaining unchanged.

1.3 Importance of Maize and Rice in Nigeria's Food Economy

1.3.1 Maize (Zea mays):

In terms of hectareage planted, maize is the third, most important cereal crop in Nigeria after sorghum and millet respectively. However, maize is the single,

most important grain crop in the Southern parts of the country, especially because of its relatively higher protein content which makes it nutritionally superior to root crops which are predominantly cultivated in these areas.

Although, maize can be cultivated in virtually all ecological zones of Nigeria, the South-Western States of the country, namely, Oyo, Osun, Ogun, Ondo, Ekiti, Kwara and Kogi, account for over 40.0% of the total annual maize output because of the relatively high and conducive annual precipitation of between 1,016mm and 2,032mm. The greater importance of maize in the Western parts of the country, especially in Oyo, Ibadan and Ilaro areas is based on cultural preferences for maize diets which range between 2.6kg and 2.8kg per caput per week. (Agboola, 1979). Besides, the maize crop is the "hunger breaker" in these areas in that it is the only foodstuff which is available during "hunger period" when farmers work on their new food crop farms.

Agboola (1979) also posited that with the exception of middle-belt; there is a systematic decline in maize production northwards. However more recent work done by the IITA shows that maize is produced more in the north than in the south, Agboola (1979) also adds that North of the rivers Niger and Benue, maize is cultivated as a famine-period crop in that it matures earlier than the major cereal crops (millet and sorghum), thereby providing the much-needed food when the grain stocks have run low. Food crop production activities of the Gombe enciave ADP proved that with the use of fertilizer, maize production, which before the project was a minor crop became a profitable commercial farm enterprise venture in many parts of the defunct North-eastern state (Daplyn, 1982). In the Eastern parts of the country, maize cultivation is limited by the wetter than ideal conditions of 2,036 - 3,048mm of rainfall per annum (Agboola, 1979). It should be noted also, that the availability of early maturing and drought resistant varieties of maize has made possible maize cultivation in the arid and semi-arid zones of the North-eastern parts of the country, especially, in Borno and Yobe states.

In Nigeria, maize is used for both human and livestock consumption with the latter use becoming very competitive to the former. For direct human consumption, maize is eaten, boiled or roasted "on the cob". Other forms of preparing maize for food include boiling the grains with beans and other condiments; soaking and milling the grains, sieving the paste in water and making it into pap, ("Ogi/akamu") or boiled into moderately hard paste wrapped in leaves and eaten with mashed beans (ewa), fried beans paste ("akara") or boiled beans paste ("moin-moin") when cold. Dry maize grains are also ground to make "tuwo masara" (maize meal) or flour to make bread. In certain parts of the country,

maize grains are used for the preparation of drinks and/or food drinks in addition to their uses as staple foods. And as an industrial raw material, maize is used as the leading energy component in livestock feeds, especially for poultry. In recent years, the high and rising cost per tonne of maize has been a major problem threatening the poultry industry in the country.

Because of its importance in the food crop economy of the country, maize has remained one of the six food crops through which successive governments have been planning to make Nigeria become "self-reliant" in food production. The other food crops are rice, millet, guinea-corn, cassava and the pulses. Thus, the programmes already tried to promote maize production by various governments in the country since the early 1970s include the NAFPP, the OFN, ADPs, GRP, Back-to-land programme (BLP) together with some credit and crop yield insurance schemes and back-up Extension Services. Notwithstanding these programmes, available statistics show persistent huge deficits in the demand for and supply of maize in the country. The major causes of poor maize production in the country include little or no fertilizer application; poor weed management practices; environmental stresses; the use of low yielding seeds varieties which are also susceptible to disease and pest attacks and lack of understanding between the researcher, the extensioner and the farmer.

1.3.2 Rice (*Oryza sativa*)

In Nigeria, rice is among the least important cereal crops in terms of hectareage under cultivation and food crop output. Nevertheless, the rice crop commands much higher value than any other grain crop in the country. According to Okigbo (1962) one tonne of rice was worth about three times the value of other

cereals. Until recently, rice was widely regarded as a superior food commodity which was consumed mainly by city dwellers and the middle and high income groups in Nigeria (Agboola 1979). As a grain crop, rice is grown in virtually all ecological zones of the country mainly for cash purposes.

Although, it has been cultivated in the country for about three hundred years, its importance in the nation's food economy started to receive attention during the past three decades when the ^{Shortage in} supply of ^{other} traditional food commodities became acute. Before that time, rice consumption was limited to city dwellers, high income groups and during festive occasions such as the Christmas and New Year Celebrations. However, increased national population, increased per caput national income; rapid urbanization; changes in tastes and preferences; shortage of traditional foodstuffs such as yam, maize, guineacorn and millet in the early 1970s, coupled with the availability of cheap, well processed and easy to prepare imported rice made rice consumption a household menu in the country since the mid 1970s. According to Alao *et al* (1979), rice had become a favourite menu which was eaten at least once in every three meals in Nigeria, even among the "Iyan eating" people of Ondo State. The marginal propensity of Nigerians to consume imported, long-grain, par-boiled rice and its ready availability in the country adversely affected the domestic rice industry from the mid-1970s to mid-1980s. Many local rice growers abandoned the enterprise with the resultant decline of the nation's "self-sufficiency ratio" in rice production from 99.9% in 1971 to 15.1% in 1983.

Considering the huge drain which food import bills constituted to the dwindling and scarce foreign exchange earnings of the country, the Federal Military

Government of Nigeria in 1985 through 1995 banned the importation of rice, maize and wheat all of which could be produced in the country. The ban on rice importation encouraged local farmers to commence investment of productive resources in rice cultivation once again. According to Winslow and John (1989), the higher prices per tonne of locally produced rice, stimulated farmers to increase substantially, their output of rice paddy.

1.4 Justification for the Study

Although a number of HYVs of seeds have been developed and tested in Nigeria by various Research Institutes, Universities and Colleges of Agriculture, many of these seeds are either not available to farmers or are not adopted because they do not conform with the socio-cultural background of the farming communities to which they are introduced. Even when they are adopted, supplementary inputs such as fertilizers, irrigation water, credit and pesticides needed to obtain optimum output from the HYVs of seeds are not available. Koinyan (1988) observed that the quantity of HYVs of seeds available to farmers in Nigeria was low and that with increased promotional efforts, well remunerative food crop prices and greater commercialization of food crop production, the demand for improved seeds in the country would continue to increase all other factors remaining the same. Similarly Adesimi (undated) observed that despite the fact that most of the large increases in food production which had occurred in different parts of the world had been associated in one way or another with the use of new forms of inputs, little was known quantitatively (particularly in most developing countries) about the nature of demand for them. Nigeria's National

seed supply (NSS) has once lamented that there is no reliable information on actual demand for improved seeds in the country. This implies that the projection for high quality seeds in Nigeria has not been based on reliable data!

In view of the above, this study was aimed at providing bench-mark information for the demand for certified maize and rice seeds in Ondo State of Nigeria.

1.5 Objectives of the Study

The objectives of the study are:

- (1) to provide baseline information on the socio-economic characteristics of farmers buying certified seeds of maize and rice and their buying habits in Ondo state of Nigeria.
- (2) to identify and discuss sources of supply of certified seeds to Ondo State;
- (3) to identify, quantify and estimate the factors influencing the demand for certified maize and rice seeds in the State in 1993 and 1994;
- (4) to examine the constraints limiting increased use of certified maize and rice seeds by farmers in Ondo State and,
- (5) to offer policy suggestions for increased use of certified seeds of maize and rice in the State.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Theoretical Background of Input Demand

According to Good and Hatt (1952), empirical research is an intricate relation between theory and fact. An understanding of what investigators actually do when they engage in research reveals that they are very much concerned with both theory and fact. From the scientific stand point, a fact is regarded as an empirically verifiable observation while theory refers to the relationship between fact (Good and Hatt (1952). This means that a theory is a vehicle by which empirical observations are verified. Hence, a good starting point for any scientific research is a clear statement of the theoretical considerations of the subject being investigated. This becomes obvious when it is realised that as a tool of scientific inquiry, theory:

- (1) offers a conceptual scheme by which the relevant phenomena are systematized, classified and inter related and
- (2) defines the major orientation and kind of data that are relevant.

Economic studies involving factor demand analysis may be undertaken using two main theoretical approaches. The first approach makes the production function the basis of farm input demand in recognition of the fact that input are purchased for the sake of the contribution they make to production. Hence, the demand curves for inputs are derived from the production function on the assumption of profit maximisation.

According to Olayide et al (1980), any modern farm input, be it fertilizer, improved seeds, plant protection chemicals is a market purchased variable factor

of production. They explained that in each production period, the mobilization of any modern input ultimately depended on the farmer's demand for it. A farmer's demand for a farm input is an outcome of two decisions namely: whether or not to use the input and what quantity of it to use. In the final analysis, these decisions are influenced by the expected returns from the use of the input. In addition, what serves as an output in one situation may serve as an input in the other. For example improved seed which serves as an output to seed production companies also serves as an input to commercial farmers who want to expand their crop output.

Thus, there is a close link between input demand and product demand.

However, Jingan (1977) noted two differences between input demand and product demand. First, he argued that the demand for a product was a "direct demand" based on its expected marginal utility while the demand for an input was derived from the demand for its product. Secondly, he claimed that the supply of a product depended on its cost of production while the supply of an input depended on its opportunity cost. Nevertheless, Jingan (1977) posited that the demand for input is similar to the demand for product in that pricing of inputs such as entrepreneurship was influenced by social and human factors.

Following the postulates of economic theory, the demand for input generally depends on the price of the inputs, the prices of other inputs and the price of its product. For example if there were no demand for maize grain as a commodity, maize farmers would have no demand for maize seed and, if the demand for maize grain increases substantially, the demand for maize seed will also increase as existing growers seek to expand output and perhaps as new maize farms which

require maize seeds are set up.

The second approach uses the demand theory directly as basis for constructing the demand function specific to each input used in production. One of the advantages of this approach is that it permits the researcher a wider choice with regards to model specification. In this connection, a generalized input demand function in an implicit format can be specified as:

$$D_i = f(P, q, r_i, r_s, r_c, v, a, b) \dots \dots \dots (1)$$

where

D_i = quantity of input i used ($i = 1, 2, 3 \dots n$);

r_i = price per unit of factor i ;

r_s = price per unit of close substitute;

v = vector or index number of the prices of all other inputs;

P = unit price of the product to be produced;

q = output of the farm;

a = measure of neutral technical progress in the production functions;

b = the measure of non-technical progress.

The price of a commodity and the prices of the inputs used are important factors in the determination of economic optimum in any of production process. Thus economic theory stipulates that an input is optimally used where its marginal physical product (MPP) is equal to the ratio of its price to that of the product. In other words, an input is optimally utilized where its marginal value product (MVP) equals its price that is $MVP_x = P_x \dots (2)$

where;

MVP_x = marginal value product of input x , P_x = price per unit of input x .

