THESIS

This is to certify that the

dissertation entitled

MARKETING OF FOOD CROPS AND INPUTS: THE CASE OF FUNTUA AGRICULTURAL DEVELOPMENT PROJECT IN KADUNA STATE, NIGERIA

presented by

Salisu Ahmed Ingawa

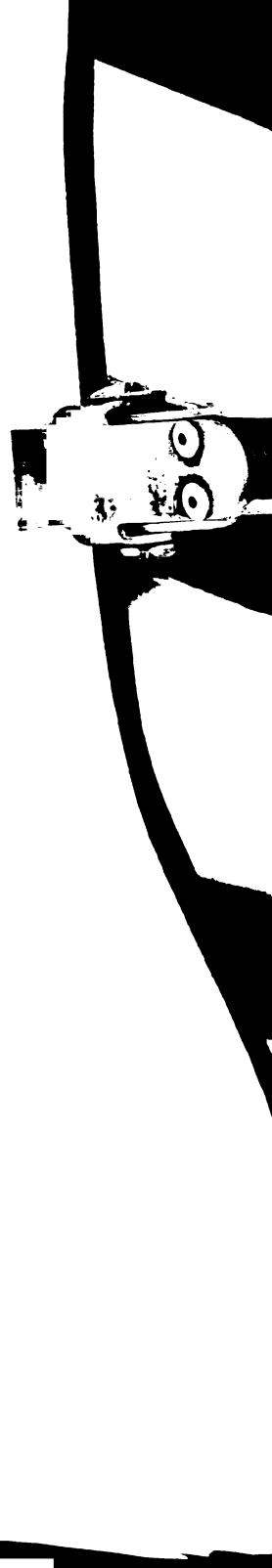
has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Agricultural Economics

Harold M Riley
Major professor

Date Aug 29 1983

O-12771



MARKETING OF FOOD CROPS AND INPUTS: THE CASE OF FUNTUA AGRICULTURAL DEVELOPMENT PROJECT IN KADUNA STATE, NIGERIA

By

Salisu Ahmed Ingawa

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Agricultural Economics

1983

ABSTRACT

MARKETING OF FOOD CROPS AND INPUTS: THE CASE OF FUNTUA AGRICULTURAL DEVELOPMENT PROJECT IN KADUNA STATE, NIGERIA

By

Salisu Ahmed Ingawa

The poor performance of the Nigerian agricultural sector in the late 1960s and the first half of the 1970s prompted a large number of policies and programs to revitalize the sector. However, marketing problems have emerged that threaten to check the gains being made through large-scale agricultural development projects.

This study evaluated the performance of the marketing systems for food crops and farm inputs in the Funtua Agricultural Development Project (FADP), the first of several large-scale ADPs in Nigeria. The evaluation of the input procurement and distribution system also considered performance at the state and national levels. Data for the analyses came from Agricultural Project Monitoring, Evaluation and Planning Unit at Kaduna, the FADP evaluation unit at Funtua and from secondary sources.

The evaluation of the food crop marketing system was largely based on examination of price behavior over time and space. Results showed that food crop prices declined significantly during the last two years of the project, especially for maize which was a relatively new grain crop in the area. Seasonal price fluctuations were larger than in previous studies and seasonally highest prices were occurring much

earlier than previously reported. Comparison of seasonal price increases with storage costs indicated that short-term storage would have been profitable.

Correlation analyses showed that farm level prices of food crops were strongly correlated among the various FADP districts. Comparison of price spreads with transportation costs indicated that the price spreads did not depart significantly from transportation costs.

It was concluded that the food crop marketing system performed reasonably well especially in terms of price correspondence among the area districts. However, the system did not perform as well in terms of temporal price behavior, particularly for maize. It was recommended that the planning of ADP-type projects include a careful assessment of demand prospects for increased crop output and that storage, processing and market information needs be anticipated and provided for in the project's operational plan.

The FADP fertilizer distribution system functioned effectively through a network of farm service centers. However, the heavily subsidized national fertilizer procurement and distribution system failed to provide adequate quantities and timely product delivery. Decentralization of the fertilizer procurement function and a revision of subsidy policies are recommended.

Dedicated to my father, Alhaji Ahmadu Ingawa

and in memory of my late mother, Binta Fatsima

ACKNOWLEDGEMENTS

I wish to express my sincere gratitude to Professor Harold Riley, my major professor and thesis supervisor, for his guidance, encouragement and constructive criticism. I also wish to thank Dr. Eric Crawford for his helpful criticism and suggestions for improvement. I gratefully acknowledge the contributions and assistance of the other members of my committee, Professor Carl Liedholm and Professor T. Schillhorn Vanveen.

The support, guidance, and understanding shown by Professors Carl Eicher, David Norman, and Lester Manderscheid, throughout my graduate program is deeply appreciated.

I wish to thank members of the Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University for friendship and suggestions. Assistance given by Professor George Abalu, Dr. M. S. Krishnaswamy and Dr. M. R. Raza is also appreciated. The encouragements of Dr. Jacob Voh, toward the completion of this study is appreciated.

I am grateful to the World Bank, the Agricultural Project Monitoring and Evaluation Unit of the Nigerian Federal Ministry of Rural Development, and the Funtua Agricultural Development Project for their consent, data provision, and assistance in conducting this study. At FADP I am particularly grateful to Alhaji Ahmed Alti, the project manager, and to Alhaji Mohmed Aminu, Alhaji Mohmed Abu, and Ibrahim Kwajaffa, members of the project evaluation unit. At APMEPU I wish to specifically thank Ray Robertson, Derek Poate, Joseph Bivins, M. G. Daplyn and Peter Olorunfemi for their help and patience in explaining and preparing the data. The assistance of Mr. Roger Slade of the World Bank is gratefully acknowledged.

I am grateful for financial support from Ford Foundation and Ahmadu Bello University.

The help of Paul Wolberg and Chris Wolf in setting up the data for computer analysis, as well as their readiness to help at all times, is deeply appreciated. I also thank Eleanor Noonan for initial typing and useful advice on secretarial assistance. Lois Pierson's enthusiasm in final editing and typing of the final draft is greatly appreciated. Thanks to Barbara Miller for good naturedly typing many of the tables. I benefitted greatly from the developing technology in microcomputing. Without the Osborne I the revisions, deletions, additions, etc. would have been much more painful.

Finally, I owe a debt of sincere gratitude to my wife, Hadiza, and our children, Nasir and Nafisa, for their patience and understanding.

TABLE OF CONTENTS

	Page
LIST OF TABLES	viii
LIST OF FIGURES	x
LIST OF MAPS	xi
LIST OF ABBREVIATIONS	xii
CHAPTER 1: INTRODUCTION	1
Background	1
Trends in the Nigerian Economy	2
Gross National Product	2
Population and Urbanization	5
Agricultural Production	6
Food Prices and Imports	6
Earlier Food Marketing Studies in Nigeria	10
Agricultural Development Projects	11
The Special Place of Maize Under ADPs	12
Objectives of the Study	14
Organization of the Study	15
CHAPTER 2: REVIEW OF THE LITERATURE	17
General Approaches to the Study of Food Marketing	17
Structure-Conduct-Performance Paradigm	20
Measures of Pricing Efficiency in Food Marketing	22
Food Marketing Studies in Nigeria	24
Methods of Analysis	25
Results of the Studies	27
Policy Recommendations	28
Criticisms of Nigerian Food Marketing Studies	29
What Do Correlation Coefficients Indicate?	31

CHAPTER 3: INTEGRATED AGRICULTURAL DEVELOPMENT PROJECTS 35
General Discussion on Agricultural Development Projects 35
Integrated Agricultural Development Projects in Nigeria 41
Conceptual Framework on Agricultural and Rural Development Projects 42
Government Policies Relating to Agricultural Development Projects 45
Design Elements of Nigerian ADPs 46
Number and Locations of ADPs in Nigeria 47
Activities of Nigerian ADPs 48
Major Problems Associated with ADPs 50
CHAPTER 4: STUDY AREA, FADP AND THE DATA 52
Study Area and Project Background 52
Funtua Agricultural Development Project Activities . . . 56
The Data and Data Collection Methods 63
Producer and Market Price Surveys 67
Producer Price Surveys 67
Place of Produce Sale 70
Market Price Surveys 72
CHAPTER 5: INPUT PROCUREMENT AND DISTRIBUTION SYSTEM 74
Introduction 74
Channels of Fertilizer Procurement and Distribution 1967-76 and 1976-80 78
Costs in the Procurement and Distribution of Fertilizers 82
Domestic Fertilizer Production 83
Market for FSFC Fertilizer 85
Fertilizer Demand in Nigeria 86
Kaduna State System of Fertilizer Procurement and Distribution, Before and After 1976 87
Kaduna State Farmers Supply Company 92
Input Procurement and Distribution at FADP 95
Relative Importance of Farm Inputs at FADP 97
Other Farm Inputs 103

CHAPTER 6: INTER-TEMPORAL GRAIN PRICE RELATIONSHIPS AT FADP . . 104
Time Series Variations or Movements 105
Trend Analysis 106
Visual Method 106
Trend Analysis Using Regression Methods 112
Seasonal Analysis of Prices 115
Estimation of Seasonal Price Increase Using Regression Procedures 127
Comparison of Seasonal Price Increase with Estimated Cost of Storage 131
Summary 141
CHAPTER 7: SPATIAL PRICE ANALYSIS 143
Spatial Price Analysis 144
Data Problems Relating to Spatial Price Analysis . . 147
Villages in Spatial Price Analyses Studies 148
Spatial Integration of Staple Food Prices within FADP Districts 149
Interdistrict Price Spread and Transportation Costs . . . 165
Summary 168
CHAPTER 8: SUMMARY AND CONCLUSIONS 169
Data and Limitations of the Study 171
Agricultural Input Distribution System 172
Temporal Price Behavior 176
Spatial Price Behavior 178
Conclusions and Recommendations 180
Marketing System for Staple Food Crops 180
The Marketing System for Inputs 182
Project Planning and Implementation 184
Suggestions for Further Research 186
APPENDIX A: RESULTS OF ESTIMATING TRENDS IN ACTUAL UNDEFLATED FOOD CROP PRICES AT FADP, 1976-1979 188
APPENDIX B: STATISTICS ON MAIZE AND OTHER CEREALS 192
APPENDIX C: SEASONAL AND INTERCROP PRICE ANALYSES, ZARIA AREA . 201
APPENDIX D: GUARANTEED MINIMUM PRICES FOR FOOD CROPS 202
APPENDIX E: CONSUMER PRICE INDICES USED TO DEFLATE FOOD CROP PRICES, 1976-1979 202
APPENDIX F: ACTUAL FOOD CROP PRICES AT FADP, 1976-1979 203
APPENDIX G: EXCHANGE RATES, NAIRA PARITY WITH U.S. DOLLAR, 1973-1979 207
REFERENCES 208

LIST OF TABLES

Table		Page
1.1	Major Components of GNP (percentages)	4
1.2	Area Planted, Production and Yields of Some Major Crops in Nigeria (1971/72-1977/78)	7
1.3	Mean, Standard Deviation, and Coefficient of Variation of Total Production, Areas Planted and Yields, 1971-1978	8
1.4	Food Imports, 1970-1978 (millions of naira)	9
4.1	Distribution of Population by Districts, FADP, 1975 . . .	53
4.2	Major Surveys Carried Out at FADP	64
4.3	Frequency Distribution of Sale Location for Staple Foods, FADP	71
5.1	Fertilizer Consumption by States, Nigeria, 1979 (tons) .	88
5.2	Fertilizer Distribution in Kaduna State by LGA, 1976-77 to 1979-80 (in 1,000 tons)	91
5.3	Funding Allocations by Zones, Kaduna State IRDP, 1981-1985 (millions of naira)	94
5.4	Input Sales at FADP, 1976-1980	97
5.5	Farmer Use of FSCs for Input Purchase, FADP, 1978	99
5.6	Purpose of FADP as Seen by Farmers	99
5.7	Purchases of Inputs from Farm Service Centers, FADP . . .	100
5.8	Fertilizer Purchase by Progressive and Non-Progressive Farmers, FADP	101
6.1	Regression Equations for Trend Estimates in Real Producer Prices in FADP Districts, 1976-1979	113
6.2	Further Analysis of Seasonal Price Indices	118
6.3	Regression Results Fitted to the Upward Sloping Portions of Average Seasonal Producer Prices for Food Crops at FADP, 1976-1979 (Prices in real 1970 value)	128
6.4	Regression Results Fitted to the Upward Sloping Portions of Average Seasonal Producer Prices of Food Crops at FADP, 1976-1979 (Nominal 1976-79 Prices)	129
6.5	Harvest Prices Plus Hypothetical Storage Costs for Food Crops FADP, 1976-1979	136