2.2 Review of Empirical Studies

A survey of literature on farm input demand in Nigeria reveals very few quantitative studies, viz: Adesimi (undated), Chromaty (1959), Idachaba (1976), Ladipo and Adeyemo (1980) Momathemba (1976) and Phillips (1988).

Adesimi (undated) used time series data to estimate a farm demand ^{model} for fertilizer. He postulated that the desired level of fertilizer use in maize production was a function of the current price of fertilizer, lagged price of maize, and the hectareage of land currently planted to maize. Changes in the logarithmic transformation of the actual level of fertilizer use were postulated to be proportional to the differences between the logarithms of the desired and actual levels of use.

The objective of the study was to develop a farm demand model for fertilizer with a view to estimating demand statistics with respect to the economic variables that could be manipulated to achieve policy objectives.

Results showed that both product and input prices together with the planted hectareage affected fertilizer demand. All the coefficients were significantly different from zero at 1.0% to 5.0% levels. Although the estimated coefficients bore signs consistent with economic theory the estimated elasticities of adjustments were low.

According to Griliches (1959) the relatively low elasticities of adjustment suggested that some socio-economic constraints inhibited adjustments of fertilizer to desired levels. These constraints were short history of fertilizer use among the ^{farmers} respondents, lack of complementary factors, physical scarcities of fertilizer and problem of distribution when the fertilizers reach the states. He also ^{found} that farmers usually experienced some difficulties in having access to fertilizers because only influential farmers got them from the Agricultural Input supply company.

Mechanisation is very advantageous in agricultural production not only in terms of the cost effectiveness, but also in terms of timeliness of farm operations and increase in cultivated land area. Chromaty (1959) in his study examined the farm demand for tractors, machinery and trucks with the aim of identifying the factors determining farm demand for tractors, trucks and machinery services. He used OLS to estimate the demand for farm machinery on the assumption that the price of machinery ^{was} not influenced by the current sales of machinery. The explanatory variables estimated were current sales, machinery prices and their output, net farm income and farm wage rate. According to him, fitting a theory of consumer demand to the purchase of durable inputs has some problems:

- (1) the believe that purchases should vary inversely with the price of input and with the consumer's income is not always true. For example observation of machinery purchase data revealed that about ^{half} of the tractor tillage and seeding equipment sales occur in the first-four months of the year;
- (2) the price of some machines are fixed for a period of time. Some manufacturers set prices at the beginning ^{of the year} and do not fluctuate as sales occur;
- (3) it is often hypothesized that machinery-labour substitution exists in agriculture meaning that the price of the farm labour should affect the demand for machine;
- (4) the age distribution of the machinery affects replacement rates.

The results of the regression analysis showed that a 10.0% increase in machine prices had been accompanied by a 10% decrease in machine purchases, 10.0% increase in the value of assets led to 6.0% increase in demand for machines

while 10% increase in net farm income led to 5% increase in machine purchases. However the coefficient for farm wage rate was negative meaning that it did not support the hypothesis that machinery is substituted for labour as farm wages rise.

Idachaba (1976) examined the demand for pesticides in the cocoa belts of the defunct Western State (now Ekiti, Ondo, Ogun, Osun and Oyo States). Idachaba (1976) estimated the demand for gammalin 20 and copper sulphate in the old Western State using time series data from 1959 - 1971. OLS, method he postulated that the quantity of chemicals demanded was a function of current own price of pesticide, price of cocoa and farmers' income. The model was based on the general production function in which price elasticity was expressed as weighted sum of input elasticities of demand with respect to crop price where the weights were the production elasticities of the respective inputs. The results showed that the pesticides demand curve faced by the cocoa farmers was consistent with economic theory and that it was downward sloping; the demand for pesticides which had been influenced by pesticide subsidies greatly contributed to increased on -farm application of the pesticides studied; reductions in pesticide demand could be attributed to low cocoa producer prices as well as marketing Board taxes. In order words, the demand for the pesticides were more responsive to changes in their prices than to changes in the prices per tonne of cocoa.

Ladipo and Adeyemo (1981) studied the demand for mechanization service by food-crops farmers in Oyo State of Nigeria. The objectives of the study were to determine the farmers' response to partial mechanization; indicate the economic advantages that partial mechanization could bestow on farmers and to compare the cost and the benefit of partial mechanization with those of manual operation.

the cost and the benefit of partial mechanization with those of manual operation.

The cost of ploughing harrowing and ridging were estimated and compared with what it will be when the same volume of operation is done by manual labour. Data were collected from five Local Government Council in which agricultural input service centres were located. The data were collected from monthly reports and financial years between April and September during the peak period of demand for mechanization services.

Results showed that the total area of land for which mechanization services demanded per month in Iwo were 30.15ha and 20.5ha in 1978 and 1979 respectively. The cost of mechanisation was N587.7 and N467.7 while manual operation cost N9045 and N7655 in 1978 and 1979 respectively. The quantity of service demanded and executed in Ibadan on the average was 258.05 ha and 160.55 ha respectively within the same period. The cost of mechanisation was N4839 and N3046.16 while that of manual was N7740.5 and N4810.5 in 1978 and 1979 respectively. The trend was the same in Ilesa. The cost of partial mechanisation was N1832.6 and N188.8 in 1978 and 1979 while the same area cost N33,168 and N53,181 respectively if manually prepared.

The study indicated that the demand for mechanisation was heaviest in the months of April, May, August and September which are preparatory months for planting of crops for each season. Also, there was cost advantage in mechanisation over manual operations when both were compared with a price ratio of 0.061- meaning that if one hectare costs N100 with manual operation, it will cost approximately N6.0 when mechanized! Thus, a farmer could increase his

hectarage sixteen times if he adopted partial mechanisation as opposed to manual operation.

Momathemba's (1976) study was similar to that of Idachaba's (1976) model though with some modifications. The objective of Momathemba's 1976 work was to determine the factors affecting the on-farm consumption of Gammalin 20, copper sulphate, kokotine and perenox using cross sectional data for the 1972/73, 1973/74 and 1974/75 cocoa seasons. The pesticide model developed specified unit price of the pesticide; total hectarage under cocoa; hectarage of fruit bearing trees; total income realised from the sale of cocoa, and cost of hired labour for the farmer. Multiple regression analysis involving the use of Ordinary Least Square (OLS) was used to estimate the functional relationship between the explanatory variables and the dependent variable. However, expected cocoa prices were not used as one of the factors affecting on-farm consumption of the pesticides because, according to her, cocoa price net of marketing cost was uniform in any one production season and would thus show very little variability. This was a modification of Idachaba's (1976) work. In addition she included both total hectarage under cocoa and hectarage of fruit bearing trees amongst her explanatory variables. The total hectare under cocoa referred to cocoa farm size including both fruit bearing and non-fruit bearing cocoa trees while the second one referred specifically to the fruit bearing farm land.

Results of the lead equations regressed on-farm consumption of *g*ammalin 20, copper sulphate, kokotine and perenox showed that the coefficients of own-price carried ^apriori negative sign except for kokotine which carried a positive sign. But for all the chemicals, price was statistically insignificant at 5.0% and 10.0%

levels. This implied that the demand for all the pesticides with the exception of kokotone were price elastic. The coefficients of cocoa hectarage and fruit bearing hectarage also carried positive signs but the fruit bearing hectarage was not significant at 5.0% and 10.0% levels in copper sulphate. Total income and cost of hired labour were inconsistent with economic theory and were statistically insignificant in Gammalin 20 and copper sulphate. The likely reason for inconsistent sign on the income variable was that farmers in the cocoa belt were involved in other agricultural enterprises and/or non-agricultural businesses in which they invested part of their incomes from cocoa. The coefficient of the variable representing cost of hired labour was also not consistent with a priori expectations but was significant at both 5.0% and 10.0% levels. She explained that this could be due to scarcity of labour coupled with the past "Udoji" high costs of labour in that as the farmer attempted to minimize losses from cocoa pests and diseases hired labour at relatively high costs. The coefficient of multiple determination (R^2) was generally low for all the equations (26%, 38%, 11% and 10.7% in the lead equations for the five chemicals. This implied that there were other very important explanatory variables that were not included in the model.

The objective of Phillips (1988) study was to estimate the demand for tractor services by farmers in the Zaria, Funtua and Maigana districts of Kaduna State. He used the OLS method to estimate the tractor hiring behaviour of 35 farmers in the study area during the 1985/86 planting season. He postulated that the demand for tractor services was a function of farm size, available on farm family labour, constructed index of producer prices, wage rate per hour, the cost per hectare of non labour variable input and cost per hour of hiring tractor services.



Results showed that 71.2% of the observed variations in the demand for tractor services was explained by the specified independent variables. The demand for tractor services was found to be positively explained by the index of producer prices, farm size, hired labour, cost and non-labour variable costs. On the other hand, the found that available on farm labour and hourly cost of hiring tractor services were negatively signed. Elasticities of demand for tractor services were computed at the mean values of statistically significant variables. He found that a 10% increase in the hourly cost of hiring tractor services reduced tractor hiring by about 4% suggesting that the demand for tractor services among the farmers is inelastic to the hiring rate. Also a 10% increase in the index of producer prices causes the demand for tractor services to increase by 9.2% implying the same.

The results of the literatures reviewed in this section showed that own-price, output price and farm size are the basic factors determining the quantity of input demanded. Other factors such as cost of hired labour, available farm family labour, wage rate, output, net farm income and farm wage rate depend on the type of input. Although none of the studies reviewed was on seed demand because of dearth of literature, the experiences of the foregoing authors will provide the necessary guide in specifying the model for this study. Thus, while endeavouring to draw from the experiences of these authors, other variable such as distance from the source of input, which is thought to be relevant to be demand would be tried in this study.

CHAPTER THREE

3.1

RESEARCH METHODOLOGY

Sampling Procedure and Data Collection

Both primary and secondary data were collected. Primary data were collected through the use of a pre-tested and well structured questionnaire schedule which was administered on farmers buying certified seeds of maize and rice in Ondo State. The selection of respondents (for interview) involved multi-stage sampling. Three out of the six agricultural zones of Ondo State were first picked by random sampling followed by the picking of two Local Government Areas (LGAs) from each zone, also by random sampling. Next, three towns/villages were selected from each LGA. A list of farmers buying certified seeds of maize and rice from each town or village was made with the assistance of the staff of the Agricultural Input Supply Company (AISC) of Ondo State and the Extension Agents of the Ondo State Agricultural Development Project (ODSADP) in each LGA. From the list, ten percentage of farmers in each town or village was randomly selected and interviewed. The distribution of the respondents by zones is presented in Table 2.

Data included quantiles and prices per unit of seeds bought; sources of supply; proportion of respondent's income earned from Agriculture; Farm sizes; household size; ages;

Table 2: The Distribution of the Respondents

Zone	LGA	Town/Village	No. of Respondents	Total No. of Respondents
One	Ado	Ado	14	38
		Ago Aduloju	12	
		Ajebamidele	12	
	Ikole	Araromi	14	40
		Ijesa-Isu	12	
		Oke-Ako	14	
Four	Ifedore	Igbara-Oke	11	27
		Ijare	9	
		Isarun	7	
	Ile-Oluji/ Okegbo	Farm Settlement Iyere	13 4	23
		Awo Village	6	
Six	Akoko North/West	Ajowa	14	32
		Ikaramu	10	
		Okeagbe	8	
	Ekiti-East	Eda-Ife	14	40
		Isinbode	12	
		Omuo	14	
		Total	196	
				196

reasons for purchasing improved seeds of maize and rice; buying habits and major occupation of the respondents.

Data were collected from two hundred respondents using structured questionnaires and also from the officials of the ODSADP and AISC through oral interviews. Secondary data were also obtained from the records and or publications of the National Seed Service (NSS), Ibadan, the Agriculture Input Supply Company, (AISC) Akure, Ondo State ADP, (ODSADP) Akure. Data collection lasted four months (April - July 1995).

3.2 METHODS OF DATA ANALYSIS

Returned questionnaires were checked for completeness and collated for analysis. One hundred and ninety six (196) questionnaires representing 98% of returned questionnaires were accepted for analysis.

Data were analysed using descriptive statistics and multiple regression analysis. The descriptive statistics involved the use of mean, standard deviation and frequency distribution. The frequency distribution was used to analyse socio-economic information such as ages of respondents, their farm and household sizes, and proportions of income earned from farming. The mean and standard deviation were obtained by the formula specified in equations (1) and (2) respectively.

The multiple regression analysis involved the use of Ordinary Least Square (OLS) method to estimate the functional relationship between the dependent variables and the set of explanatory variables in separate demand function⁵ for certified seeds of maize and rice.

Applying economic theory and the experience gained from the work of other researchers to the issue of the demand for certified seeds in Ondo State, it was postulated that the demand function for maize and rice seeds in the State were presented by equations (3) and (4) respectively:

$$QM_{ij} = f (PM_{ij}, PR_{ij}, DM_{ij}, FM_{ij}, YM_{ij}, EM_{ij} \dots\dots\dots) \quad (3)$$

$$QR_{ij} = f (PR_{ij}, PM_{ij}, DR_{ij}, FR_{ij}, YR_{ij}, \dots\dots ER_{ij} \dots\dots\dots) \quad (4)$$

where;

QM_{ij} = quantity of certified maize seed purchased by the i th grower in the j th year (kg);

QR_{ij} = quantity of certified rice seeds purchased by the i th grower in the j th year (kg);

PM_{ij} = price/kg of maize seed bought by the i th grower in the j th year (n);

PR_{ij} = price/kg of maize seed bought by the i th grower in the j th year;

DM_{ij} = distance travelled by the i th grower to buy certified maize seeds in the j th year (km);

DR_{ij} = distance travelled by the i th grower to buy certified rice seeds in the j th year (km);

FM_{ij} = size of the maize plot of the i th grower in the j th year (ha)

FR_{ij} = size of the rice plot of the i th grower in the j th year (ha)

YM_{ij} = quantity of maize produced (kg) by i th grower in the j th year (kg)

YR_{ij} = quantity of rice produced by the i th grower in the j th year (kg)

EM_{ij} = error term associated with collecting information from the i th maize grower in the j th year;

ER_{ij} = error term associated with collecting information from the i th rice grower in the j th year;

The error term was assumed to be normally distributed with zero mean and constant variance; i.e. $ER_{ij} \sim N(0, \sigma^2)$

$$i = 1, 2; j = 1993, 1994$$

Two functional forms namely, the linear and power functions of equations were specified for both maize and rice as presented by equations (5), (6), (7), and (8).

Linear

$$OM_{ij} = a_0 + a_1 PM_{ij} + a_2 PR_{ij} + a_3 DM_{ij} + a_4 FM_{ij} + a_5 YM_{ij} + EM_{ij} \dots (5)$$

$$QR_{ij} = b_0 + b_1 PR_{ij} + b_2 PM_{ij} + b_3 DR_{ij} + b_4 FR_{ij} + b_5 YR_{ij} + ER_{ij} \dots (6)$$

Power:

$$QM_{ij} = \alpha_0 PM_{ij}^{\alpha_1} PR_{ij}^{\alpha_2} DM_{ij}^{\alpha_3} FM_{ij}^{\alpha_4} YM_{ij}^{\alpha_5} EM_{ij} \dots (7)$$

$$QR_{ij} = \beta_0 PR_{ij}^{\beta_1} PM_{ij}^{\beta_2} DR_{ij}^{\beta_3} FR_{ij}^{\beta_4} YR_{ij}^{\beta_5} ER_{ij} \dots (8)$$

The logarithmic transformation of equations (7) and (8); are given as equation (9) and (10) respectively:

$$\log QM_{ij} = \alpha_0 + \alpha_1 \log PR_{ij} + \alpha_2 \log PM_{ij} + \alpha_3 \log DM_{ij} + \alpha_4 \log FM_{ij} + \alpha_5 \log YM_{ij} + \log EM_{ij} \dots (9)$$

$$\log QR_{ij} = \beta_0 + \beta_1 \log PR_{ij} + \beta_2 \log PM_{ij} + \beta_3 \log DR_{ij} + \beta_4 \log FR_{ij} + \beta_5 \log YR_{ij} + \log ER_{ij} \dots (10)$$

Regressions were run separately for maize and rice. It was assumed that the data collected satisfied the assumptions of the regression model as enumerated by Kmenta (1971). These assumptions are:

- (a) Normality: that is error term is normally distributed;
- (b) No exact linear relationship exists among the explanatory variable;

- (c) Zero mean; that is $E T = 0$;
- (d) Homoskedasticity: that is $E (ET)^2 = \sigma^2$;
- (e) Non-auto regression; that is $E (ET_i ET_j) = 0; i \neq j$;
- (f) Non stochastic X; X_1 is a non stochastic variable with values fixed in repeated examples.

Evaluation Criteria

Trial runs were made for the two specified models to see which of them fitted the data better. In choosing the demand equations for certified seeds of maize and rice, the following criteria were used;

- (1) the goodness of fit; using the coefficient of multiple determination (R^2) and adjusted R-squared (R^2). The equation with higher R^2 was chosen. The adjusted R^2 is a more desirable measure of goodness of fit than R because it is not influenced by the number of regressors (Kmenta, 1971);
- (2) the signs on regression coefficients;
- (3) the "F - Value" which was used to test the significance of the overall model;
- (4) the statistical significance of individual coefficients as determined by the t-ratios. The "t-ratio" was calculated by the estimated coefficient of a regressor divided by its standard error of estimate. As "a rule of thumb" an estimated coefficient which was at least twice its standard error was adjudged significant at the 5.0% level. Only the 5.0% level of significance was used in this study because it was adjudged untidy to use different levels of significance to evaluate results emanating from one and the same regression run. This will be tantamount to using double standards.

CHAPTER FOUR

PRODUCTION, SUPPLY AND DISTRIBUTION OF CERTIFIED

SEEDS IN NIGERIA

4.1 Historical Background

In Nigeria, seed programmes have been in operation since the mid-1970s with several public sector agencies investing in institutional and physical infrastructure. The Federal Government of Nigeria (FGN) realising the importance of seed and the need for an efficient seed system approached the FAO in 1974 for assistance in the establishment of a seed service in Nigeria (Usman, 1994). The FAO/UNDP assisted seed project was launched in 1975. The following year (1976) witnessed the launching of the National Seed Service (NSS) of the Federal Department of Agriculture with Headquarters at Ibadan and Regional Unit at Samaru.

The development of the NSS was supported by two FAO projects, the first project - improvement in production and Quality control of food crop seed spanning 1975 to 1980 was funded by the UNDP while the second phase project from 1981 to 1985 was funded entirely by the Federal Government of Nigeria under a Unilateral Trust Fund arrangement. During the period, seed processing and seed testing facilities were provided and installed in Ibadan and Samaru, Zaria. The third phase of the project was from 1988 - 89 during which the NSS enjoyed another technical assistance from FAO/UNDP on the improvement of the quality of seed. The facilities for seed certification were upgraded and many laboratory staff were trained. An independent National Seed Certification and Quality Control Scheme was established within the NSS for seed certification.

Simultaneously, with the development of the NSS, the State Seed System took off with the collaborative efforts of the NSS. Each State had a State Seed Multiplication Unit (SSMU) which produced certified seeds for its farmers from the foundation seeds obtained from the NSS.

In 1985, the Private Sector was allowed into the seed industry in the country. The defunct Agricultural Seed Limited, Obasanjo Farms at Ota commenced seed production and marketing mainly hybrid maize. Others such as Temperance Limited, Total Agricultural Limited, Top Seeds Limited and Green land Farms joined the entry of the Private Sector into the seed industry and necessitated a seed certification and Quality Control Scheme to monitor seed quality at all stages of production. Also, four seed testing laboratories and a central one at Abuja were recently established to carry out seed testing services in Nigeria. By 1989, the National Seed System had resulted in the production and distribution of improved seed varieties; hybrid seeds; the creation of awareness on the benefits of improved seeds; seed certification and Quality Control System and Seed Manpower Development.

The Objectives of the Seed programme in Nigeria are:

- 1 to select cultivars that would lead to the introduction of new varieties to be adopted by farmers for mass production;
- 2 to develop new techniques in other fields such as fertilizer technology, chemical control of weeds, pests and diseases that would open up new potentials in crop production;
- 3 to provide efficient advisory service that can be used to stimulate demand for other inputs and

- 4 to improve the quality of produce both for consumption and manufacturing processes.

To achieve these objectives, a number of institutions were involved. They include the NSS, National Crop Research Institute (NCRI) under the leadership of the Federal Ministry of Science and Technology (FMST); International Institute for Tropical Agriculture (IITA), National Seed Certification Agency (A section of NSS); ADPs; Farmer's Supply Companies (FASCOMS) and Commercial Services Units of the ADP. In 1992, the FGN promulgated decree Number 72 to regulate operations of the seed trade in Nigeria and the role of various institutions involved in seed production, distribution and marketing in the country.

4.2 Processes of Certified Seed Production

After the release of an improved cultivar by the breeder, the seed is multiplied through a few cycles of reproduction namely Breeder Seed (BS), Foundation Seed (FS) and Certified Seed (CS).

The Breeder Seed is the highest class of seeds from which all other pedigree classes emanate. It is the first generation of seeds. BS is generally produced by the plant breeder who evolves the variety. In Nigeria, it is produced by research Institutes, Faculties of Agriculture or any individual that has the facilities. It is usually produced in small quantity of about 10-15 kg (Maini 1994) and supplied to the NSS for multiplication. The second stage is the FS production. The FS is the progeny of the BS. Its production is restricted to some suitable ecological areas under close supervision of the NSS. According to the Nigeria National Seed Decree Number 72 of 1992, the production, processing and

distribution of FS is the responsibility of the NSS. The quantity of FS produced by the NSS between 1980 and 1991 is presented in Table 3. The table shows that maize and rice had the highest two quantities and together accounted for 73.7% of total FS produced by the NSS for the 12 year period with maize and rice contributing 44% and 29.7% respectively.