7.1 Correlation Matrix for Monthly Producer Prices of Sorghum Farfara Among FADP Districts, 1976-1979 (n = 41) 151

7.2 Correlation Matrix for Monthly Producer Prices of Sorghum Kaura Among FADP Districts, 1976-1979 (n = 41) 152

7.3 Correlation Matrix for Producer Prices of Maize Among FADP Districts, 1976-1979 (n = 41) 153

7.4 Correlation Matrix for Producer Prices of Millet Among FADP Districts, 1976-1979 (n = 41) 154

7.5 Coefficients of Price Variation for Staples, FADP Districts, 1976-1979 (percent) 155

7.6 Comparison of Correlation Coefficients of Absolute Monthly Prices and Monthly Price Differences, FADP, 1976-1979 160

7.7 Correlations of Staple Food Producer Prices at FADP Calculated on a Yearly Basis 162

7.8 Distribution of Correlation Coefficients of Producer Prices for Staple Crops at FADP by Location, 1976-1979 163

7.9 Producer Price Differences between Bakori District and Other Districts, FADP, 1976-1979 (Among less than Bakori district in naira per ton) 166

7.10 Expected Transport Cost between Bakori and Other District Headquarters (Naira per ton) 167

LIST OF FIGURES

Figure		Page
5.1	Imports of Fertilizer in Nigeria, 1965-1980	77
5.2	Channels of Fertilizer Distribution, Nigeria, 1967-1975	79
5.3	Channels of Fertilizer Distribution, 1976-1980	80
6.1	Farfara Producer Prices at FADP, 1976-1979	107
6.2	Kaura Producer Prices at FADP, 1976-1979	108
6.3	Maize Producer Prices at FADP, 1976-1979	109
6.4	Millet Producer Prices at FADP, 1976-1979	110
6.5	Food Crop Prices at Malumfashi, 1976-1979	111
6.6	Seasonal Price Indices for Sorghum Farfara. 1977-1979 . .	119
6.7	Seasonal Price Indices for Sorghum Kaura, 1977-1979 . . .	120
6.8	Seasonal Price Indices for Maize	121
6.9	Seasonal Price Indices for Millet, 1977-1979	122
6.10	Seasonal Indices of Producer Prices for Food Crops, Malumfashi District, 1977-1979	125
6.11	Actual and Expected Prices for Farfara, Malumfashi District, 1976-1979	137
6.12	Actual and Expected Prices for Kaura, Malumfashi District, 1976-1979	138
6.13	Actual and Expected Prices for Maize, Malumfashi District, 1976-1979	139
6.14	Actual and Expected Prices for Millet, Malumfashi District, 1976-1979	140

LIST OF MAPS

Map		Page
1.1	Nigeria: International and State Boundaries	3
3.1	Administrative Map of Nigeria	49
4.1	Towns and Villages, FADP	54

LIST OF ABBREVIATIONS AND ACRONYMS

ABU	=	Ahmadu Bello University
ADP	=	Agricultural Development Project
APMEPU	=	Agricultural Projects Monitoring, Evaluation and Planning Unit of the Federal Ministry of Agriculture
ADC	=	Agro-Service Center
FADP	=	Funtua Agricultural Development Project
FFPU	=	Federal Fertilizer Procurement Unit
FSC	=	Farm Service Center
IAR	=	Institute for Agricultural Research, Ahmadu Bello University, Zaria
KAFSCOM	=	Kaduna State Farmers Supply Company
NAFFP	=	National Accelerated Food Production Program
NGB	=	Nigerian Grains Board
OFN	=	Operation Feed the Nation

Currency Units

100 Kobo = One Naira

1 Naira = 1.596 U.S. Dollars

Note: See Appendix G for trend in Exchange Rates.

CHAPTER 1

INTRODUCTION

Background

Nigeria is implementing agricultural development projects throughout the country as a means of solving its agricultural and rural development problems. The investments in monetary and manpower requirements are immense. These projects are intended to have substantial effects not only on the agricultural sector, but the rest of the economy as well.

One area such projects will affect substantially is the marketing system for staple food crops. This is due to an emphasis on food crop production which reflects the government's concern with large increases in food imports.[1] Major concerns include the coordination of project activities with those of the private, traditional staple food marketing system--marketing inputs for farm production and the output from the projects.

The purpose of this study is to investigate the marketing of staple food crops and inputs at Funtua Agricultural Development Project (FADP), one of many such agricultural development projects in Nigeria. Funtua Agricultural Development project is in Kaduna State, one of the 19

[1] Nigeria's food imports increased from less than 60 million naira in 1970 to over 1 billion naira in 1978, in current prices. When an inflation rate of 17 percent per year is taken into account, the increase is much less, but still remarkable. See Table 1.4.

states in the country (Map 1.1). Productivity of small farmers cannot be successfully increased without an effective marketing system for both their products and the inputs they require. An effective marketing system, which encourages production of the right agricultural products by offering incentive prices, is essential.[2]

FADP planners were confident that the traditional, private marketing institutions in the area would be able to adequately handle the marketing of the anticipated increases in production of staple food crops. However, this was not the case in input marketing where the project incorporated elaborate arrangements for the marketing of inputs.[3]

Trends in the Nigerian Economy

Gross National Product

The Nigerian economy has been growing rapidly in terms of national income over the 1970's. The Gross National Product (GNP) grew from about N9 billion in 1971 to about N30 billion in 1980, as measured in real 1974-75 prices (Table 1.1). A recent World Bank report indicated that Nigeria had a per capita GNP of 1,010 dollars in 1980. The growth in GNP per capita between 1960 and 1980 was an average 4.1 percent per

---

[2] M. S. O. Nicholas, Foreward to "The Private Marketing Entrepreneur and Rural Development." FAO Agricultural Services Bulletin No. 51, (Rome: FAO, 1982), p. 1.

[3] FADP planners pointed out that the system for staple food marketing was highly organized but fragmented. Marked spatial and temporal price irregularities occurred. Based on this, the project was planned to provide market intelligence service, crop assembly, and marketing advice to help farmers improve their bargaining position. See The World Bank, Appraisal of Funtua Agricultural Development Project, Nigeria, (Washington, D.C.: The World Bank, 1974), Annex 2, p. 9.

Map 1.1 Nigeria: International and State Boundaries

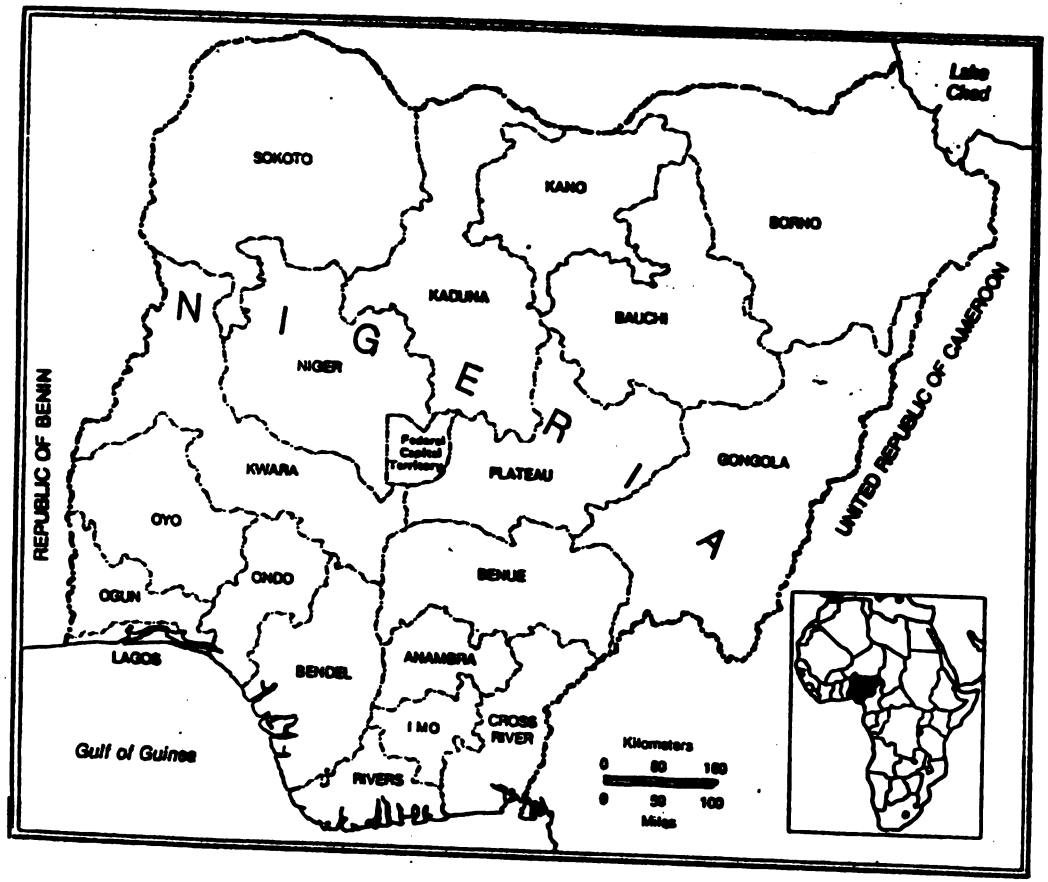


Table 1.1

Major Components of GNP
(percentages)

Component	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Total GNP (Billion Naira)	9.4	11.2	12.0	13.1	14.4	16.3	18.6	21.5	25.1	29.7
Agriculture	36.0	32.0	27.9	24.7	23.4	22.7	22.0	21.0	19.8	18.4
Mining & Quarrying	33.1	39.3	43.4	45.1	45.5	44.4	42.9	41.1	39.1	37.1
Manufacture	5.0	4.1	4.8	4.8	4.7	5.1	5.6	6.3	7.1	8.0
Electricity & Water	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5
Building & Construction	3.5	4.1	4.7	5.4	5.7	6.5	7.4	8.5	9.9	11.3
Distribution	9.1	8.1	7.4	6.9	6.7	7.0	7.2	7.5	7.8	8.2
Transport & Communication	1.8	1.9	2.1	2.1	2.3	2.4	2.6	2.8	3.1	3.4

Note: The accounting period is not consistent with a calendar year. Figures for 1980 are actually reported as figures for the accounting period of 1979/80. Likewise, 1971 = 1970/71.

Sources: Federal Republic of Nigeria, Third National Development Plan, 1975-1980, Federal Ministry of Economic Development, Lagos, 1975, p. 22; Federal Office of Statistics, "Gross Domestic Product of Nigeria: 1974/75-1979/80."

year (World Bank, 1982, p. 110). This places Nigeria in the ranks of middle-income countries in Africa--a distinction held by only a few.

The structure of GNP shows one striking change: agriculture's contribution fell from 36.0 percent of GNP in 1971 to 18 percent in 1980. On the other hand, the contribution from petroleum extraction, as shown under Mining and Quarrying, rose from 33 percent to 46 percent in 1975 and then fell to 37 percent by 1980. Building and construction showed a steady growth from 1971 to 1980.

Changes shown in other sections of the economy are less significant since the changes are much smaller in relative terms and data is generally of questionable quality to allow for differentiating between small changes. The decline in the manufacturing and distribution categories are undoubtedly questionable based on casual observations of the economy.

Population and Urbanization

By the mid-1980's. Nigeria's population is estimated to be 84.7 million, which converts to an annual growth rate of 2.5 percent. It is projected that the population will be growing at 3.4 percent per year between 1980 and the year 2000, giving a projected population of 119 million in 1990 and about 170 million in the year 2000.[4]

The growth in population is also accompanied by rapid urbanization. Urban population as a percentage of total population increased from 13 percent in 1963 to 20 percent in 1980. The percentage of urban people living in cities of over 500,000 has grown from 22 percent in 1960 to 58 percent in 1980. The number of cities with over 500,000 inhabitants grew from two in 1960 to nine in 1980.[5]

[4]The World Bank, World Development Report, 1982. (New York: Oxford University Press for the World Bank, 1982), pp. 142-148.

[5]Ibid.

The population growth described, coupled with the rates of urbanization, are putting considerable strain on the domestic food distribution system. In order for the marketing system to continue with the level of efficiency observed by earlier researchers, it has to adapt to the emerging circumstances.

Agricultural Production

Agricultural production generally stagnated in the 1970's, and in some cases, even declined. Production of the major cereals--sorghum, millet and maize--has declined over this period. However, more marked decline is evident when considering so-called cash crops--groundnuts and cotton. Planted areas of both cash crops and food crops have also declined as depicted in Table 1.2. However, yields of all crops have generally improved slightly. Calculation of the coefficient of variation with respect to production, areas planted and yields shows that production was more unstable than either areas planted or yields (Table 1.3).[6] This comparative instability of total production indicates the flexibility of shifting from one crop to another, from year to year, as well as influences of hostile production environment in terms of the weather and occasional outbreaks of pests and crop diseases.

Food Prices and Imports

The average annual rate of inflation for the period 1960-69 was 2.6 percent; however, by the next decade Nigeria experienced a dramatic

---

[6] These figures should only be regarded as indicative. The quality of the data is poor. It is widely believed that production of maize has increased considerably in many areas during the period of the 1970's. This should have been reflected in the national average.

Table 1.2

Area Planted, Production and Yields of Some Major Crops in Nigeria*
(1971/72-1977/78)

Crop	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78
Millet							
Production	2835	2391	3794	5554	4737	2893	2579
Area	4788	3692	5651	4787	5478	3939	3090
Yield	592	648	671	1160	860	736	834
Sorghum							
Production	5794	2298	3125	4738	3328	2950	3327
Area	5387	3792	5516	4653	5721	4842	3480
Yield	704	606	567	1018	581	609	956
Maize							
Production	1274	639	809	528	1332	1075	758
Area	1197	1050	1130	579	971	892	610
Yield	1064	609	715	912	1372	1205	1243
Groundnuts							
Production	1381	1350	878	1946	449	459	557
Area	1796	2032	2076	1796	1472	684	755
Yield	769	665	423	1084	305	671	737
Cotton							
Production	426	105	85	481	81	294	269
Area	798	236	121	478	197	384	278
Yield	533	445	705	1006	411	765	968

*Area in 1000 hectares, production in 1000 tons and yield in kg/ha.

Source: A. O. Falusi and L. B. Williams, "Nigeria Fertilizer Sector: Present Situation and Future Prospects." IFDC, 1981.

increase in the average annual rate of inflation--18.2 percent.[7] A number of factors are responsible for this marked increase in inflation rates. Two of these factors are: (1) the rapid increase in incomes, and (2) the decline of agricultural production. Food constitutes a large proportion of the average household expenditure; therefore,

[7]The World Bank, op. cit., p. 110.

Table 1.3

Mean, Standard Deviation, and Coefficient of Variation of Total Production, Areas Planted and Yields, 1971-1978

Crop	Production			Area Planted			Yield		
	Mean	SD	CV (%)	Mean	SD	CV (%)	Mean	SD	CV (%)
Millet	3540	1205	34	4489	949	21	786	192	24
Sorghum	3651	1196	33	4470	864	18	720	188	26
Maize	916	314	34	918	242	26	1017	284	28
Groundnut	1003	573	57	1516	579	38	665	252	38
Cotton	249	165	66	356	228	64	690	240	35

Notes: SD is standard deviation
CV is coefficient of variation and is calculated as the ratio of standard deviation to its mean

Source: Calculated from Table 1.2.

shortfalls in food production translate into increased food prices resulting in higher rates of inflation in the economy. Food prices are one of the major contributors of a high inflation rate in Nigeria.

The country is becoming increasingly dependent on imported food. Many feel that the oil market, which the country depends on for balancing its foreign exchange, is very unstable. And yet the oil market provides the means of payment for imported foods. Thus it is apparent that increasing food imports is not the answer to Nigeria's food problem. Food imports made up 12.4 percent of total imports in 1978; this translates into 7 percent of Gross Domestic Product (GDP) for that year. The recent historical trend in the value of food imports is shown in Table 1.4.

Table 1.4

Food Imports, 1970-1978
(millions of naira)

Year	Food Imports Nominal Naira	Food Imports Real 1970 Naira	Food as Percent Total of Imports	CPI
1970	57.7	57.7	7.6	100.0
1971	87.9	76.0	8.1	115.6
1972	95.1	79.7	9.6	119.3
1973	126.3	100.5	10.3	125.7
1974	154.8	108.6	8.9	142.6
1975	298.9	156.7	8.0	190.8
1976	440.1	190.4	18.5	231.2
1977	780.7	277.9	10.4	280.9
1978	1108.2	385.3	12.4	287.6

Source: Import figures including percentages from B. U. Ekuerhare, "A Theoretical Framework for the Economic Appraisal of the Green Revolution in Nigeria." Paper, First National Seminar on the Green Revolution in Nigeria, ABU Zaria, September 21-24, 1981; real value figures calculated using general Consumer Price Index from Central Bank of Nigeria. Shown in last column.

Increasing food imports and rising food prices have prompted serious efforts by the government to channel revenues from the oil sector into food production. Various programs have been initiated and there seems to be some confusion as to the appropriate policies needed to reverse the situation. Several of the government-sponsored programs are: the Operation Feed the Nation (OFN), the National Accelerated Food Production Program (NAFPP), the Integrated Rural Development Projects, the Guaranteed Minimum Price Scheme for Food Crops, and the latest addition, the Green Revolution Program. The Guaranteed Minimum Prices have not served as

incentives to producers so far since they have remained well below the market prices. The case of maize is even more striking (See Appendices D and F).

Earlier Food Marketing Studies in Nigeria

A number of food marketing studies were carried out under the guidance of W. O. Jones of Stanford Research Institute. These studies were part of a larger study researching the staple food marketing systems in Nigeria, Kenya and Sierra Leone. The studies set out to appraise the efficiency of the staple food marketing systems and to identify ways in which their effectiveness might be enhanced.[8]

The general findings of these studies, and similar studies conducted later, are that the marketing systems for staple food crops are operating in a competitive manner.[9] Markets are characterized by large numbers of retailers, wholesalers and consumers. The activities of trade associations, even where they existed, did not seem to deter competition. Entry and exit into and out of the system was found to be free from

---

[8]William O. Jones, "The Structure of Staple Food Marketing in Nigeria as Revealed by Price Analysis." Food Res. Inst. Studies, Vol. 8, No. 2, 1968, p. 95.

[9]This general conclusion can be found in Alan R. Thodey, "Analysis of Staple Food Price Behavior in Western Nigeria," Ph.D. Dissertation, University of Illinois, 1969, p. 176; Elon H. Gilbert, "Marketing of Staple Foods in Northern Nigeria: A Study of the Staple Food Marketing Systems Serving Kano City," Ph.D. Dissertation, Stanford University, 1969, p. 281; Anita Whitney, "Marketing of Staple Foods in Eastern Nigeria," Agricultural Economics Report No. 114, Department of Agricultural Economics, Michigan State University, 1968, p. 48; H. M. Hays, Jr., "Organization of the Staple Food Marketing System in Northern Nigeria," Ph.D. Dissertation, Kansas State University, 1973, pp. 165-166; and N. O. Ejiga, "Economic Analyses of Storage, Distribution and Consumption of Cowpeas in Northern Nigeria," Ph.D. Dissertation, Cornell University, 1977, p. 365.

obstacles. There was very little government intervention in the operation of the staple food marketing system.[10]

Policy recommendations from the studies centered on suggesting that government should not interfere with the system of staple food marketing. There was optimism that the system was flexible and adaptable enough to handle emerging circumstances. The government was advised to concentrate on the provision of infrastructures like roads and improved market stalls. There were also suggestions for standardization of units of measurement.

The studies provided a first-time, comprehensive look at the traditional staple food marketing systems of the major geographical regions of Nigeria. The ability of the food marketing systems to adapt to new circumstances is now being tested under such impacts as agricultural development projects, population growth, and rapid urbanization.

Agricultural Development Projects

Agricultural development projects like Funtua ADP are regarded as a key to solving Nigeria's food problems. They are also expected to make farming a more renumerative occupation and thus reverse the increasing problems of rural-urban migration.

Among the expected contributions of ADPs are: (1) increased yields obtained for most crops, coupled with increased total production of various crops, (2) provision of a motivated and better-qualified cadre of extension agents, (3) development of an extensive system of rural road networks to improve communication between various communities within the ADP areas, and (4) the provision of employment opportunities to various levels of skilled and unskilled manpower from both within and without the ADP area.

---

[10] Anita Whitney, op. cit., pp. 48-50.

These ADPs were also expected to generate a large body of information relating to agriculture in various parts of the country that could be used as an input towards future agricultural policy formulation. Projects, no matter how small, always require monitoring and evaluation as a means of gathering feedback, formulating guidelines for policy changes, and assessing progress as well as new circumstances which might evolve. The Nigerian ADPs are provided with strong monitoring and evaluation components. However, the monitoring units have served more in a data-gathering capacity than in analysis and evaluation.[11]

The Special Place of Maize Under ADPs

Maize was not a major grain crop in the northern parts of Nigeria before the advent of agricultural development projects. Production was often restricted to backyard gardens. Most of the maize produced was eaten on the cob after roasting. There was very little conversion into grains, as is the case with sorghum and millet--the major grain crops of the area.[12] Maize contributed only 3 percent of the daily caloric intake of cereals in the Zaria area.[13] Even though maize was not a major staple in the northern states of Nigeria, it has been an important food crop in the southern parts of the country for a long time.

---

[11] R. H. Slade, The Monitoring of Funtua, Gusau, and Gombe Agricultural Development Projects. (Washington, D.C.: The World Bank, n.d.), p. I.A.3.

[12] L. A. Tatum, "Maize as a Grain Crop in the Northern States of Nigeria." Samaru Agricultural Newsletter, Vol. 13, No. 4, October 1971, pp. 7-90.

[13] E. B. Simmons, "Calorie and Protein Intakes in Three Villages of Northern Zaria Province, May 1970-July 1971." Samaru Miscellaneous Paper No. 55.

FADP focused special attention on the production of maize. Maize is the grain crop with the greatest potential in terms of increased yields and total output of all grain staples in the savanna zones of Nigeria. It has the highest responsiveness to fertilizer compared with the major competing cereal grains, namely, millet and sorghum. Research has shown that maize production in the savanna areas is technologically feasible and economically profitable. Doubts have, however, been expressed as to the ability of the existing marketing system to handle levels of large-scale production of maize, both at the product level as well as in terms of supplying the required production inputs.[14]

On the basis of maize production research at the farmer level, Norman, et al. (1976), pointed out that the potential for maize produced in the northern states will depend on:

1. The willingness of consumers in the northern states to change their diets by substituting maize for sorghum;
2. The ability to tap the southern market for maize for human consumption;
3. The development of the livestock industry so as to create demand for feed grains; and
4. The development of agro-industries, such as starch and oil processing.

There are indications that the consumption of maize, particularly among the higher income groups in urban centers, is increasing, and that use of maize for meal preparation is not confined to special occasions. There does not seem to be any taste preference for a particular variety

---

[14] Norman, et al., "The Feasibility of Improved Sole Crop Maize Production Technology for the Small-Scale Farmer in the Northern Guinea Savanna Zone of Nigeria." Samaru Miscellaneous Paper No. 59, Institute for Agric. Research, Admadu Bello University, 1976.

of maize in the area. However, the traditional white variety is easier to process into flour, and thus requires less labor by housewives who do the majority of meal preparations. The yellow maize varieties have higher yields but due to processing problems local mills were charging premiums for milling the yellow varieties. Thus, even if people in the area are willing to substitute maize for sorghum, the difficulties of processing maize could slow down the substitution process.

As discussed later in this thesis, little has been done to take advantage of the avenues enumerated above in an attempt to promote the production and acceptance of maize.

Objectives of the Study

The aim of this study is to understand the relationship between the agricultural development projects in Nigeria and the traditional staple food marketing system. The importance of such projects in terms of potential for increased staple food grain production suggests that marketing problems could pose bottlenecks to successful execution of the project plans.

This study will concentrate on the linkage between project activities and the traditional staple food marketing system. The study will try to put together elements from the public sector food marketing programs and the private, traditional marketing system. The assumption is that both the private and the public aspects of staple food marketing are needed and each has to take cognizance of the other for a more efficient system. This reflects what Lele termed as the "pluralistic approach."[15]

---

[15]Uma Lele, The Design of Rural Development: Lessons from Africa. (Baltimore: Johns Hopkins University Press for The World Bank, 1975), p. 100.

Thus, this study hopes to extend earlier studies of food marketing in the area by applying similar methods of analysis under the context of an agricultural development project. The study will also add a new dimension to such studies by including a detailed consideration of the input procurement and distribution system. The specific objectives of the study are as follows:

1. To describe in detail the various activities carried out by agricultural development projects in Nigeria as exemplified by Funtua Agricultural Development Project.

2. To describe, compare, and examine the inter-relationship between the systems of input procurement and distribution at the project, state, and national levels, before and after the re-organization of 1976.

3. To evaluate the performance of the staple food marketing system serving Funtua Agricultural Development Project districts through an analysis of staple food prices over space and time.

4. Based on the results of the evaluation of the staple food marketing system, draw inferences on how well maize is integrated into the marketing system in the area.

5. To draw conclusions and make suggestions as to the specific considerations regarding agricultural marketing to incorporate in the planning of agricultural development projects like FADP.

Organization of the Study

Chapter 2 reviews literature on staple food marketing. It starts with a consideration of the approaches to the study of food marketing. The chapter then examines the structure-conduct-performance paradigm, followed by food marketing studies in Nigeria and a criticism of the studies.

Chapter 3 discusses integrated agricultural development projects, in terms of conceptual framework, government policies and locations

of such projects in Nigeria. Chapter 4 then specifically discusses the Funtua Agricultural Development Project with details involving the area, project, and project activities. Chapter 4 also discusses the data collection method and details of some surveys used in the study.

Chapter 5 describes and discusses inter-relationships between systems of input procurement and distribution at the project, state, and national levels. Chapters 6 and 7 present and discuss results of price analyses--Chapter 6 dealing with temporal price analyses and Chapter 7 discussing spatial price analyses. Chapter 8 summarizes and concludes the study.

CHAPTER 2

REVIEW OF THE LITERATURE

This chapters reviews the literature on food marketing studies in Nigeria. It starts with a discussion of approaches to the study of food marketing and the structure-conduct-performance paradigm.