The last stage in the seed multiplication process is seed certification. Certified Seed (CS) is the direct progeny of FS so handled to maintain satisfactory genetic purity and identity acceptable to the certifying agency. According to Joshua *et al* (undated) seed certification is defined "as the system designed to assure desired seed quality through third party checking and control on seed multiplication". It is the process by which a third party guarantees the quality of the seed by the issuance of a certificate of fitness certifying that all attributes of the parent seed are maintained after carrying out the tests to ensure that both field and laboratory standards are met. Seed certification processes involve field and laboratory tests which can be summarized as follows. For the field test, the certification officer inspects the field, collects information on the original seed, crop history of the land, weed control methods, soil fertility and any other relevant information. He also examines the phenotype characteristics of the seeds, its isolation requirements and on the other hand, tests for laboratory standards which include moisture content, physical purity (i.e. freedom from weed, other crop seed or inert matter). Seed viability and vigour, seed health status (to detect presence of disease(s) on the seed that are not shown on the field). To pass the tests, a pure seed must attain a certain percentage of purity. For example maize and rice have a minimum of 98.0% purity each.

Table 3: Foundation Seed Production by National Seed Service (NSS) (1980-91) (Metric tonnes)

Crops	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	TOTAL *	% of Total*
Rice	650	1,647	1,270	1390	914	1212	50	1315	367.88	274	134.8	64.26	9738.94	29.7
Maize	500	1300	1233	1447	1561	1845	1877	1845	1103.9	961	648.8	110.86	14,432.56	44.0
Sorghum	300	200	253	321	225	263	300	441	54.03	152	98.0	8.95	2615.53	8.0
Millet	100	100	161	215	130	153	170	487	32.56	82	45.0	30.6	2188.28	67
Wheat	40	140	50	10	103	50	100	-	283	105	20.0	12.5	913.5	2.8
Groundnut	130	60	50	15	70	50	500	381	213.35	226	210	4.32	1720.67	5.2
Cowpea	-	100	60	11	53	65	80	351	21.22	34.9	22.73 *	12.08	810.93	2.5
Soyabean	-	3	5	8	10	10	25	255	25.33	24	10.0	5.19	381.12	1.2
Total (Tons)	1120	3550	3082	3417	3066	3648	3552	2175	2101.28	1858.7	1001.09	249.36		100.1

Note * Calculated by the author for analytical purposes

Source: NSS (1992)

Finally, a sample of the seed must satisfy the DUS test, that is the attribute(s) of the seed must be distinct, uniform and stable over time. A seed variety usually has at least an attribute that distinguishes it from all the other seed varieties. To pass the certification test process, the distinct attribute of the seed must be uniform and stable. This implies that the special attributes of the seed variety must not break down in subsequent generations. Certified seeds are produced by the ADPs in accordance with decree number 72 of 1992. The quantity of the certified seeds supplied to each State's ADP is usually very small (See table 4). The ADP is mandated by this decree to multiply the seed through the State Seed Multiplication Units (SSMU). This is done through appointed outgrowers under close supervision of the Quality Control Officer and the Certification Officer from the NSS. The output of outgrowers (i.e. certified seeds) are supplied to the Agricultural Input Supply Company (AISC) of each State, in Nigeria for sale to the public. Table 4 shows the quantity of certified seeds produced by the ADPs in Nigeria from 1980 - 1991.

From the table, the quantity of maize and rice seeds produced by the ADPs were 47,700.68 and 18,361.48 metric tonnes representing 46.63% and 18% respectively of the total quantity of certified seeds produced respectively. This implies that approximately 65.0% of total certified seeds produced in Nigeria from 1980 - 1991 was made up of maize and rice seeds.

Table 4: Certified Seed Production by ADPS/SSMUS in Nigeria. (Metric tonne)

Crop YR.	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	Total*	% of Total*
Rice	1250	2200	2037	1877	1016	1825	1417	n.a	615.6	287.48	4890.4	945	18361.48	18.0
Maize	2000	1600	1820	2120	5281	8031	7036	n.a.	877.1	717.88	18464	1013.7	47700.68	46.6
Sorghum	800	1500	1800	2100	1004	1420	2978	n.a.	214.4	67.12	328.6	79.6	12291.72	12.0
Millet	500	550	924	750	224	298	418	n.a.	109.6	-	233.6	123.2	4130.40	4.0
Wheat	100	40	140	180	7	-	870	n.a.	80	25.54	n.a.	n.a.	1370.54	1.3
Groundnut	1500	2000	1012	3000	208	255	768	n.a.	95.1	14.57	n.a.	35.9	8888.57	8.7
Cowpea	-	-	690	-	463	1150	166	n.a.	186.2	54.38	1224.8	110.44	4044.8	4.0
Soyabean	-	-	10	-	-	469	-	n.a.	119.6	39.15	3261.75	106.9	4006.16	3.9
Total	6150	7890	8433	10027	8023	13448	13653	n.a.	2225.5	1206.1	28636.75	2414.74		

n.a. - not available

* - Calculated by the author for analytical purposes

Source: NSS (1992).

For all the processes of seed certification mentioned above to be successfully carried out a certification agency is necessary. Such an agency according to Joshua *et al* (undated) Usman and Adegbuyi (1994) should be an organization that is independent of seed production and marketing agencies on one side and a government department on the other if it is to provide the needed services. The functions of the agency as identified by these authors include establishment of minimum seed certification standards in consultation with the seed specialists; ensuring that only superior and released varieties are brought in certification fold; developing well-defined rules and procedures of seed certification and make them available to the general public; developing tags and seals that contain information on proper use of seed; Verification of the source of seed to be certified; field inspections; processing plant inspection; sampling and arranging seed analysis to verify conformity to seed standards; undertaking registration of seed growers; compiling and publishing annual statistics of seed certified and cooperating with international agencies to promote quality of seed moving in international trade.

4.3 Distribution of Certified Seeds

The last major sequential step in certified seed production is distribution. Certified seeds marketing and distribution involve all business activities in the movement of the seeds from the point of production to the growers/farmers who are the ultimate consumers. Certified seeds are processed immediately after harvesting. The seeds are sorted to remove undesirable materials such as inert matters, weed seeds, other crop seeds, broken seeds, shrivelled and small seeds which do not conform with prescribed quality standards. In addition, it improves

storability and plantability. The processing of certified seeds include precleaning to remove trash and appendages, basic cleaning, and grading. When all undesirable materials have been removed, the seed is treated using insecticides and fungicides, put in a container, standardized, labelled, sealed and moved to the store/house. Certified seeds are treated to minimise insect infestation during storage and incubation of spores of pathogens brought from the field. In the marketing of certified seeds, container/sacks must be labelled with a tag containing relevant information with the sign "treated with poison" appearing on it because the seeds are unfit for human consumption.

Seed storage is important because of the time lag between production and demand. Since the production and consumption times are different, the preservation of seeds in the tropical climate involves investment of capital, time, man power and material. Good seed storage requires well designed storage rooms, equipped with wooden pallets, rodent proofing, cool dry and clean environment, proper fumigation and proper management. Relative humidity, moisture content, oxygen, carbondioxide content of the surrounding air, history of seed treatment and seed vigour are also important factors which influence seed viability and vigour during storage. The ADP, NSS and AISC undertake the storage of certified seeds in the country.

Certified seeds of maize, rice, cowpea and sorghum are packaged in jute bags and paper bags. Moisture vapour can penetrate these materials when kept in moist storage conditions. They are used when storage materials are in short supply. The use of polythene bags is preferable but then, the seed must be dried to a 9% moisture level to avoid deterioration of the seed. Joshua et al (undated)

identified some of the advantages inherent in seed packaging. They are:

1. It facilitates handling and storage;
2. It makes seed transportation much easier;
3. It is in compliance with legal requirements;
4. It preserves viability and seed quality;
5. It makes it a presentable or attractive product for selling;
6. It is necessary to maintain lot identity; and
7. It presents seeds in different sizes for small, medium and large scale farmers.

After carrying out all the activities listed above, the next is to supply or distribute them to farmers. This is very important because the facilities for carrying out all the activities discussed above are available in the cities which are far from villages where the farmers live and work. Table 5 below shows the distribution of foundation seed in Nigeria in 1992.

Table 5: 1992 Foundation Seed Distribution in Nigeria.

Regional Offices	Crops	Total Quantity of Seed Distributed
South west	Maize, popcorn rice, soyabean, cowpea	17.41
North-west	Maize, rice, soyabean, sorghum, millet, groundnut, cowpea	52.860
North east	Rice, maize, cowpea, soyabean, sorghum, millet, groundnut	37.17
South east	Rice, maize, soyabean cowpea	20.04
Middle Belt	Rice, Maize, cowpea	18.00
Total	Maize, rice, cowpea sorghum, millet, soyabean, and groundnut	145.48

Sources: NSS 1992 report.

This table shows that maize, rice and cowpea were the major crop-seeds distributed to all parts of the country in 1992. About seventeen (17.41) metric tones of maize, rice, cowpea, soyabean and popcorn seeds were distributed to the South western part of the country now Ekiti, Ondo, Oyo, Ogun Lagos and Osun States. In all about 146 metric tones of Foundation seeds were distributed.

Seed distribution involves bringing product information and services required to the farmer and transmitting to the seed producer, information on the local conditions, habits, complaints and satisfaction expressed by the farmers. Seed marketing/distribution may be monopolized by a single organization or may involve several marketing organizations which may compete or complement one another. According to Sevilla (1982) there are three levels through which seed passes before it reaches crop producers. The first level is the multiplication of the

involves retailers and large scale farmers. All these levels are clearly identified in the flow of improved seeds in Nigeria as illustrated in figure 3. The breeder seed produced by the Research Institutes are sent to the National Seed Committee for close examination. From there, it is sent to the NSS which produces Foundation seeds and sends them to the ADPs for multiplication by the SSMU appointed seed growers. From there, AISC, Cooperatives, Private Seed companies and seed dealers undertake the marketing and sale to farmers at both State and Local Government Area levels.

The distribution of seed takes time. According to Verburgt (1981), it took Kenya ten years to distribute seed within "walking distance" because of poor means of transportation. It may take a longer time in Nigeria considering the poor conditions of our roads. However, Barbosa (1982) observed that the use of intermediate or retail dealers has been very effective in reducing the time required to distribute certified seed to farmers; most especially where there are several distribution and sale points. The farmer is the last step in the seed distribution channels. The acceptance and use of certified seeds can be increased when the sale attracts potential farmers, channel seed availability towards satisfying farmers' needs, helping farmers to recognise the true value of certified seed and offering them the best possible service.