General Approaches to the Study of Food Marketing[1]

There are as many ways of studying food marketing as there are definitions of marketing. The various methods can be grouped into three main categories as used by Kohls and Uhl (1980). These categories are: (1) the Functional Approach, (2) the Institutional Approach, and (3) the Behavioral Systems Approach.

The Functional Approach emphasizes the various functions performed by the marketing system, such as the exchange functions of buying and selling; the physical functions of storage, transportation, packaging, processing; and the facilitative functions like risk-bearing, financing, grading, and the provision of market intelligence. Main attention is not focused on who does what, but on what is done irrespective of who performs the service.

---

[1]This section is based on Richard L. Kohls and Joseph N. Uhl, Marketing of Agricultural Products. 5th ed., (New York: MacMillan Publishing Company, 1980), Chapter 2.

This approach is useful in determining the minimum cost of performing a given marketing function by comparing the costs of different middlemen performing the same function.[2] Since this approach breaks a complex system into smaller parts, it is amenable to detailed analysis of parts of the system. However, unless enough attention is paid to the linkages relating the subsections, the bigger system viewpoint may be lost.

The Institutional Approach, on the other hand, emphasizes the institutions and institutional arrangements that are involved in the marketing process. The approach endeavors to understand operating procedures, scales of operations, costs and returns, etc. Studies using this approach concentrate efforts on institutional arrangements of middlemen--at retail and wholesale level, brokers and commission men, as well as processors and supporting institutions that provide facilitative services, such as banks, moneylenders and government departments appropriate to marketing.

The institutional approach is useful in analyzing attitudes toward change and improvement of the marketing system. The acceptance or rejection of a proposed innovation can be highlighted by the study of the various institutions involved and how the proposed change affects them in terms of losses and gains. Thus, it can help by showing the likely future pattern of new technology adoption.

The third approach, the Behavioral System Approach, stipulates that food marketing should be looked at as a number of behavioral systems involved in various kinds of decision-making. It emphasizes

---

[2]The marketing functions have characteristics among which is the difficulty of eliminating them. Middlemen may be eliminated but their functions will be done by someone else. Ibid., p. 27.

the multi-disciplinary nature of a meaningful study of such a system aggregate. It implicitly considers dynamic elements in the system's aggregate through the impact of decisions in one system on the behavior of the other interrelated systems.

A variant of the Behavioral Systems Approach is the Subsector Approach developed by Shaffer[3] in 1968. He defined a subsector as "the vertical set of activities in the production and distribution of a closely related set of commodities." Studying agricultural production-distribution systems using the concept makes such studies more manageable without compromising coverage since subsectors have both a vertical as well as a horizontal dimension that can be delimited based on the circumstances of a particular situation. The subsector approach to the study of agricultural marketing is not tied to specific methods of analysis since the concept is only concerned with providing an analytical framework within which available tools could be used for the analysis.[4]

The Food System approach, closely related to subsector approach, was used in a large number of studies carried out by the Latin American Studies Center at Michigan State University.[5] This approach regards production and distribution as an integrated system that coordinates

---

[3]James D. Shaffer, "On the Concept of Subsector Studies." Am. Journ. Agr. Econ., 55 (May 1973), pp. 333-335.

[4]No single field of study is adequate to handle all aspects of subsector studies; therefore, such studies draw from diverse fields like farm management, industrial organization, marketing, cooperatives, etc.

[5]Kelly Harrison, et al., "Improving Food Marketing Systems in Developing Countries: Experiences from Latin America." Research Report No. 6, Latin American Studies Center, Michigan State University, 1974

production, distribution and consumption. It "emphasizes interdependence of related activities and is concerned with the coordination of economic activities as a system."

This approach is particularly useful in the context of developing countries where numerous, often diverse, factors have to be taken into account in performance of economic activities that form part of an overall tightly interdependent system. Factors are both economic and non-economic.

Structure-Conduct-Performance Paradigm

A large number of agricultural marketing studies rely on the theoretical foundations laid by the "perfect competition" model.[6] This is particularly true in studies based on the structure-conduct-performance (S-C-P) paradigm. The S-C-P paradigm has its origin in the works of Bain.[7]

The structure variable refers to number and relative sizes of firms as well as the degree of product differentiation and the extent of vertical integration.[8] Market conduct, on the other hand, refers to the behavior of firms relating to pricing practices, innovativeness,

---

[6]The basic assumptions of the perfect competition model are (1) firms produce homogeneous commodity, and consumers are identical from sellers' point of view, (2) both firms and consumers are numerous, and the sales or purchases of each individual unit are small in relation to aggregate volume of transaction, (3) both firms and consumers possess perfect information about prevailing price and current bids, (4) entry into and exit from the market is free for firms and consumers in the long run. See James M. Henderson and Richard E. Quandt, Microeconomic Theory: A Mathematical Approach. 3rd ed., (New York: McGraw-Hill Co., 1980), pp. 136-137.

[7]Joe S. Bain, Industrial Organization. (New York: Wiley, 1959).

[8]Product differentiation and vertical integration have a direct connection to conditions of entry and exit in an industry.

investment behavior and similar matters. Structure and conduct are influenced by "basic conditions", like location and ownership of raw materials, available technology, price elasticity of demand for products, laws and government policies within which the firms operate.[9]

Performance is the consequence of structure and conduct. It is a multi-dimensional concept whose criteria for evaluation needs to be set out clearly, especially where one is not using the p.c. model as the norm. Often used criteria for performance evaluation, besides the standard norm of the p.c. model, include elimination or minimization of waste, technological innovativeness, full or commensurate employment of resources, and equitable distribution of income. Some of the latter criteria are already implicitly considered in the p.c. model under its requirements of operational and pricing efficiency conditions. However, for employment and income distribution issues additional analysis is often needed beyond strict adherence to the p.c. model.

The criteria listed above, unlike the p.c. model, have received little serious attention. Part of the problem results from the indeterminance of the S-C-P model when the p.c. model is no longer the yardstick. The structure of the market influences but does not totally control the conduct of firms. Thus, the system is not determinate with respect to conduct and therefore not determinate with respect to performance. No given performance can be attributed to a given structure without considering conduct, with is indeterminate.[10]

---

[9]F. M. Scherer, Industrial Market Stucture and Economic Performance. (Chicago: Rand McNally, 1970), pp. 1-7.

[10]Harold F. Breimyer, Economics of the Product Markets of Agriculture. (Ames, Iowa: Iowa State University Press, 1976), pp. 80-81.

Measures of Pricing Efficiency in Food Marketing

Pricing efficiency[11] refers to how well prices across space, time, and variety reflect expected prices based on assumptions of competitive conditions. In spatial price analysis, prices in two locations for the same commodity should differ only by transfer cost, provided competitive conditions prevail.[12] The analysis is simplified when there are few central markets to which produce is sent and thus the pattern of flow is easily mapped. Where the pattern of sources of supply and destinations are many, the mapping and interpretation of spatial price variation needs to be approached more cautiously.

There are problems in determining the levels of transfer costs--they are not a linear function of distance. There is a distance-independent cost component that reflects the cost of loading and unloading.

In temporal price analysis a price series is studied to reveal the components of the series like the trend, the seasonal, and if the series is long enough, some cyclical variations. Trend is the long-run movement in the price level, with long-run being dependent on the type of product (for example, two to three years in grain crops and up to ten

---

[11]Two major criteria of efficiency used in agricultural marketing are pricing and operational efficiency. Operational efficiency is achieved when the maximum amount of marketing services are achieved with a minimum of inputs. It is the achievement of maximum output/input ratio. See Breimyer, op. cit., pp. 132-134.

[12]Transfer costs include loading and handling besides transportation charges. High value of transfer costs in relation to the value of agricultural products may result in big price differentials between locations. See William G. Tomek and Kenneth L. Robinson, Agricultural Product Prices. (Ithaca, New York: Cornell University Press, 1972), p. 143.

twelve years in cattle). Trend can be estimated using simple linear regression of the form:

$$Y = a + bX + e$$

where, b is the trend coefficient

Y is the estimated price

X is the time variable of the series, and

e is the error term

The seasonal component is usually estimated using the method of moving averages. Actual prices are expressed as a percentage of their moving average. Seasonal indices are calculated similarly from the moving averages. Seasonal analysis is important in showing periods of relative low and high prices over the season and could thus help producers and merchants in the process of selling and purchasing decisions.

Estimation of cyclical price variation requires deseasonalizing the data by dividing it with corresponding seasonal indices and then removing trend by dividing further with trend values. What is left after the two-step division is the cyclical component and irregular movements. The cyclical component indicates long-term oscillations about a trend line. The oscillations are sometimes periodic.

Analysis of pricing efficiency over space and grade makes considerable use of correlation theory. Correlation coefficients are calculated between different grades to see how well they substitute for one another. The higher the correlation between different grades of a product, the stronger is the substitution relationship between them. Likewise, over space, high correlation coefficients that are positive indicate that prices are unified under a common system. Price spreads

across space or grades are also very useful when coupled with transportation rates and estimates of premium prices across grades.

Food Marketing Studies in Nigeria

W. O. Jones and a team of researchers carried out a number of food marketing studies under the auspices of Stanford Food Research Institute.[13] These studies were part of a larger study of staple food marketing in Tropical Africa which included the countries of Sierre Leone and Kenya, as well as Nigeria. As pointed out by Jones, these studies were carried out to overcome deficiencies in information about internal marketing of food stuffs in tropical African countries. Two important food marketing studies in Northern Nigeria, carried out after the Stanford studies, were by Hays (1973) and Ejiga (1977). These studies are discussed together with the earlier studies since they all employed similar methodologies.

Data for some of the analyses came from government price data collected by the Nigerian Federal Office of Statistics and data reported in the Northern Nigerian government's "Crop and Weather Reports." These data were supplemented with field work carried out by the researchers.

---

[13]The studies of greatest concern here are: William O. Jones, "The Structure of Staple Food Marketing in Nigeria as Revealed by Price Analysis." Food Res. Inst. Studies, Vol. 8, No. 2 (1968), pp. 95-123; Elon H. Gilbert, "Marketing of Staple Foods in Northern Nigeria: A Study of the Marketing Systems Serving Kano City." Ph.D. Dissertation, Stanford University, 1969; Alan R. Thodey, "Analysis of Staple Food Price Behavior in Western Nigeria." Ph.D. Dissertation, University of Illinois, 1969; Anita Whitney, "Marketing of Staple Foods in Eastern Nigeria." Agricultural Economics Report No. 114, 1968.

Methods of Analysis

Each of the studies has examined, in considerable detail, the operational and pricing efficiency of the systems of food marketing under investigation. Emphasis was on the structure, conduct, and performance of the systems. For example, in order to determine the operational efficiency of the marketing system for sorghum and millet, Hays examined in detail the market channels, institutions, intermediaries, and other functionaries involved in the marketing process, and evaluated costs in relation to the marketing services provided, including a budgeting of the incomes of the intermediaries at each stage of the marketing channel.[14]

The general research framework for Hays' study is based on Pritchard,[15] with modifications taken into consideration of the economic, technological, and social constraints in the developing country's environment.

In general, each of the studies devoted considerable attention to the analysis of temporal price behavior in order to test the allegation of depressed food crop prices during the immediate post-harvest period as well as claims of an excessive rise in prices during the off-season period. Seasonal price indexes were calculated for various locations and crops. These indices were then analyzed to reveal the pattern of seasonal variations. Seasonal increases in price were then compared with costs of storage.

---

[14]Henry M. Hays, Jr., "The Organization of Staple Food Grain Marketing Systems in Northern Nigeria: A Study of Efficiency of the Rural-Urban Link." Ph.D. Dissertation, Kansas State University, 1973.

[15]N. T. Pritchard, "A Framework for Analysis of Agricultural Marketing Systems in Developing Countries," Agri. Econ. Res., 21: 78-85.

The studies have looked at the level of spatial integration of markets in order to see how well the structure compares with what it would have been if the assumptions of p.c. model applied. The important variables are the cost of transfer of commodities between locations and the level of information flow between the locations. It is important to know which locations trade with one another.

Bivariate correlation coefficients were estimated for various crops and pairs of locations. Price differences between locations are also estimated and then evaluated against the cost of transportation and handling between locations.

Bivariate correlation coefficient between two series of prices is defined as:

$$r = \frac{\sum_{i=1}^{N} (X_i - \bar{X})(Y_i - \bar{Y})}{\left\{\left[\sum_{i=1}^{N} (X_i - \bar{X})^2\right]\left[\sum_{i=1}^{N} (Y_i - \bar{Y})^2\right]\right\}^{1/2}}$$

where, X_i = i^{th} observation of price series X
Y_i = i^{th} observation of price series Y
N = number of observations
$\bar{X}$ = mean of price series X
$\bar{Y}$ = mean of price series Y

The degree of correlation as expressed by the value of the correlation coefficient is taken as an indicator of the extent to which two markets or locations are integrated.[16] Under conditions of perfect competition the correlation coefficient between prices in two locations will be 1.00. This is not achieved in the real world due to less than perfect conditions in information flow, homogeneity of products, and physical mobility.[17]

---

[16]Uma J. Lele, Food Grain Marketing in India. (Ithaca, New York: Cornell University Press, 1971), p. 23.

[17]Ibid.

There are many problems in using correlation coefficients as indicators of market integration. Results of such analysis have indicated unexpected outcomes. High correlations have been found between markets that do not trade with one another. It is also common to find significant negative correlations between locations which do not make sense. Additionally, it is difficult to set up the cutoff points showing what levels of correlation indicate what level of market integration. Perfect competition only calls for a correlation of 1.00, anything less has to be explained by other means.

Results of the Studies

Results of seasonal price analyses showed that urban locations tended to have less price variation compared to more rural locations, suggesting that some storage might be taking place in the urban centers. However, this was not verified by interviews with traders. The studies indicated that traders held stocks no larger than were needed for current needs, lasting about a week to a month.[18] The seasonal price analyses also showed that prices "appear to be subject to more irregular fluctuations than might be expected."[19]

The results from the market integration studies in Nigeria indicate that there is only weak integration of staple food markets as indicated by the low levels of correlation coefficients between markets. However, cowpeas showed the existence of a well-integrated system of markets.[20]

---

[18]Thodey, op. cit., p. 108; Gilbert, op. cit., p. 95; Hays, op. cit., p. 163; and N. O Ejiga, "Economic Analyses of Storage, Distribution and Consumption of Cowpeas in Northern Nigeria." Ph.D. Dissertation, Cornell University, 1977. pp. 134-135.

[19]Jones, op. cit., p. 110.

[20]Thodey, op. cit., p. 118; Ejiga, op. cit., p. 296.

Many reasons were suggested to explain the reasons for the low levels of the correlation coefficients observed in food crops other than cowpeas. These included the poor quality of the data used and problems associated with converting to standardized measures from the local measures used in transactions.[21]

Other possible explanations of poor market integration are poor information flow about prices and the complete absence of even rudimentary market news reports. Even where available, such reports were only for limited official circulation. Quality differences were also hypothesized to have contributed towards some of the low correlation coefficients observed.[22]

The studies have achieved the overall goal of providing detailed information on the structure and functioning of the staple food marketing systems in Nigeria. The summary findings of these studies regarding the operational and pricing efficiency of the Nigerian staple food marketing system is that the systems are operating in a competitive manner except in a few "unimportant" cases.[23]

Policy Recommendations

Policy recommendations were similar in all the studies. These recommendations suggested that government would do better by not interfering with the system of staple food marketing. There was optimism

---

[21] Local measures show significant variations from one location to another and in some cases from one season to another, reflecting supply conditions.

[22] Jones, op. cit., p. 155.

[23] Thodey, op. cit., p. 176; Gilbert, op. cit., p. 286; Whitney, op. cit., p. 48; Hays, op. cit., pp. 165-174.

that the system was flexible and adaptable enough to handle emerging circumstances. The government was advised to concentrate on the provision of infrastructures like roads and improved market stalls. There were also suggestions for standardization of units of measurement used in marketing transactions. Featured prominently was also a call for the establishment of an organized market intelligence system to serve producers, consumers, and merchants.

In conclusion, these studies provided a comprehensive look at the traditional staple food marketing system that represented the major geographical regions of Nigeria. Inter-regional comparisons can be made, since the basic research framework used was very similar in all the studies. Even where conclusions from the analyses were disputed, the researchers' well-documented field accounts are very valuable. The studies have also served greatly in stimulating interest in students and government officials about the complexities of the Nigerian staple food marketing system.

Other studies of the staple food marketing system in Nigeria not discussed as part of the general overview include studies by Anthonio, Welsch, Olayemi and Okereke.[24]

Criticisms of Nigerian Food Marketing Studies

Criticisms of these studies is, in general, criticism of the structure-conduct-performance paradigm--and its various derivations.

---

[24]Q. B. O. Anthonio, "The Marketing of Staple Foodstuffs in Nigeria: A Study of Pricing Efficiency." Ph.D. Dissertation, University of London; D. E. Welsch, "Rice Marketing in Eastern Nigeria." Food Res. Inst. Studies, 6, (1966), pp. 329-352; J. K. Olayemi, "Food Marketing and Distribution in Nigeria: Problems and Prospects." Nigerian Institute for Social and Economic Research, University of Ibadan, 1974.

Harriss divided the criticism into two parts: one part relating to the data and the methodology, and the other dealing with relevance of data in the conclusions of the studies. On both accounts Harriss pointed out deficiencies in the studies.[25]

The quality of the secondary data used for the Nigerian studies was generally poor. This is even pointed out by the researchers who used the data. It is a common problem in developing countries; it reflects the poor conditions of data-gathering institutions, particularly those under government ministries.

On methods of analysis, the shortcomings of correlation analysis have been discussed earlier. Those shortcomings coupled with poor data further weaken the strength of the analyses.

On the use of margin analysis, problems include the necessity of using value judgement to explain what a "fair" margin is, explanation of reasons for losses if the costs exceed returns, and an explanation of profits at some point and losses at other times.[26] Other problems according to Harriss included the lack of clear statement in the studies as to what measure of seasonal price variability was being used, inadequate explanations as to the selected interest rates in calculating storage costs, and the use of urban estimates for such costs while most of the storage is carried out at the village level.[27]

The use of unidirectional flow of product model, from the rural areas to the urban centers, has also been questioned since it ignores

---

[25] Ibid., p. 199.

[26] Ibid., p. 204.

[27] Ibid., p. 205.

the possibility of price reversals at certain periods of the season as evidenced in Indonesia.[28] However, this is a weak argument in the case of the major Nigerian staples which more reasonably conform to unidirectional flow than Timmer's other models.[29]

A recent study on staple food marketing from Stanford indicated that the criticisms have been noted, but the same methods were used as in earlier studies.[30]

What Do Correlation Coefficients Indicate?

Although a big part of Harriss' critique is based on the improper use of correlation coefficients, she made some of the same mistakes for which she was criticizing others. Harriss stated that "high coefficients indicate stable margins or stable prices . . ." She went on, " . . . since in India and West Africa they (correlation coefficients) obviously do not indicate stable prices, they must indicate stable margins." High correlation coefficients between prices do not necessarily indicate only "stable margins or stable prices". Prices and margins could be rising while coefficients are still high. A simple illustration of this is shown below.

Assume a series of prices in each of three markets (A, B, C) for a commodity. Market A is the reference market whose prices are correlated with other markets. The price series in market B were constructed to reflect a constant margin of .02 over prices in market A. Likewise,

---

[28]C. Peter Timmer, "A Model of Rice Marketing Margins in Indonesia." Food Research Inst. Studies, Vol. 13, No. 2, (1974), pp. 99-143.

[29]Bidirectional flow models may be useful in the case of those products that have a large import component, like rice in recent years.

[30]Van Roy Southworth, "Food Crop Marketing in Atebubu District, Ghana." Ph.D. Dissertation, Stanford University, 1981.

ILLUSTRATIVE DATA

Price of Commodity X (Naira/kg)

Period	Market A	Market B	Market C
1	.25	.27	.27
2	.26	.28	.30
3	.28	.30	.33
4	.27	.29	.33
5	.29	.31	.36

Notes: B - A = constant
C - A <> constant
Corr. AB = .99
Corr. AC = .97

prices in market C were constructed to reflect a rising margin over the series. Computation of correlation coefficients for markets B and C as related to market A shows that both coefficients are above .90, the generally accepted level above which such coefficients are considered high.

Correlation coefficient is a measure of the covariation between two variables--it measures the degree of linear association between them. It is dimensionless and can range from -1 to +1. For most purposes attention is given to positive coefficients. When they are high, approaching unity, this indicates that the two prices move together in the same direction. Increases in price in one series corresponds with an increase in prices in the other series. Likewise, if the price in one declines, the price in the other market also declines. A negative correlation coefficient simply indicates that as the price in one market increases, the price in the other market decreases. It is difficult to

explain in rational terms how two markets can operate in this fashion. When the correlation coefficient between two markets is zero or close to zero, the two markets are said to be unrelated.

Correlation coefficients do not imply causation. The two variables involved in the simple correlation coefficient are at the same level of importance. The correlation between A and B, AB, is the same as the correlation coefficient between B and A, BA. There is no independent or dependent variable, unlike the case of regression. These are discussed in most statistics text books.[31]

Correlation coefficients could be used to indicate patterns of spatial relationships provided precautions are taken in the choice of locations, appropriate prices, and in the interpretation of the results. For high correlations to signify monopolistic situations in a system of markets, a very high degree of market control must exist. Most studies indicate this condition is rare in African food marketing systems.[32]

In summary, this chapter has examined the literature on food marketing with emphasis on studies done in Nigeria. It started with a general review of the framework for food marketing studies. It then looked at Nigerian food marketing studies in terms of methodology and findings, and concluded with a critique of the studies. The review indicated that much research has been conducted in the area of food

---

[31]George W. Snedecor and William G. Chochran, Statistical Methods. 6th ed., (Ames, Iowa: Iowa State University Press, 1967); John Neter and William Wasserman, Applied Linear Statistical Models. (Homewood, Illinois: Richard D. Irwin, 1974).

[32]An exception to this could be in the case of controls imposed by governments as in the case of OPAM operation in Mali, but even there it is indicated such controls fail to be effective. See Elliot Berg, "Reforming Grain Marketing Systems in West Africa." Center for Research on Economic Development, University of Michigan, 1979.

marketing in Nigeria, but there is a gap in terms of relating such studies to agricultural development projects. There are also problems in terms of some of the methodologies used in the studies.

CHAPTER 3

INTEGRATED AGRICULTURAL DEVELOPMENT PROJECTS

This chapter examines agricultural and rural development projects, particularly those labelled as integrated agricultural development projects. The first section deals with a general overview of such projects, including those in East Africa. The chapter then considers ADPs in Nigeria--their conceptual framework, government policies, number and location, and their activities. The chapter wraps up with a discussion of some of their problems.

General Discussion on Agricultural Development Projects

With the demise of the Community Development approach and the inconspicuousness of small-scale agricultural development projects, increasing attention has been given to large-scale Integrated Agricultural Development Projects in developing countries. Of special importance in the turn towards Integrated Projects is the availability of funding for such projects from foreign aid donors and lenders who seem to have accepted the approach, e.g., the World Bank.

Most of these large-scale projects operated as autonomous or semi-autonomous organizations removed from normal established bureaucracy. This detachment from the traditional organization is thought to bring dynamism into the operations of the projects. But this same detachment

has often been the cause of interorganizational conflicts inimical to the achievement of project goals.[1]

Integrated Agricultural Development projects are often deliberately made large and conspicuous. They are established in geographical regions most conducive to achievement of rapid increases in production and well served with infrastructural facilities. Establishment of such projects is often accompanied by political campaigns in support of the projects. The political support for such projects enable the projects access to an unusually large share of available qualified personnel and other resources. The projects become isolated enclaves of concentrated resource use in comparison to the surrounding areas.

Although the major aim of these projects is to increase the incomes of the farmers via increases in the output of one or more farm products, other components are invariably included. That is the essence of the term "integrated" in such projects. The projects differ in how much of other components are included. The most often included components are credit, enhanced agricultural extension and supervision, marketing of outputs, provision of physical inputs such as fertilizer, and, in some cases, the provision of social services like health care facilities, schools, etc.

Although there is a large volume of literature on Integrated Agricultural Development Projects, there are very few studies that specifically examine the role of marketing in such projects. For Africa, Lele

---

[1]This is more likely to occur where personnel from the governmental organization are moved to the new project organization and promoted, with greatly improved conditions of service. The colleagues left in the old organization tend to cause problems, particularly when their cooperation is requested.

has comprehensively assembled and critically examined the available evidence.[2] The projects examined dealt with various issues including agricultural marketing. The growth of such projects after 1975 has been mainly in West Africa, particularly in Nigeria. With few exceptions, the new projects in West Africa have a lot in common with their East African predecessors and, hence, a look at the experience on projects in East Africa could help in understanding the West African projects. Of special interest are the Chilalo Agricultural Development Unit (CADU) and the Wolamo Agricultural Development Unit (WADU), both in Ethiopia and the Lilongwe Rural Development Program in Malawi. These projects will be reviewed based on Lele, with special emphasis on the marketing component.

The similarity of the projects in eastern Africa to the Nigerian projects is striking in terms of the components of the two groups of projects. Both are based on the assumption that a "critical minimum effort" is necessary to make a noticeable impact on the target population in a relatively short period of time. Both sets of projects provided very similar services made up of soil conservation, roads, general agricultural extension, credit, marketing services, training and, in the case of the eastern Africa projects, health clinics and nutrition education.[3]

---

[2]Uma Lele, The Design of Rural Development. (Baltimore and London: Johns Hopkins University Press for the World Bank, 1975).

[3]Similarities in the services provided by the East African projects as compared to the Nigerian ADPs is not surprising since the experience gained by the World Bank in the older projects influenced the structure of the ADPs in Nigeria. The details of the East African projects' activities are described in Lele, Ibid., pp. 14-21.

Lele's examination of the East African Projects revealed that there was a tendency to set up formal marketing institutions in such projects. There was a serious neglect of the traditional marketing institutions existing in the project areas. The result of such an approach led to higher marketing costs compared to the traditional marketing institutions existing in the area.