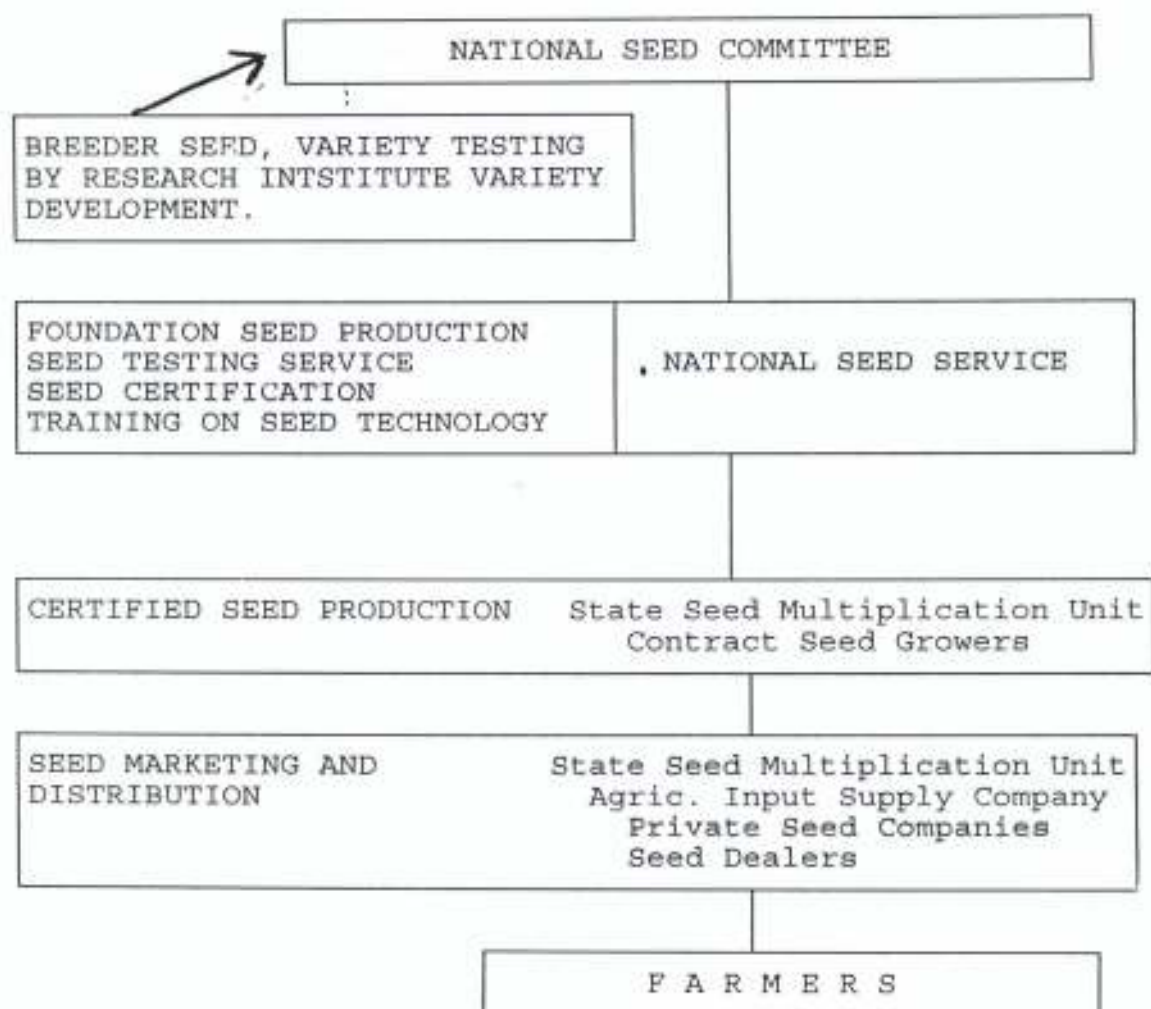


Figure 3: The Flow of Improved Seeds to Nigerian Farmers.
Source: FAO/NSS/UNDP.

CHAPTER FIVE

5.0 RESULTS AND DISCUSSION

5.1 Socioeconomic Characteristics

Those of interest to this study were the ages and household sizes farm sizes of respondents; their major occupations; proportions of annual income earned from farming; farming experience; reasons for cultivating maize and rice and the reasons for growing certified seeds of maize and rice.

5.1.1 Age Distribution and Household Size

The age distribution and household sizes of respondents are presented in tables 6 and 7 respectively. Table 6 shows that the modal age of the respondents lied within the age bracket of 60 - 69 years. However, 77 (38.3%) of the interviewees were below 50 years of age which could be said to have the stamina for manual farm work. The implications of the age distribution on adoption of improved seeds in the State will be examined in the next chapter. The mean age was 52.3 years.

Table 6: Age Distribution of Growers of certified Maize and Rice Seeds in Ondo State, Nigeria, 1995

Age (Yrs)	Frequency	Relative Frequency (%)
Below 30	6	3.1
30 - 39	31	15.8
40 - 49	40	20.4
50 - 59	42	21.4
60 - 69	57	29.1
70 and above	19	9.7
Total	196	99.5 [*]

Less than 100.0% because of rounding-up errors.

On the other hand, the most predominant household size among the respondents was that of 5 - 8 members which accounted for approximately 46.0% of the sample. Large household sizes could be advantageous to farmers if the members are adolescents who are willing to contribute to farm work; otherwise, they could constitute serious constraints to the provision of adequate investment funds to farm businesses.

Table 7: The Distribution of Respondents' Household Sizes, in Ondo State, Nigeria, 1995.

Size of household	Frequency	Relative Frequency (%)
1 - 4	71	36.2
5 - 8	91	46.4
9 - 12	31	15.8
Above 12	3	1.5
Total	196	99.5 [*]

Less than 100.0% because of rounding-up errors.

5.1.2 Major Occupation, Farm Sizes and Proportion of Annual Income from Farming from Farming

Table 8 shows that maize and rice growers in Ondo State had a multiplicity of occupations with majority of them (87.7%) having farming as their major occupation. This finding was corroborated by another finding that 154 (78.6%) of the respondents earned more than 50.0% of their annual incomes from farming as presented in table 9. However, the farm sizes of the respondents for maize and rice were generally small for both crops in the two years covered by the study as presented in tables 9 and 10.

Table 8: Frequency Distribution of the Respondents' Major Occupation, 1995

Major Occupation	Frequency	Relative Frequency
Trading	7	3.6
Tailoring	2	1.0
Farming	168	85.7
Teaching	4	2.0
Civil Service	6	3.1
Others*	9	4.6
Total	194	99.9+

- Bricklaying, Vulcanizing, tailoring, etc.

Source: Field survey, 1995

Table 9: Frequency Distribution of the Proportion of Respondents' Annual Income earned from Farming, 1995.

Proportion of Frequency Income (%)	Frequency	Relative
20 - 30	7	3.6
31 - 40	9	4.6
41 - 50	26	13.3
51 - 60	44	22.4
61 - 70	41	20.9
71 - 80	24	12.2
81 - 90	32	16.3
91 - 100	13	6.6
Total	196	99.9*

+ - Less than 100.0% because of rounding-up errors.

Source: Field survey, 1995

Table 10: Frequency Distribution of Respondents' Maize Farm Sizes 1993 and 1994

Farm Size (ha)	1993 Frequency	Relative Frequency	1994 Frequency	Relative Frequency (%)
Less than 1	98	50.0	85	43.4
1 - 1.99	68	34.7	59	30.1
2.00 - 2.99	16	8.2	29	14.8
3.00 - 3.99	4	2.0	6	3.1
4.00 - 4.99	1	0.5	5	2.6
5.00 - 5.99	2	1.0	2	1.5
6.00 - 6.99	4	2.0	1	0.5
7.00 and above	3	1.5	7	3.6
Total	196	99.9	196	100.0

Source; Field Survey 1995.

Table 11: Frequency Distribution of Respondents' Rice Farm Sizes, 1993 and 1994

Farm Sizes (ha)	1993 Frequency	Relative Frequency	1994 Frequency	Relative Frequency (%)
Less than 1	102	52.0	91	46.4
1.00 - 1.99	78	39.8	77	39.2
2.00 - 2.99	9	4.6	13	6.6
3.00 - 3.99	2	1.0	8	4.1
4.00 and Above	4	2.0	6	3.0
Total	196	99.4	196	99.3 *

* Less than 100.0 because of rounding-up errors.

Source: Field Survey, 1995.

In 1993, for instance, 166 (84.7%) and 180 respondents (91.8%) had maize and rice farms respectively having less than 2 hectares. This trend was also the same for 1994. However, the number of respondents having 2 hectares and above for maize increased from 30 (15.3%) in 1993 to 50 (25.5%) in 1994. Similarly, the proportion of the interviewees having 2 hectares and above for rice rose from 7.7% in 1993 to (13.8%) in 1994. Tables 10 and 11 also show that generally, farm sizes for rice were smaller than those for maize, probably because rice cultivation is more labour intensive than maize cultivation.

5.1.3 Farming Experience and Cropping System Used

Results show that the modal class for respondent farming experience lie between 11 and 20 years with a frequency of 60 or approximately 31% of the sample while those who have been farming more than 50 years constituted approximately 7% of the sample. Thirty nine respondents or 19.9% of the sample had the least farming experience of 1 - 10 years.

Generally, the respondents could be said to have acquired a lot of skill and technical know-how in the cultivation of maize and rice since 157 (80.1%) of them had more than 10 years farming experience.

With respect to the cropping system, results showed that both sole and mixed cropping were used for the two crops with the sole cropping system being more predominant for rice cultivation. For instance 10.9% of the interviewees planted maize sole while 81.6% of them cultivated rice as sole crop. Cassava was the most popular crop grown with maize while maize was the only crop mixed-cropped with rice for strategic reasons. The bulk of the respondents i.e. 89.1%

planted maize as mix crop while 81.6% planted rice as sole crops.

These findings corroborated the findings of ODSADP's survey in 1992 that about 22.0% of total hectareage for maize in Ondo State was under sole cropping while rice was generally cultivated as a sole crop.

5.2 Sources of Information and Supply of Certified Seeds in Ondo State

Since the FGN has stopped the direct supply of Foundation Seeds (FS), the NSS has been the only source of FS to the States while the ADP Supplies only certified seeds to farmers.

Following the incidence of the outbreak of Downy Mildew disease in Nigeria between 1989 and 1990, the NSS embarked upon Downy Mildew Resistant (DMR) Improved Seed package to the effected States in the country. Twenty metric tonnes of DMR varieties of maize were supplied to Ondo State comprising of 10 tonnes of Mega Maize IV, 6.8 tonnes of TZPBSR-W and 3.2 tonnes of DMRESR-Y (NSS 1992 Report).

Table 14 shows the quantity of maize and rice FS supplied to the State during the 1992 and 1993 cropping seasons.