Lele argued for a pluralistic approach in the marketing of project outputs and inputs under such projects. The pluralistic approach allows the participation of multiple institutions, both formal and nonformal, parallel to one another which may provide new alternatives for producers and enhance overall efficiency of the system.

The suggestion that the pluralistic approach is a better choice should, however, be treated with caution since it is possible to theoretically conceive of a single system that could be equally efficient. However, in practice and based on a number of projects examined, the single formal institution approach has not fared well.

Price incentives form a major rationale for including marketing components in Agricultural Development Projects. It is claimed that markets in areas where these projects operate are small and fragmented and the marketing system is prone to various kinds of inefficiencies with middlemen exploiting producers. Other reasons offered include the need to reduce defaults in credit programs.[4]

The reasons offered as rationale for including formal marketing programs in integrated projects are generally not substantiated by

---

[4]Ibid., Chapter VI, pp. 100-115; The World Bank, Appraisal of Funtua Agricultural Development Project, Nigeria. (Washington, D.C.: The World Bank, 1974), Annex 12, pp. 1-18.

documented evidence. Cohen,[5] for example, wrote, "There is a lack of competition and much collusion in Chilalo markets. This results in wide marketing margins, lower price to farmers and erratic seasonal price fluctuations due to speculation." This may be true in Chilalo but the conditions described by Cohen may arise from other causes besides lack of "competition" due to collusion.

Both Ethiopian projects, CADU and WADU, carried out purchasing of crops. The arrangement to purchase crops generally starts with one crop but later gets extended to other crops. Different crops pose different management problems to projects and formal marketing institutions. Export crops are easier to manage than food crops. Export crops have a centralized system of marketing with unidirectional flow of the products to "central" collection markets from where they are transported to the ports. In addition, there is usually only a single organization in charge of the crop. This is close to the position of wheat in CADU. CADU management found it relatively easy to handle wheat marketing since the wheat goes to a few big flour mills. Most of the other crops, however, had to go to local markets that deal in small quantities of sales and purchases.[6]

The small quantities dealt with in the marketing of staple food crops have similarly posed problems in Malawi's LLDP where the marketing of inputs and outputs was entrusted to the Agricultural Development and Marketing Corporation (ADMARC). Although ADMARC handled export crops

---

[5]John M. Cohen, "Effects of Green Revolution Strategies on Tenants and Small-Scale Landowners in the Chilalo Region of Ethiopia." Jour. Developing Areas, Vol. 9, (April 1975).

[6]Uma J. Lele, Ibid., p. 103.

fairly easily, the organization could not handle staple food crops. In the case of maize, LLDP project management had to introduce a scheme to purchase maize directly from the farmers. As a result of the LLDP management pricing differential (they paid more than ADMARC), there was conflict and bitterness from ADMARC administrators that ended up hurting the farmers and increasing the cost of LLDP marketing operations.[7]

Findings also showed that the involvement of project management in direct crop purchases led to financial problems. CADU, WADU and LLDP have suffered through their participation in schemes to stabilize product prices with no idea as to the level which prices should be stabilized.

More problems are created than solved in attempts to stabilize prices if yield variability is larger than price variability. If price variability is due to yield variation, it may be unwise to institute stabilization schemes without a detailed analysis of the price structure and yields over a number of crop seasons. There is no indication that this was done in any of the projects discussed.

Intervention in the marketing of inputs and outputs in these projects also neglected to consider the possibilities of modifying the existing marketing institutions, both traditional and formal, so as to handle the marketing aspects of the projects. This completely ignores the advantages to be gained from Lele's "pluralistic approach."

Although the problems in Nigeria are similar to those found in East Africa, there are also some major differences. While in East African projects over-centralization was a major problem, this has not been the

---

[7]Op. cit., pp. 105-106.

case so far in Nigeria, at least in staple food marketing. It is, however, an important issue in the case of input procurement and distribution system. In the case of staple food marketing the local marketing institutions were left to take care of this aspect. There was an informal arrangement for the purchase of some project output of staples via government channels, but the arrangement did not turn out as planned. Inadequate background research on the capacity of the local traditional marketing system to handle the envisaged quantities of maize led to problems in the disposal of the crop at prices expected by the farmers.[8]

The problems in Nigerian ADPs included lack of vertical coordination of production and marketing activities which led to economic losses to both producers and consumers. There were no provisions for agricultural product processing activities under the ADP arrangements. Complaints were made regarding late opening of buying stations for statutory crops like cotton and groundnuts.[9]

The concept of agricultural development projects as applied to the Nigerian situation is dealt with in the following sections.

Integrated Agricultural Development Projects in Nigeria

The concept of an Integrated Rural Development Project (IRDP) is not a new one in Nigeria, but it got major support at federal government level when it was explicitly considered in the third National Development

---

[8]FADP, Quarterly Report, January-March, 1980.

[9]F. S. Idachaba, "Concepts and Strategies of Integrated Rural Development: Lessons from Nigeria." Food Policy Technical Research Paper No. 1, Department of Agricultural Economics, University of Ibadan, Nigeria, p. 30.

Plan of 1975-1980.[10] According to the plan document, it was the policy of the Nigerian government to:

> . . . promote a new strategy whereby available extension personnel be redeployed to permit concentrated efforts in selected compact areas. Taken together with an appropriate institutional set up, such as farmer's groups and cooperatives, this strategy will ensure that extension, input supply, supporting services, such as marketing and equipment hiring are integrated at the village level.

The above essentially makes up the Nigerian government's concept of Integrated Rural Development. Further, in the same paragraph it was mentioned that the IRDPs and National Accelerated Food Production Program depended on the above policy guidelines.

Conceptual Framework on Agricultural and Rural Development Projects

There is considerable ambiguity in the discussion relating to the Integrated Rural Development Projects in developing countries and its relation to development objectives.[11] Often many take Integrated Rural Development to be synonymous with Integrated Agricultural Development (IAD). The latter was the case in the third National Development Plan document. This was probably due to the great weight of agriculture in most rural areas of developing countries. However, IRD is much more broadly based than IAD and includes components generally considered to be non-agricultural, like health care services, educational facilities and programs, and development of awareness in the political process. It

---

[10] Ibid., p. 1. It should be noted that the difference between IRDPs, IADPs and ADPs is often lost, particularly in government documents. The difference, though important, is not strictly adhered to.

[11] Tekola Dejene, "Integrated Rural Development in Africa: Planning and Evaluation." Masters Thesis, Michigan State University, 1973.

is clear that these issues are obviously all inter-related and hence the futility of attempts to draw demarcations as to where agricultural development stops and rural development starts.

The problem is not just a matter of semantics, particularly if one looks at what gets carried out from the planning documents. The planning and execution, as well as the results obtained so far from the first three IADPs in Nigeria, do not support the claim of these being integrated in the sense of IADs let alone as IRDs. The Nigerian ADPs cannot be categorized as Integrated Rural Development projects since they are mainly production-oriented ADPs. For the term IRDP to be used there is need for projects to include components that reflect greater concern with rural welfare, like adult literacy, health care components, etc. Even as integrated agricultural projects there is very little coordination, let alone integration, of project activities as revealed by recent studies.[12]

Of the five models presented by Idachaba, Model I, "Integrated Supply of Farm Inputs and Marketing Facilities", probably came closest to the situation in Nigerian ADPs. As pointed out by Idachaba, the basis for this model rests on the premise that agriculture is the predominant occupation in rural areas and any attempts to raise productivity must thus consider the sector. Another premise is that raising productivity has a number of necessary prerequisites.

The necessary prerequisites include:

1. Timely provision of the right inputs at the right places
2. An effective extension system

---

[12]Idachaba, op. cit., p. 36; D'Silva and Raza, pp. 282-297.

3. An integrated extension-research-training system
4. An extensive network of feeder roads
5. Supportive farm credit
6. Supportive institutions

Another premise of the model is that gains in productivity can be lost if not complemented with development of an efficient marketing system to handle issues relating to pricing, storage, transportation, processing, and others that might arise as a result of project activities.[13]

The other four models included various components in addition to the above, like equity, rural non-farm production activities of the small-scale industry types, social amenities relating to health and education, and political awareness. Attention will now focus on Model I since even the requirements of this minimal model for the term of integrated development have not been met.

Although all the components of Model I are often present in Nigerian ADPs, the coordination needed to consider them as a single unit is absent. It is also clear that the form of these components is strikingly different from the form required for an integrated system. For example, the marketing component does not include the processing and marketing of staple food crops, the leading justification for the projects. The case of maize marketing is particularly illustrative and results presented later tend to confirm the lack of integrated planning and execution of the projects in general, and in the FACP in particular.

---

[13]Ibid., pp. 3-5.

Government Policies Relating to Agricultural Development Projects

The origin of the policies relating to the ADPs was the increasing concern with low productivity of agricultural production and the consequent inability of agriculture to feed the growing population of the country, which is becoming more urbanized and non-agricultural. The Federal government discussed with the World Bank and various state governments the ways to arrest the problem.

What emerged was a policy directive on the establishment of agricultural development projects, particularly in the more northern parts of the country. The geographical coverage has since been extended to cover most of the zones of the country.

The agricultural development projects were planned to provide a "short-term", quick way of improving farm production and incomes. The projects would provide a concentration of support services to areas of reasonable potential and dense farm population. The guidelines assumed that in such areas farm sizes cannot increase and that farmers are faced with the task of maintaining fertility of existing lands to maintain present production levels. The government and the bank felt that conditions would permit the rapid acceptance of new improvements offered to the farmers.[14]

Since the ADPs are planned to provide only short-term solutions to problems of farm production and incomes, the government had other plans for a more long-term solution based on the utilization of unused parcels of land in the tsetse-infested middle belt areas of the country. Thus the failure or success of the current ADPs will probably influence consideration of the long-term option.

---

[14]The World Bank (1974), op. cit., p. 4.

Design Elements of Nigerian ADPs

The specific elements of ADP design for successful operation included (1) the careful selection of location for the project, ensuring that the soil is fertile and extending the availability of higher yielding, tested-crop production packages to farmers, (2) the project should focus on farm inputs, rural roads, water resources and improved extension, (3) the projects had to be large and prominent to attract attention to researchers and farmers, and away from administrators, (4) an appropriate incentive structure, based on farmers' estimates of financial profitability, had to be built in to encourage voluntary farmer participation. Subsidies on inputs were very generous and the management structure allowed for the use of foreign expertise to make up for deficiencies in local personnel. There was also provision to incorporate the training of local manpower for the projects.

The above factors accounted for the reported relative success of the agricultural development strategy based on ADPs in Nigeria.[15] There are also a number of criticisms of the policies. One such criticism focused on the large investments involved and the lack of concern with cost recovery. The government's subsidy provisions are too generous to allow for the replication of the success of such projects elsewhere without financial capability for similar subsidies.[16]

The heavy reliance on foreign personnel is also seen as a negative factor since upon termination of their contracts local personnel of

---

[15]The World Bank, Accelerated Development in Sub-Saharan Africa, An Agenda for Action. (Washington, D.C.: The World Bank, 1981), p. 53.

[16]Ibid., p. 16.

equivalent training and experience are often unavailable to manage the projects. There is need for an integration of local personnel in all key areas of project decision-making, extending from the project preparation stage to the total transfer of the project to local management. Al-Sudear appropriately comments that ". . . planners in the developing countries must themselves become more fully involved in charting development strategies and investment projects appropriate to their specific country requirements."[17] But to get the statements realized there is a need for greater involvement of local personnel in the day-to-day running of projects.

Number and Locations of ADPs in Nigeria

The number of ADPs in Nigeria has increased steadily since the first three were initiated in 1974-75. Six more had been added by the end of 1980, and a number of the original projects had been extended to cover wider geographical areas.

The first set of projects included Funtua, Gusau and Gombe ADPs. The second batch of projects focused on Lafia, Ilorin, Ayangba and Bida ADPs. Other ongoing ADPs include the Oyo North ADP and the Ekiti-Akoko ADP. There are a number of other ADPs in preparation, some of which were at appraisal stage in 1981 (See Figure 3.1).

Funtua, Gusau and Gombe ADPs are in Kaduna, Sokoto, and Bauchi states, respectively. Lafia ADP is in Plateau state, Ayangba ADP in Benue state, Ilorin ADP in Kwara state, Bida ADP in Niger state, Oyo North ADP in Oyo state, and Ekiti-Akoko ADP in Ondo state.

---

[17]Abdelmuhsin M. Al-Sudeary, Forward to Investment Projects in Agriculture by McDonald P. Benjamin, (Harlow, Essex: Longman, 1981), p. xv.

The project activities were monitored by the Agricultural Project Monitoring, Evaluation, and Planning Unit (APMEPU) at Kaduna. Recently two more APMEPUs have been added--Benin and Enugu--located in Bendel and Anambra states, respectively. There is also an Agricultural Rural Management and Training Institute at Ilorin in Kwara state as part of the system (See Map 3.1).

Activities of Nigerian ADPs[18]

The ADPs have multiple functions that included Rural Infrastructures, Farm Service Centers, Farm Inputs and Farm Support Services. Under the Rural Infrastructures component the projects undertake the construction of feeder roads, earth dams, ponds and soil conservation schemes.