Table 12: Foundation Seed Supplied to Ondo State in 1992 and 1993

Foundation Seed	Quantity (Kg)	
	1992	1993
Crop Variety		
Maize	10	n.a
Rice: ITA 150	50	n.a.
ITA 128	n.a	100
ITA Cisodemi	n.a	3
Susokoko	n.a	3
Total	60	106

n.a. = Not available

Source: Ondo State ADP, Akure.

Table 14: Quantity of Certified Seeds of Maize and Rice Supplied and Demanded in Ondo State from 1991 - 1994.

Maize						Rice				
Quantity (metric tonnes)	1991	1992	1993	1994	Total	1991	1992	1993	1994	Total
Quantity Supplied	136.5	205.17	185.52	206.69	743.88	80.5	79.37	65.0	101.05	325.92
Quantity demanded	136.5	205.17	186.06	206.69	732.42	80.5	79.37	61.9	101.05	322
Balance	-	-	9.46	-	11.46	-	-	3.1	-	3.1

Source: ADP reports (1991 - 1994).

Table 14 shows the quantities of certified seeds of maize and rice supplied and demanded in Ondo State between 1991 and 1994. A total of 743.88 metric tonnes of certified maize seeds were supplied out of which 732.42 metric tonnes representing 98.5% of total supply were demanded. Similarly, a total of 325.92 metric tonnes of certified rice seeds were supplied while 322.82 metric tonnes (or 99.0% of total supply) were demanded between 1991 and 1994 respectively. Except in 1993, all the quantities of certified seeds of maize and rice produced were sold. No record of the total quantity of certified seeds of maize and rice required by farmers in the State was available as at the time of this field survey. The major reason given was that the State ADP did not know the adoption rate and the annual replacement rate i.e. the proportion of farmers growing certified seeds of maize and rice in the State. In spite of this, table 14 shows that there was a high demand for certified maize and rice seeds in the State.

Within Ondo State, the ADP and AISC were the major sources of supply of certified seeds to farmers. The ADP produced what AISC supplies. Table 15 shows the quantities of certified seeds supplied by the ADP to AISC between 1992 and 1994 in Ondo State.

Table 15: Ondo State: Quantity of Certified Maize and Rice Seeds Supplied to AISC 1992 - 1994 (metric tonnes)

Crops	Years		
	1992	1993	1994
Maize	38.90	34.12	18.24
Rice	N.A	7.83	3.1

N.A. = not Available

Source: Ondo State ADP Reports.

The quantities of maize and rice seeds supplied in 1994 were the smallest. This might be due to the political disturbance arising from the annulment of 1993 Presidential elections.

The interaction between ADP and AISC is very important in the supply and demand of certified seeds in the State. Although both organisations are different and autonomous, there were logistics problems between them. This lies in the fact that the ADP bears the cost of producing certified seeds while the profit goes to AISC. Reports showed that the ADP, therefore, retained part of the seed produced for direct sale to farmers. This probably explained the reason why there was a wide difference between the quantity of seeds produced and quantity supplied to AISC as presented in tables 14 and 15. It was also alleged that the quantity of certified seeds supplied by the State's ADP to AISC was not always enough. In times of short fall in supply, the company usually made a "stop - gap" arrangement with the UTC Agro-Seeds, a private Seed Company based in Zaria. The seeds bought from UTC Agro seeds were expensive because of the profit maximisation objective typical of the private sector business enterprise. However, at times when there were favourable conditions and good management, the quantity supplied by the ADP may be more than the quantity demanded by AISC. Both ADP and AISC sell excess seeds to needy States to avoid a glut. In quantity supplied.

AISC was the most popular source of certified seeds in the State as presented in table 16. Results showed that of the six sources of supply of certified seeds in the State, AISC had the highest frequency of 112 (57.1%) followed by influential farmers

with a frequency of (30.6%). Findings showed that there was no any private seed company in the State. The small seed farmers available were very few and unpopular due to poor delivery system in addition to high cost of crop protection chemicals and mechanisation services.

Table 16: Frequency Distribution of Sources of Improved Seeds to Respondents

Sources	Frequency	Relative Frequency
Ministry of Agriculture	10	5.1
ADP	40	20.5
Private Seed Sellers	15	7.5
Fellow farmers	60	30.6
Cooperative Societies	35	17.5
Agric. Input Supply Company	112	<u>57.1</u>

Source: Field Survey, 1995

With regards to sources of information about the supply and availability of certified seeds of maize and rice in the State, it was found out that Extension Agents (EAs) had the highest frequency of 120 (or 61.2%) of the respondents as presented in table 17. This finding was expected because the EAs constitute the link between farmers and sources of agricultural innovations in the State. The findings that 98 respondents were informed through radio were also expected because radio, as a means of mass media is more common than television especially in the rural areas.

Table 17: Sources of Information on Availability of Certified Seeds of Maize and Rice in Ondo State.

Sources of Information	Frequency	Relative Frequency
Radio	98	50.0
Television	60	30.6
Friends	56	28.6
Extension Agents	120	61.2

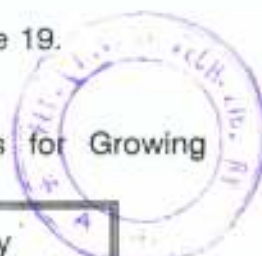
Source: Field Survey, 1995.

5.3 Buying Habits and Ranking of Farm Inputs

The buying habits of growers of certified seeds are important to seed production and marketing companies for planning purposes. If seed production companies must meet the needs of their clientele as and when due, they must schedule their production plan properly, bearing in mind, available storage facilities and marketing/distribution outlets.

The buying habits of respondents are presented in table 19. The commonest buying habits of respondents was that of buying little quantities of improved seeds and supplementing them with traditional seeds. This implied that the respondents were growing traditional seeds alongside with certified seeds. According to the growers, traditional seeds were better adapted to local conditions thereby reducing the risks of crop failure. Other reasons for growing traditional seed varieties included ease of availability, socio-cultural preferences and compatibility to cropping pattern. (Table 18). Other buying habits of respondents are presented in table 19.

Table 18: Frequency Distribution of the Respondents Reasons for Growing Traditional Seeds Varieties



Reasons	Frequency	Rel. Frequency
1. Better adaptation to the environment	30	32.2
2. Readily available	30	25.4
3. Socio-cultural preferences	15	12.7
4. Fit better cropping pattern	15	12.7
5. Higher local demand	12	10.2
6. Taste better than HrVs	8	0.5

Source: Field Survey, 1995

Table 19: The Buying Habits of Growers of Certified Maize and Rice Seeds in Ondo State, Nigeria.

	Buying Habits	Frequency	Relative Frequency (%)
1.	Buying just the quantities needed at the time of planting every year.	60	30.6
2.	Buying quantities in excess of immediate requirements and storing them against the subsequent years	8	4.1
3.	Buying annual requires of the seeds a few weeks to the beginning of planting season.	17	8.7
4.	Making forward contract for the supply of improved seeds needed at planting period.	15	7.7
5.	Buying little quantities of improved seeds and supplementing with traditional seeds	100	51.0
6.	Buying quantities needed in one season and planting the product therefrom for subsequent seasons before making fresh demand.	85	43.4

Source Field Survey, 1995.

Another important buying habit of the growers of certified seeds was buying the quantities needed and planting the product therefrom for some seasons before making fresh demand. Eighty five respondents fell into this group. These respondents probably wanted to save themselves the problem of looking for certified seeds every season. Probably because they lived far away from the points of sale of certified seeds. Sixty respondents (about 31%) had the habit of buying "just the quantities needed for planting annually". The likely reasons for this behaviour were

lack of good storage facilities; regular supply of certified seeds; and very high prices of seeds vis-a-vis low farm incomes.

Of the one hundred and twenty six respondents who had habit of storing certified seeds, 44.4% of them did so because of the fear that the seeds may not be available when needed. This and other reasons for storing certified seeds together with their relative frequencies are presented in table 20.

Table 20: Frequency Distribution of the Respondents Reasons for Storing Certified Seeds.

Reasons	Frequency	Relative Frequency
1. The seeds may not be available early enough next season	56	44.4
2. Fear of increase in price	28	22.2
3. Fear of short supply	30	23.8
4. Fear of not having enough money when seeds are available	12	9.5

Source: Field Survey, 1995

Official information from the Ondo State Agricultural Input Supply Company blamed the shortage in the supply of certified seeds generally on the inability of the ODSADP to meet its requirements at the on-set of the crop-growing seasons. Information from the ADP also confirmed that the supply was always late. The reason given was that it was risky to plant when the rain was not yet stable because it might to crop failure and waste of seeds.

The ranking of farm input presented in table 21 further shows the importance the farmers in the State attached to improved seeds. It indicates the order of preference for the purchase of farm inputs. From the table, improved seeds had the

topmost priority among the respondents. This implies that given a financial assistance, improved seeds would come first among the inputs followed by fertilizer, insecticides and herbicides respectively. This may be due to the fact that the other inputs are complementary to the use of improved seeds. In a similar survey carried out by the ODSADP on the proportion of small farm holders that used these inputs, the proportion of farmers demanding improved seed was the highest in all the agricultural zones in the State (ODSADP Annual Report, 1992).

Table 21: Order of Ranking of Improved Seeds and Supplementary Farm Inputs by Respondents

Farm Inputs	1st		2nd		3rd		4th	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Improved Seeds	83	42.3	52	26.5	40	20.4	29	14.8
Fertilizer	60	30.6	66	38.7	50	25.5	35	17.9
Insecticides	40	20.4	58	29.6	74	37.8	48	24.5
Herbicides	13	6.6	20	10.2	32	16.3	84	42.9
Total	196	99.9*	196	100	196	100	196	100.1*

*Less or greater than 100.0% because of rounding up errors.

Source: Field Survey, 1995

5.4 The Varieties of Maize and Rice Seeds grown by the Respondents.

The varieties of maize and rice grown by the respondents are presented in tables 22 and 23. The DMR was the commonest maize variety grown by the sampled maize farmers in the State. One hundred and seven respondents representing 54.6% grew DMR while 5.1% and 3.6% planted TPZB and Suwan 1 varieties respectively.

However 30.6% of the respondents could not say specifically the variety of the improved maize grown but there is every likelihood that majority of this group were growing DMR variety judging by the notoriety of the disease in the State in the past few years.

Table 22: Frequency Distribution of the Varieties of Maize Seeds grown by the Respondents

Varieties	Frequency	Relative Frequency
DMR-ESRY	54	27.6
DMR-ESR	20	10.2
TZPB	10	5.1
Suwan I	7	3.6
DMR-Y&W	20	10.2
"Improved"	60	30.6
No response	12	6.1
Total	196	100.0

Source: Field Survey, 1995

Table 23 shows the varieties of rice grown by the respondents. ITA 150 had the highest frequency of 70 (35.7%) while 056 had 9.2%. Fifty six respondents could not mention the particular improved rice variety they were cultivating. Considering table 22 and 23, it could be observed that many of the respondents did not respond while many could not mention the particular variety grown. This could be due to the fact that the names were too technical for them and so, they did not worry about knowing..