Farm Input component, one of the most important components of the projects, handled seed multiplication activities, supply of fertilizers, insecticides, tractors, sprayers, ox carts, ox ploughs and credit facilities to allow the purchase of some of the inputs.

Farm support services dealt with the provision of extension services and had the objective of greatly reducing the high farmer/extension agent ratios existing in the project areas.

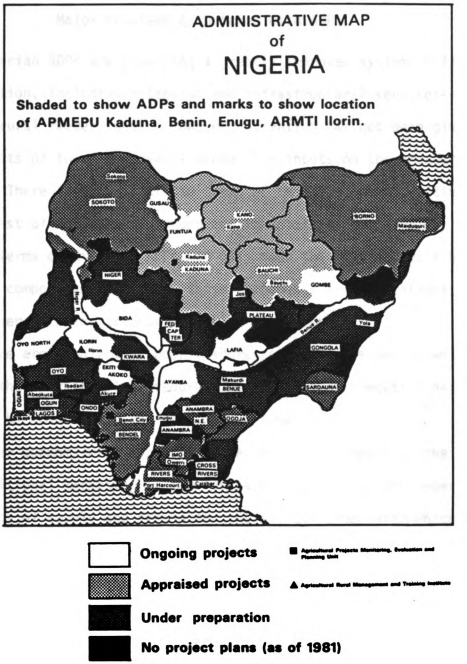
Project marketing activities, a part of farm support services, center on the activities of the commercial sections which run the Farm Service Centers. These FSCs sell inputs to the farmers and provide management information at locations easily accessible to the farmers.

---

[18]For a detailed description of the activities of the projects see The World Bank (1974), op. cit., pp. 7-10, and McDonald P. Benjamin, op. cit., pp. 186-188.

Map 3.1

Location of Agricultural Development Projects in Nigeria



Source: Federal Ministry of Agriculture, Department of Rural Development.

The details of project activities will be illustrated using the case of Funtua Agricultural Development Project in the next chapter.

Major Problems Associated with ADPs

Nigerian ADPs are providing a greatly improved system of farm input distribution, including extension and infrastructural services--particularly rural feeder roads. However, attention has not been given to the impacts of increased use of production inputs on the broader food system. There is very little in terms of relating project activities to the rest of the economy beyond the immediate project areas. Integration in terms of Nigerian ADPs can only mean that the projects have multiple components. However, these components are not integrated and in a number of cases are not even well coordinated.

There are problems of poorly addressed equity issues as well. Some of the operational procedures used in project execution have been found to be inequitable and anti-small farmer.[19]

Other economy-wide issues include the likely impact of the ADPs on the traditional marketing system for farm products and the underlying conditions of supply and demand for the various crops with which the projects are working. Relationship of project activities to government food policies and relationship to the agro-industrial sector have received relative neglect. These issues are by no means easy to grapple with much less successfully incorporate within the ADPs, particularly at the planning stages where this is most needed. Nevertheless, given the size of investments involved and the resulting non-marginal mature of

---

[19]D'Silva, Brian C. and M. Rafique Raza, "Integrated Rural Development in Nigeria - The Funtua Project," Food Policy, Vol. 5, No. 4, November 1980, pp 282-297.

the projects, one would have expected more precautions built in the project design to reflect concern with the issues discussed above.

Projects, no matter how small, always require monitoring and evaluation to provide feedback for guiding policy changes as well as to reflect progress and identify new circumstances. The Nigerian ADPs are provided with a strong monitoring and evaluation component. However, these units have served more in the area of data-gathering than in analysis and evaluation. The monitoring and evaluation unit has so far not had much impact in redirecting policy relating to managing ADPs. This is a serious shortcoming, even though admittedly the unit had a number of serious obstacles initially.[20] In the first three years of the ADP's existence there were a number of serious disagreements between the Project Management Unit and the Project Monitoring and Evaluation Unit at Kaduna regarding the validity of some results of the initial data evaluation. Things have improved, however, even though data processing still lags behind data collection capability.

However, these problems should not detract analysts from considering the successful aspects of ADP operations, including the success of APMEPU.

---

[20]R. H. Slade, "The Monitoring of Funtua, Gasua, and Gombe Agricultural Development Projects." (Washington, D.C.: The World Bank, n.d.), pp. I.B.25-I.B.31.

CHAPTER 4

STUDY AREA, FADP AND THE DATA

This chapter describes the Funtua Agricultural Development Project area and the major activities of the project. The chapter also presents the various FADP/APMEPU surveys from which data was obtained for the analyses carried out in Chapters 6 and 7, as well as the supporting information with regard to the input distribution system in Chapter 5.

Study Area and Project Background

Funtua Agricultural Development Project (FADP) is located in Kaduna State, one of Nigeria's 19 states.[1] The state is bordered by the Republic of Niger to the north; Kano, Bauchi and Plateau states to the east; the new Federal Capital Territory and Plateau State to the south; and by Sokoto and Niger states to the west. The state has an estimated population of about 7,000,000[2] and lies between latitudes 9-13^{o} north and 6-9^{o} east and is comprised of approximately 70,000 square kilometers.[3]

Rainfall in the state varies from over 1,250 millimeters in the southern parts of the state, to less than 750 millimeters in the extreme

---

[1]At the onset of the project, Kaduna State was called North-Central State. There are calls to increase the number of Nigerian States to much more than the current 19.

[2]This estimation was based on the state population of 5.5 million in 1974 and an assumed growth rate of 2.7 percent per annum.

[3]World Bank, "Appraisal of Funtua Agricultural Development Project, Nigeria." (Washington, D.C.: The World Bank, 1974), p. 2.

north. Most of the rainfall is concentrated in the months of May to September, with a high coefficient of variation in its distribution within and between seasons. There is a long dry season between October and April during which little farm work is done and unemployment and underemployment is a serious problem.

FADP area covered the five southernmost districts of the former Katsina Province (See Map 4.1). Total population of the project area, based on the 1963 census, was estimated at 500,000 for 1975 based on a 2.5 percent growth rate. Breakdown of the population by district is presented in Table 4.1.

Table 4.1

Distribution of Population by Districts, FADP, 1975

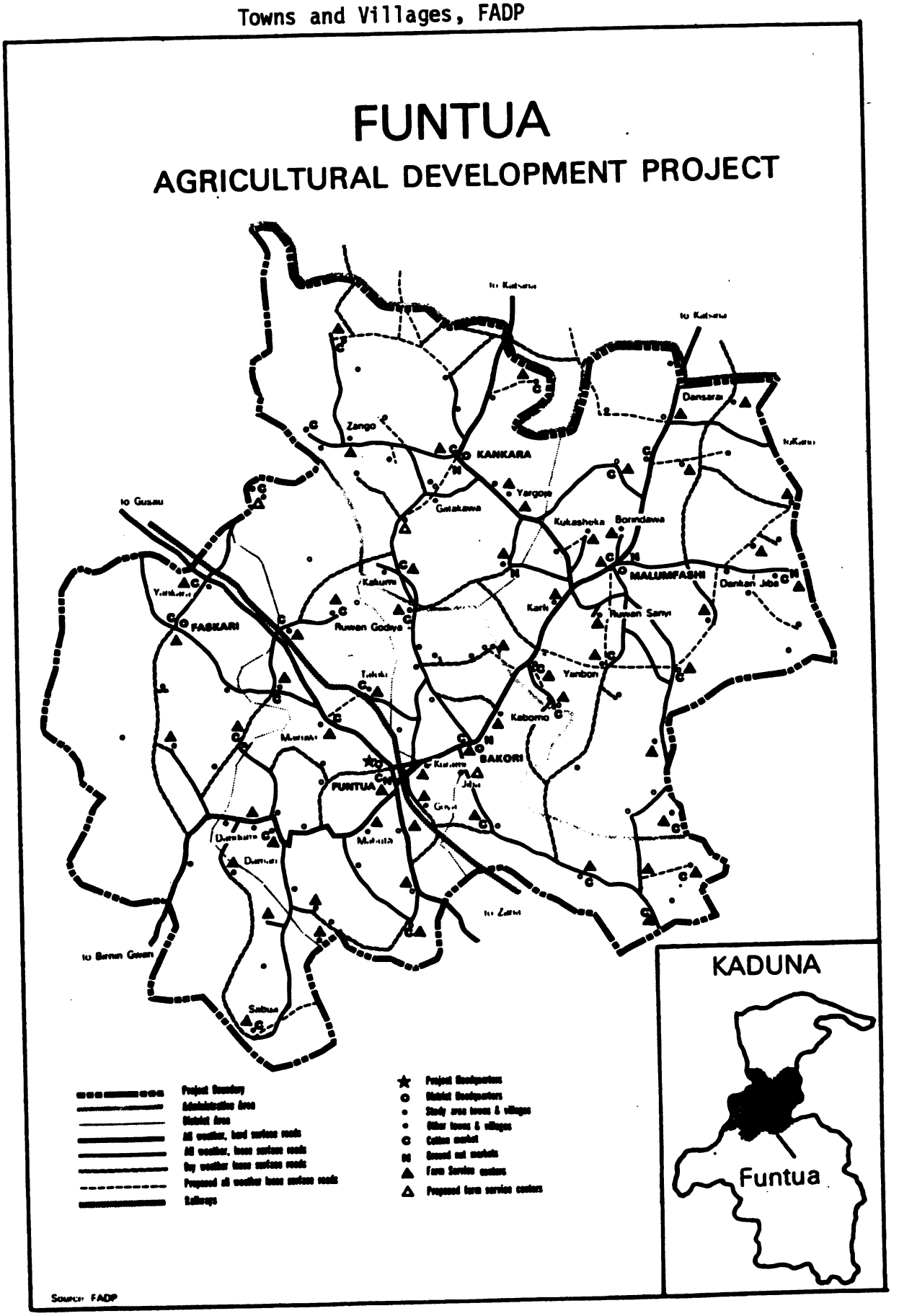
District	Number of Villages	Population
Funtua	16	126,519
Bakori	19	128,730
Malumfashi	22	125,967
Kankara	12	73,204
Faskari	8	45,580
Total	77	500,000

Source: FADP, "Guide for Project Staff." FADP, 1975, pp. 2-3.
Note: Original total population estimate was 905,000.

FADP area covered 7,500 square kilometers or about 10 percent of Kaduna State's total area. Average farm size in the area was less than four hectares but there are many large farms in the area as well. A survey carried out for the period of 1979/80 revealed that 36 percent of the farms in the area were less than 2 hectares, 74 percent were less

Map 4.1

Towns and Villages, FADP



than 4 hectares and 93 percent were less than 6 hectares with a Gini Coefficient of .55.[4] Average farm family size in the area was six persons per household, but this fluctuates from period to period due to sudden arrivals or departures of relatives.[5]

Crops grown in the project area include: sorghum and millet, which have been the basic staple food grains in the region for a long period; cotton and groundnuts, which in the past provided important sources of cash income for farmers; and others like maize, cowpeas, vegetables, sugarcane and some rice. Most crops are grown intercropped in mixtures. The prevalence and nature of growing crops in mixtures is well studied by Norman and others.[6] Finally the project area is well served by

---

[4]APMEPU, "Funtua Agricultural Development Project Completion Report," APMEPU, Federal Department of Rural Development, Kaduna, 1982, p. 67. Gini coefficient measures the degree of equity in the distribution of a resource among classes of a population. It varies from zero (maximum equity) to one (all the resources owned by one individual or class of the population). The value of .55 in the distribution of land is in the middle range of the scale. This is somewhat higher than what Norman reported for other areas of northern Nigeria. (See Norman, et al., "Technical Change and the Small Farmer in Hausaland, Northern Nigeria." African Rural Economy Paper No. 21, Department of Agricultural Economics, Michigan State University, East Lansing, 1979, p. 123.) Other sources regarding incomes and their distribution in northern Nigeria include Peter J. Matlon, "Income Distribution Among Farmers in Northern Nigeria: Empirical Results and Policy Implications." African Rural Economy Paper No. 18, Michigan State University, East Lansing, 1979; Eric W. Crawford, "A Simulation Study of Constraints on Traditional Farming Systems in Northern Nigeria." MSU International Development Paper No. 2, Michigan State University, East Lansing, 1982; and James O. Olukosi, "The Distribution of Personal Incomes Among African Farmers--A Two Period Analysis." Ph.D. Dissertation, Michigan State University, East Lansing, 1979.

[5]R. H. Slade, "The Monitoring and Evaluation of the Funtua, Gusau and Gombe Agricultural Development Projects." (Washington, D.C.: The World Bank), n.d., p.

[6]See for example Norman, et al., 1979, pp. 56-64; E. F. I. Baker and Y. Yusuf, "Mixed Cropping Research at the Institute for Agricultural Research, Samaru, Nigeria." In Intercropping in Semi-Arid Areas, J. H. Monyo, A. D. R. Ker and M. Campbell, (eds.), (Ottawa: International Development Research Center).

good first-class roads linking the major towns but with a poor rural road network connecting villages to one another and to major towns.