Table 23: Frequency Distribution of Varieties of Rice grown by the Respondents, 1995.

Variety	Frequency	Relative Frequency
ITA 150	70	35.7
Faro 11	12	6.1
Os 6	18	9.2
Improved	56	28.6
No response	40	20.4
Total	196	100.0

Source: Field Survey, 1995.

5.5 Reasons for Growing Certified Maize and Rice Seeds

According to the ADP Annual Report (1992), maize was the most commonly grown food grain in Ondo State. Rice on the other hand was assuming an increasing economically important position. The reasons for growing certified maize and rice seeds were for sale and consumption. One hundred and thirty six respondents representing 69.4% grew rice for sale. This proportion was more than that of maize which was about 40%. Although the proportion of the rice farmers (69.4%) who produced for commercial reasons was higher than that of maize yet, the proportion (about 40%) of maize sold was still high enough considering the popularly acclaimed subsistency among the farmers in the State which is characterized by the production to satisfy family food needs. This high degree of commercialization probably explains the reason why high proportion of the respondents' income was derived from farming (table 9). One hundred and sixteen of the sampled maize farmers (59.2%) grew maize to provide food for the family. This proportion was higher than that of rice

(about 31%). This may be due to the fact that maize can be consumed in many forms. Also, since almost every farmer in the State grows maize, at least once in a year, the supply is always high in the market. The resultant low price relative to the price of rice probably discourages its commercial production.

Judging by these reasons, a rational farmer in the State would like to increase his output, *ceteris paribus*. This can be achieved through two main ways: the first is to increase the farmland under cultivation using more sophisticated farm implements and machines while the second is by increasing the output per unit area of land. But considering the dearth of farm machines and implements and high cost of mechanisation services, a farmer is left with the second option that is, increasing the output of the land presently under cultivation using HYVs and other necessary inputs. This was the motivating factor for the demand for certified seeds of maize and rice among the sampled farmers in the State as depicted in table 24. From the table, higher yield per land area was the major reason why the respondents demanded for certified seeds of maize and rice. One hundred and twenty respondents (61.2%) fell into this group. This was probably due to low output characterized by the small farmers in the State. The second most important reason consented to by about 46.0% of the sampled farmers was the early maturity of the certified seeds. This is advantageous in that it will increase the number of times the crop can be produced in a year. Also, early maturity enables the farm output meet the high demand in the market. All these increase the farmer's farm income. Seventy respondents adopted certified seeds of maize and rice because of their resistance to pests and diseases. This might be due to the incidence of downy mildew disease reported in the State a few years before this field survey was conducted. The International Institute of Tropical Agriculture (IITA) and Institute for Agricultural Research and Training (IAR&T) reported that of the maize growing areas in Nigeria, Ondo State had the highest incidence of downy mildew disease followed by Kwara State. Out of the 28 farms

surveyed in Ondo State, 22 of them had incidence of downy mildew disease while none of the sampled farms in Kano, Oyo, Plateau, Niger and Federal capital Territory had downy mildew disease (IAR&T Annual Report 1989-1990 pg 128). This probably explained the reason why the farmers in Ondo State adopted certified seeds.

Table 24 Frequency Distribution of the Respondents Reasons for Growing certified maize and Rice seeds.

	Reasons	Frequency	Relative frequency
1.	Higher yield per land area	120	61.2
2.	Early maturity	90	45.9
3.	Disease or pest resistance	60	30.6
4.	Better consumer acceptance	50	25.5
5.	Drought resistance	10	5.1
6.	Better storability	25	12.8
7.	Taste better than traditional seeds	40	20.4
8.	Shorter cooking time	15	7.6
9.	Suppress weeds	8	4.1

Source: Field Survey, 1995.

5.6 Problems Encountered in the Use of Certified Seeds

The respondents were asked to indicate the problems they were encountering in the acquisition and use of certified maize and rice seeds. Their responses are presented in table 25. The table shows that untimely availability of certified seeds was the commonest problem experienced by the farmers in the State. The seeds were not usually available at the beginning of the planting seasons and, at times, they could be scarce throughout the year. Another equally important problem experienced by the respondents was the fact that certified seeds did not do well without the use of fertilizers. This could pose a serious problem to the respondents considering the fact that artificial fertilizers were very expensive, scarce and irregular in supply. Even when a farmer got certified seeds at the right time, inavailability of fertilizers might

prevent him from either using them or getting the expected results.

Table 25: Frequency Distribution of the Constraints to the Acquisition and Use of Certified Seeds of Maize and Rice in Ondo State.

Problem	Frequency	Relative Frequency
1. Untimely availability of certified seeds	71	36.2
2. Do not normally do well without fertilizer	71	36.2
3. Inadequate finance	50	25.5
4. Scarcity of seeds	34	17.3
5. Scarcity of labour	29	14.8
6. Distant point of sale	23	11.7
7. Lack of storage facilities	17	8.7
8. Low yield	15	7.7
9. Pests and diseases	11	5.6
10. Reduction in subsequent yield if stored seeds are planted	6	3.1
11. Low resistant to drought	4	2.0
12. Others	10	5.1

Source: Field Survey, 1995

Inadequate finance was another problem experienced by the respondents. About 26.0% of the sampled farmers agreed that they could not afford the cost of certified seeds and complementary inputs. The use of certified seeds together with the complementary inputs increased the level of investment of the farmer. This constituted a serious problem to the respondents whose farm incomes were very low and who did not have a reliable credit source. Labour shortage was another problem encountered by twenty nine respondents. About 15.0% of the respondents could not increase the quantity of certified seeds demanded due to scarcity of labour. This

might be due to the fact that increased use of certified seeds would necessitate increased in farm size and invariably increase in labour demand throughout the season. Labour shortage could constitute a serious problem more especially in an area where farm operations are dictated by the same climatic conditions.

The storage problem experienced by seventeen respondents was due to the fact that the storage facilities required for storing certified seeds to maintain their vigour, viability and genetic potentials were too expensive than what a small scale farmer could afford. This was a serious problem realising the fact that certified seeds were not readily available in the study area. A farmer who wants to grow them it regularly must have the facilities for storing them. The proportion of the respondents who were faced with the problems of pests and diseases was low (about 6.0%) probably due to the resistant varieties supplied to the farmers in the State by the NSS. Also, the proportion of the respondents facing the problem of low yield was about 6.0%. This problem was not expected. This was because although certified or improved seeds generally are bred for a particular attribute, it is expected that they should be high yielding. This problem could therefore be attributed to the unsuitability of the seeds to local conditions or probably because the farmers could not purchase the complementary inputs. However, the low proportion indicated perhaps that the low yield was never a serious problem. Other problems limiting increased use of certified seeds by the respondents included unfavourable weather conditions, poor prices of products and lack of adequate information on the use of certified seeds. These problems were mentioned by 5.1% of the respondents as presented in table 25.

5.7 Estimated Demand Models

These are presented separately for maize and rice in tables 26 and 27 respectively. The standard errors of estimated coefficients are in brackets.

5.7.1 Maize Seed Demand Models

The demand models for certified seeds of maize in 1993 and 1994 are presented as equation (11) and (12) respectively in table 26. The adjusted R^2 values showed that the postulated regressors explained approximately 67.0% and 64.0% in the variations in the quantities of certified maize seed demanded in 1993 and 1994 respectively while the F-test indicated that the models were significant at the 5.0% level. With the exception of the positive sign on the coefficients of Log PM_{ij} for 1993 and 1994, the signs on the coefficients of other variables conformed with the postulates of economic theory. The positive sign on the coefficients of Log PM_{ij} suggested that an increase in the price of certified maize seeds would lead to an increase in the quantity of maize seeds demanded. Explanations tenable include: (1) being improved seeds, buyers' demand increased as price rose because of the assumption that the higher price was synonymous to better quality; (2) the rise in

Table 26: Estimated Demand Models for Certified Maize Seeds in Ondo State Nigeria, 1993 and 1994 (Logarithmic Functions)
Dependent Variable = Log of Maize Demanded (Kg)

Years	Logarithm of independent variables						F-Values	R^2	DW	EQ N No.
	Constant	PM_{ij}	PR_{ij}	FM_{ij}	DM_{ij}	YM_{ij}				
1993	-0.674 (0.300)	0.719* (0.135)	-0.525* (0.230)	0.275* (0.135)	0.158* (0.034)	0.0035	78.530*	0.666	1.61	11
1994	-3.631 (1.236)	0.557 (0.049)	2.123* (0.798)	0.184* (0.053)	0.226* (0.045)	0.397* (0.174)	13.168*	0.638	1.74	12

Notes: * indicates that the estimated coefficients were significant at the 5.0% level.

Source: Data analysis

price of certified maize seeds caused buyers to purchase more quantity in anticipation of future rise in price probably due to the fact that certified maize seeds were scarce and irregular in supply (see table 20); (3) the fact that farmers got more aware and convinced about the attributes of certified maize seeds year in year out; (4) respondents got their seeds from governments sources (table 16) where, the price of seeds was not as exorbitant as they expected; and (5) the priority given to certified seed of maize because of its central position among all the other inputs as indicated in table 21.

The positive sign on the coefficients of each of the other variables in equations (11) and (12) suggested that an increase in each of the variables would cause the quantity of maize demanded to increase, all other factors remaining unchanged. For instances, the positive sign on the coefficient of Log FM_{ij} suggested that the larger the farm size, the greater the quantity of maize purchased while the positive sign on the coefficient of Log DM_{ij} implied that the farther the distance travelled by buyers, the greater the quantity of certified maize seed purchased, *ceteris paribus*. This is contrary to expectation. The possible explanation could be that farmers pooled their resources together for collective purchase or farmers that were distant from the source of supply bought in large quantities and stored to reduce the frequency of visiting the source of supply. Findings showed that on the average, the distance travelled to purchase certified seeds was about 3.0 km.

Results also showed that all the estimated coefficients were significantly different from zero at the 5.0% while the Durbin - Watson test indicated the absence of serially correlated residuals. With respect to elasticity, it was found that only the coefficient of Log PR_{ij} in equation (12) was elastic with respect to Log QM_{ij} . All other regressors were inelastic with respect to the regressand.



5.7.2 Rice Seed Demand Models

The demand models for certified rice seeds in 1993 and 1994 are presented in table 27 as equations (13) and (14) respectively. Results showed that the included independent variables explained 54.5% and 50.8% in the variations in the quantities of certified rice seeds demanded in 1993 and 1994 respectively. The *F* test showed that the two models were significant at 5.0% while the *t*-test revealed that the estimated coefficients of the regressors in equation 13 were significant at the 5.0% with the exception of that of Log DR_{ij} . On the other hand, coefficients of Log PR_{ij} and Log YR_{ij} in equation (14) were not significant at the chosen 5.0% level. The Durbin-Watson test indicated the absence of autocorrelation in the residuals.

Table 27: Estimated Demand Models for Certified Rice Seeds in Ondo State, Nigeria, 1993 and 1994. (Logarithm Functions)
Dependent Variable = Log of Rice Demanded (Kg)

Years	Logarithm of Independent Variables						F-Values	R ²	DW	EQN No.
	Constant	PR_{ij}	PM_{ij}	FR_{ij}	DR_{ij}	YR_{ij}				
1993	3.380 (0.886)	0.238* (0.053)	2.900* (0.625)	0.321* (0.041)	0.051 (0.040)	0.187* (0.042)	48.67*	0.545	2.10	(13)
1994	0.232 (0.833)	-0.500 (0.604)	0.845* (0.079)	0.250* (0.044)	0.07* (0.029)	0.017 (0.041)	41.323*	0.508	1.74	(14)

Notes: *indicates that the estimated coefficients are significant at the 5.0% level.
The standard errors of estimated coefficients are in parentheses.

Source: Data analysis

The positive sign on the coefficients of all the included explanatory variables with the exception of Log PR_{ij} in equation (14) suggested that an increase in each of these variables would cause the quantity demanded of certified seeds of rice to increase, *ceteris paribus*. The negative sign carried by the coefficient of log PR_{ij} in equation (14) conformed with the postulate of economic theory and implied that the higher the own-price of certified rice seeds, the lower the quantity demanded, all other

things remaining unchanged. However, the estimated coefficient of Log PR_{ij} was not significantly different from zero at the 5.0% level. On the other hand, the positive sign carried by the coefficient of Log PR_{ij} in equation (13) implied that the higher the own-price of certified rice seeds, the greater the quantity demanded of the seeds. The reasons are similar to those adduced in maize models. Also the positive sign on the coefficient of Log YR_{ij} suggested that the larger the expected output, the greater the quantity of certified rice seeds purchased. Similarly, the positive sign on Log FM_{ij} suggested that the larger the farm size, the greater the quantity of certified rice seeds demanded while the positive sign on log DR_{ij} implies that the farther the distance travelled to purchase certified rice seeds, the greater the quantity purchased probably due to the reasons similar to those adduced for the maize models.

With respect to elasticity, it was found that the coefficient of Log PM_{ij} in equation (13) was elastic with respect to Log QR_{ij} . This implied that a 1.0% increase in the price/tonne of maize seeds would cause quantity demanded of rice seed to increase by 2.9% *ceteris paribus*. All other explanatory variables were inelastic with respect to the Log QR_{ij} .

5.7.3 Cross-Price Elasticity of Demand

This is a measure of how the quantity demanded of one commodity responds to changes in the price of another commodity, *ceteris paribus*. Using this definition, the relationship between the demand for certified Maize and rice seeds was measured. Mathematically, this could be expressed as:

$$\epsilon_{mr} = \frac{\delta Q_m}{P_r} \cdot \frac{P_r}{P_m} \dots \dots \dots (15)$$

$$\epsilon_{rm} = \frac{\delta Q_r}{\delta P_m} \cdot \frac{P_m}{P_r} \dots \dots \dots (16)$$

where:

ϵ_{mr} = cross price elasticity of demand for certified maize seeds.

ε_{rm} = cross price elasticity of demand for certified rice seeds.

Q_m = quantity demanded of certified seeds of maize.

Q_r = quantity demanded of certified seeds of rice.

P_m = price/kg of certified maize seeds.

P_r = price/kg of certified rice seeds.

The estimated cross-price elasticities of certified seeds of maize and rice are presented in table 29. The table shows that the purchase of rice seeds was competitive to the purchased maize seeds while the demand for rice seeds was complementary to that of maize seeds in 1993. In 1994, however, the cross-price elasticities for both seeds indicated that the demand for them was complementary. The competitive relationship between maize and rice seeds in 1993 was not unexpected because it followed economic logic. It is expected that both maize and rice seeds would compete with the use of land, labour and entrepreneurship, all other things being equal. But notwithstanding this, the practice of planting some maize seeds on rice farms made the demand for maize seeds complementary to that of rice *ceteris paribus*. In addition, the demand for both seeds could also be complementary because both are food crops grown in the area of study. Since sampled farmers gave proportions of both food crops to household consumption, the demand for the seeds of each crop would be complementary because they tend to satisfy the same household need, though in varying degrees.

Table 28: Cross-Price Elasticity of Demand for Certified Maize and Rice Seeds in 1993 and 1994.

	Maize		Rice	
	PM_{ij}	PR_{ij}	PR_{ij}	PM_{ij}
1993	0.119	-0.525	0.238	2.900
1994	0.557	2.123	-0.500	0.645

Source: Data Analysis.

CHAPTER SIX

6.0 POLICY IMPLICATIONS OF MAJOR FINDINGS AND RECOMMENDATIONS

6.1 Summary of Major findings

The objectives of this study were to provide baseline information on the socio-economic characteristics of farmers buying certified seeds of maize and rice and their buying habits; identify and discuss sources of supply of certified seeds to Ondo State; identify, quantify and estimate the factors influencing the demand for certified seeds of maize and rice in the State in 1993 and 1994; examine the constraints limiting increased use of certified maize and rice seeds by farmers in the State and to examine policy implications of major findings and offer suggestions towards increased use of certified seeds of maize and rice in the State.

Results showed that the modal age of the respondents lied between 60 and 69 years while the mean age was 52.3 years. Farm sizes for the two crops in 1993 and 1994 were less than 2 hectares. The mean farm sizes for maize in 1993 and 1994 were 1.37 ha and 1.62 ha respectively while those for rice were 1.10 and 1.27 hectares for the same periods respectively. Maize was mix-cropped with food crops such as cassava, yam, cocoyam and okro by 79.1% of the respondents while rice was grown sole by approximately 82.0% of the respondents. Results also showed that the sampled growers ranked certified seeds higher than other food crop production inputs for reasons such as high yields (61.2%), early maturity (45.9%), and resistance to pests and diseases (30.6%). The buying habits of sampled growers of certified seeds of maize and rice included buying little quantities (of improved seeds) and supplementing them with traditional seeds, buying the quantities needed in one season and plant the product therefrom for subsequent seasons before making fresh

demand; purchasing just the quantities needed at the time of planting every year and storing certified seeds over time for planting as a hedge against untimely availability of certified seeds during the planting season. Untimely availability of certified seeds, inavailability or inadequate supply of fertilizers and scarcity of labour were the major constraints limiting the acquisition and increased use of certified seeds among the farmers in the State.

Regression results showed that own-prices of certified maize and rice seeds, price of close substitutes, farm size, distance travelled and expected output explained 66.6% and 63.8% of the variations in the quantities of certified maize seeds purchased in 1993 and 1994 respectively while 54.5% and 50.8% of the variations in the quantities demanded of certified rice seeds in 1993 and 1994 were explained by the same set of explanatory variables. Only Log PR_{ij} in the maize models and Log PM_{ij} in the rice models were elastic. All other regressors were inelastic with respect to the regressands. The cross-price elasticities of demand indicated that the purchase of rice seeds was competitive with that of maize in 1993 while maize seeds were demanded as a complement to rice seeds during the same year. For 1994, the cross-price elasticity of demand for each of the seeds indicated complementary relationship.

6.2 Policy Implications of Major Findings and Recommendations

The age distribution of the respondents was skewed towards the aged and ageing. Since farming in the study area relies heavily on the use of human muscles, the respondent may not have sufficient stamina to ^{do} farm work and may not be seriously interested in earning their highest possible incomes from farming.

This is corroborated by the finding that overwhelming majority of the respondents had farm sizes (for maize and rice) of less than two hectares. Another strong policy implication of the age factor is that the respondents may not be interested in adopting long term maize and rice production techniques which can improve farming operations and boost maize and rice output in the area. Others are; unwillingness to adopt modern farm inputs and to take risks. However, the relatively small farm sizes notwithstanding, the growers claimed that the use of improved seeds increased their outputs of maize and rice thereby confirming the divisibility and neutrality to scale of agricultural innovations as posited by Essang (1975).

The buying habits of the respondents could be attributed to small farm holdings, fear of timely availability of seeds, lack of cash to buy and the attachment to traditional seed varieties. These buying habits of the growers must be properly understood with the intent to make the desirable changes if government's desire to increase the outputs of these food crops through the use of improved seeds is to be accomplished.

The buying habits of the respondents indicated that they were still growing traditional seeds alongside with certified seeds. This implied that certified seeds had not been totally adopted by the farmers in the State. Although this practice might be a device against total crop failure, it points to serious lapses in agricultural extension services in the State. Besides, the untimely availability of certified seeds could have tacitly encouraged this practice. However, government can use the respondents buying habits as a means of scheduling production to meet seed demand of farmers in terms of quantity and time of supply. For this to succeed, the supply organisations in the State must have adequate and reliable information on areas under different

crop varieties, sales and potential demand for certified seeds of maize and rice to facilitate estimation of the quantities of these seeds needed by growers.

The evidence that the demand for certified seeds was price inelastic implies that farmers were mindful of the quality of the seeds rather than their prices. It suggests that maize and rice farmers in the State would purchase improved seeds of these food crops provided they are sure of their qualities all other things being equal. These findings can be manipulated and exploited to a great advantage under the present cost recovery principle of the Nigerian seed industry. For instance, subsidizing the price of certified seed as a policy measure to increase the demand for certified seeds may be misplaced in that farmers may not make judicious use of the seeds.

Finally, it could be said that with the average farm size of less than 2.0 ha both maize and rice farm size could be said to be the most limiting factor in the demand for certified seeds in the State.

Considering the policy implications discussed above, it is strongly suggested that government should, as a matter of policy increase the demand for improved seeds of maize and rice in the State in order to boost the outputs of both food crops take the following steps:

1. promote policies that encourage young and educated people to grow these food crops in the State. In this connection, government should revive its Back-to-land programme which, incidentally had maize and rice as food crop enterprises as its focus;
2. promote the availability and use of facilities by which maize and rice growers could increase their farm sizes. Again, the hiring of tractors to maize and rice

growers for land preparation and planting operations should also be revived, subsidized and made to operate more efficiently;

3. facilitate timely availability of these certified seeds as well as that of complementary inputs such as fertilizers so that growers could fully reap the benefits of these inputs. This may warrant a re-organization of the institutions in-charge of these operations in order to make them more effective;
4. discontinue subsidies on the production of certified seeds since price does not constitute a hindrance to their demand;
5. encourage public sector participation in the production, marketing and distribution of certified seeds in order to remove some of the "official bottlenecks" plaguing timely availability of these inputs to farmers;
6. more information should be disseminated to the farmers in the State on the use of improved seeds particularly through the extension agents.

Finally, this is a pioneering economic study on the demand for certified food crop seeds in the country. Thus, the study has barely scratched the surface in the gathering and analysing necessary information that would lead to the development of seed industry in Ondo State in particular and the country in general. More research inputs are needed, especially in the field of marketing certified food crop seeds in the next *century*

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