The FADP area, like other areas of the country, was experiencing problems related to rural-urban migration and stagnant agricultural production. These were a part of the reasons for establishing FADP in the area. The project was the first and largest of three pioneering agricultural development projects in northern parts of Nigeria. The other two were the Gusau ADP, which was contiguous to FADP area but located in the then North-Western state, and the Bombe ADP in Bauchi state.

Funtua Agricultural Development Project Activities

According to the project appraisal report, the FADP was estimated to cost 37.9 million naira (U.S. $57.6 million) of which 51 percent was made up of foreign exchange loan to the Nigerian Federal Government repayable at 8 percent over 20 years with a five-year grace period for the principal.[7] Part of the World Bank loan was then on-lent to the Kaduna State government for the operation of the FADP. Purchase of farm inputs by farmers was to make up about 5 percent of the project cost. The project was planned to participate in the following activities:

1. Agricultural Road Development: Construction of 1,500 kilometers of rural roads to allow light traffic during the wet season and heavy trucks during the dry season. This would improve the efficiency of farm produce evacuation and the supply of farm inputs as well as other possible benefits.

---

[7]World Bank, op. cit., p. ii.

2. Water Development: Construction of 85 small- and medium-size dams each with a minimum capacity of 100,000 cubic meters. Besides the dams 160 ponds were also included in the construction plans. All these water development schemes would provide water for human and livestock consumption.

3. Soil Conservation: This involved construction of cutoff ditches and contour ridging for the protection of an estimated 2,700 square kilometer area.

4. Building Development: Construction of 350 houses, project office, 5 development center offices, a railhead store, 77 farm service centers, and the improvement of 3 market depots for cotton in the area. Each farm service center was planned to have a storage capacity of 500 tons of farm products or inputs.

5. Seed Multiplication Farms: Improvement and expansion of existing seed multiplication farms at Kaudawa and Malumfashi.

6. Training Facilities: Expansion of boarding facilities at Daudawa training center from 20 to 40 trainees and the setting up of another training center at Malumfashi for another 40 residential trainees.

7. Farmer Support Services: Reduce the estimated farmer extension agent ratio from 2,440:1 to a more manageable 240:1. Extension agents would increase from 41 to 420--over a tenfold increase. Types of extension personnel planned included basic extension agents and personnel specialized in farm management, livestock husbandry, seed multiplication, farmer training and farm equipment. The project also planned to phase out the state-run tractor hiring service and replace it with private operators. A major element of the farmer support program was the

credit and marketing services which planned to employ over 260 people, most of them to be trained by the project.

8. Farm Inputs: Under this component 56,000 tons of fertilizer, 4,000 tons of improved seeds, 2,000 tons of insecticides, 47,000 ULV[8] sprayers, 10,000 ox carts, 10,000 ox ploughs and 100 tractors would be made available to farmers for cash and credit. Farm service centers would serve as the outlets for these sales.

9. Project Monitoring and Evaluation: This would be established with two sections--one dealing with the review of technical and financial records of the project, and the other dealing with evaluation and analysis to supply much needed data for agricultural and rural planning.

10. Post Project Development: This terms refers to plans of project activity continuation under various local institutions once the project investment period is completed.

The project headquarters is located in Funtua. The project was deliberately intended to be a large-scale project both in terms of geographical coverage and in terms of the size of investments involved. It covered the domain of two local governments composed of the districts of Funtua, Bakori, Malumfashi, Kankara and Faskari.

One of the areas of emphasis in the extension component is the assistance given to maize growers; special attention was needed since maize was not a major crop in the area prior to the establishment of the project. Detailed information on farm production activities were

---

[8]Ultra-Low-Volume sprayers have been used by IAR, Zaria, for its cotton spraying trials for quite some time.

supplied to the farmers, with emphasis given to the group of farmers the project identified as "progressive farmers".[9]

As can be seen from the above description of project activities, the project marketing component revolved around activities of the commercial section which dealt with the running of the Farm Service Centers. These FSCs sell inputs to the farmers and provde management information at locations which are easily accessible to the farmers.

Other direct marketing activities of the project include the construction and running of scheduled crop buying centers in the project area for cotton and groundnuts, in cooperation with the Cotton and Groundnut Boards. The project, however, had very little to do with the marketing of staple crops except under abnormal circumstances, like when the market for maize in the project area became saturated in 1979/80 and the project had to step in and purchase the product to avoid catastrophic declines in the crop prices. About 3,000 tons of maize were purchased by the project management--a small amount relative to total production for the season, a reported 57,254 tons.[10]

Besides the above mentioned direct involvements with marketing activities, the project was also indirectly involved. The construction of rural roads had a direct connection to the opening of additional market outlets for farm products from remote regions of the project. The project was also involved in the training of marketing personnel that managed the FSCs. Other activities included the collection of price information as part of the main project surveys.

---

[9]These are farmers who have adopted at least some of the project recommended practices.

[10]FADP, Quarterly Report, January-March, 1980.

The FADP was officially terminated after its five-year investment phase. It is now part of the Kaduna State Integrated Rural Development Authority projects under Zone II. Now it is useful to reflect on the successes and shortcomings of the project durings its operation over the 1975-1980 period. Such reflection regarding project intentions could serve as a guideline to assess which goals were actually met by the project.

To a large extent the project achieved most of the goals it set out to achieve. However, there were areas where the set targets could not be achieved and cases where substantial benefits became apparent when originally none were expected.

With respect to road construction, the project could not achieve its set target of 1,500 kilometers of rural roads. By the end of the project's five-year period, only 507 kilometers of rural roads were constructed. It was thought, however, that the original target was overambitious.[11]

In terms of water development targets the project constructed 43 dams although 85 were anticipated in the appraisal report. Of the 160 ponds targeted, none were constructed. Similarly no soil conservation scheme was undertaken except the necessary ones around the constructed dams.

The project did very well in achieving its building projects, particularly the farm service centers (FSCs) in which 71 out of the targeted 77 were built. A large proportion of the housing units, including the dormitories for trainees at Daudawa and Malumfashi, were built. However,

---

[11] APMEPU, op. cit., 1982, p. 6.

the quality of the buildings, constructed by indigenous contractors, was not satisfactory.

The project had succeeded in operating the two seed multiplication farms they started, although the actual capacity was lower than anticipation projections. This was partly due to an overestimate of the actual demand for improved seeds by farmers. The project implementation process revealed farmer preference to keep their own seeds for the next season should have been given more serious consideration.

The project has done very well in its training program for the extension staff. The goal of reducing the high farmer extension agent ratio from 2,400:1 to 300:1 was achieved. This ratio converts to a concentration level of extension staff at FADP which is ten times higher than the rest of the state.[12]

In terms of other farmer support services little success was evident. The credit scheme for farm input purchase was scrapped due to high cost of distributing "small amounts" of money (about 20 naira per farmer) and also due to the heavy subsidy on both fertilizer (80 percent) and crop protection chemicals (50 percent).[13] The marketing support services, which were mainly geared to cotton marketing, could not succeed due to the government placing unfavorable price controls on the crop. The constructed cotton markets were, however, useful to farmers. As a licensed buying agent for cotton, the project also tried some innovative ways of bulk-transporting cotton from buying stations to the

---

[11] APMEPU, op. cit., 1982, p. 6.

[12] Ibid., p. 10.

[13] Ibid., p. 17

ginnery. The project was able to purchase about 75 percent of the cotton produced in the FADP area. Although the project had no plans to get involved with food crop marketing, it was forced into such action in the case of maize during the 1979/80 season in order to ease gluts in local markets. Approximately 3,000 tons of maize were purchased.

By far the most successful component of the project operations was the supply of farm inputs. The operation had its own peculiar problems, but on the whole it was an undoubted success. The details of this component will be discussed as the major topic in Chapter 5.

In terms of achieving expected crop targets the project revealed unexpected results. The anticipated increase of maize was not achieved to the extent planned. The expected decline in the acreage of sorghum due to growth in the acreage of maize did not come about either. Acreage and production of sorghum increased beyond projection and actually helped in contributing substantial project benefits. Expected increases in cotton instead turned out to be a decline below the pre-project estimates. Millet, which was completely ignored by the project, also made substantial contribution. Thus even though the project crop production activities can be said to be a success, the success came from unexpected and unplanned directions.

In summary one can say that on the whole the project was a success. It also served as a learning experience that should be utilized when planning new projects. An indication of its acceptance as a success is the extension of the project on a state-wide basis and also the implementation of the input distribution system, developed during the project, in the new Kaduna State Farmers Supply Company. This topic will be discussed further in the next chapter.

At this juncture it would be useful to discuss the data which are used in the analyses reported in Chapters 6 and 7.

The Data and Data Collection Methods

Most of the data used in this study was collected as part of the monitoring and evaluation activity of the project. The majority of this data has not been analyzed beyond simple aggregate statistics (Slade, 1981). The data is also a part of a large data base collected under the same arrangements for the three pioneer ADPs at Funtua, Gusau and Gombe in northern Nigeria. The survey methods used are those reported by Slade and APMEPU, as well as reports obtained directly from FADP.[14]

The first problem encountered by the planners of the surveys was a total lack of basic data on which to base their survey sampling frames.[15] This made it necessary for the project to carry out a basic listing survey in conjunction with a baseline survey which provided the information needed for a proper sampling frame.

The baseline survey was made up of two components, a listing component and a socio-economic component. The listing component provided information on the number of families, hamlets (ungunni), and villages in the FADP area in 1976. The results indicated the presence of about 100,000 families in 693 hamlets. This helped in setting up the sampling frame for future surveys. The estimates have been revised downward to

---

[14]Slade, op. cit., n.d.; C. D. Poate and P. F. Daplyn, "Farm Surveys and Project Evaluation, A Methodology Manual." APMEPU, 1982. See also Jean C. Balcet and Wilfred Candler, "Farm Technology Adoption in Northern Nigeria: Summary and Conclusions." World Bank Research Project, RPO 671-88, 1981.

[15]Slade, op. cit., Part II.

about 84,000 families and a total population of 500,000 (See APMEPU, Project Completion Report, p. 1). Some of the major surveys carried out at FADP over the 1976-1979 period are listed in Table 4.2.

Table 4.2

Major Surveys Carried Out at FADP

Survey	Period	Villages	Households
Baseline	1975/76	n.a.	5,103
Mainline	1976/77	24	576
Punchline	1977/78	23	276
Deadline	1978/79	15	180

Sources: Slade, n.d.; and FADP/APMEPU.

There are major differences in the procedures used for the various surveys. Some surveys received more planning and supervision than others and are hence believed to be more reliable. The surveys are briefly discussed in turn.

The baseline survey questionnaire was designed for computer processing and hence there was need for a detailed coding manual for transcription of field data into computer-readable codes. It took a year from the inception of this survey to the time when initial results of the analysis were obtained. The actual field data collection period only lasted for six weeks.

The baseline survey was followed immediately by the mainline survey which was carried out in 24 villages and involved 24 households per village. Coding and transcription for this survey was done at APMEPU

headquarters after initial checking at the monitoring and evaluation unit in Funtua. The survey collected information on labor use, farm expenditures, farm income, non-farm income and expenditures, and household expenditures. Interviews were conducted on a weekly basis from the first week of May 1976 to March 1977.

Lack of transportation encouraged the use of enumerators who were asked to reside in the survey villages for the duration of the mainline survey (Slade, 1981). The method of data collection required the division of the sample so that when one part of the sample was being interviewed the other was left to rest so as to reduce boredom. However, enumerators were occupied throughout the survey period.

Data collection for the mainline survey ended in March 1977, but coding and transcription lasted until August 1977 and computer validation could not start until November 1977 (Slade, 1981). Slade also noted that the survey missed an important part of the growing season thus necessitating a similar survey the next year. The new survey was to rectify the shortcomings of the mainline survey. It was called punchline survey and was carried out during the 1977/78 season.

The punchline survey used a smaller sample size--a sub-sample of the mainline survey (see Table 4.2). The important difference, however, is that the punchline survey received more detailed preparation and was planned to facilitate rapid computer processing. Thus, even though it dealt with the same kind of information collected during the mainline survey, the format of entering the information gave the punchline survey a decided advantage in speed of processing.

The final main survey for which data was available for analysis was the deadline survey which was carried out during the 1978/79 season.

Unfortunately the data from this survey is believed to be of questionable reliability due to a number of factors among which are lack of adequate preparation and lack of supervision during collection. The senior evaluation officer in charge of the survey for FADP was called to take charge of the preparation of the second phase of FADP which involved statewide coverage. Thus supervision of the deadline survey execution took a secondary position in priorities.

The discussion so far has described the data sets for this study. However, most of the data needed for this study came from what the project considered supplementary surveys. These surveys were carried out in conjunction with the main surveys described above. They included such surveys as the agronomic surveys, the producer price surveys, market surveys, and extension surveys.

For this study the results of the producer price surveys from 1976 to 1979 were the most important. The market survey and a few other supplementary surveys were also used. The main surveys were also used to fill in information gaps and to obtain general information relating to the project.

By noting kinds of main surveys carried out, it is evident that the project was mainly concerned with production while marketing issues were considered secondary. Thus problems arise for anyone trying to study the marketing aspects of the project. The data collected does not provide means of carrying out a complete study of the issues since such issues were not considered in the data collection. A lot of the information one would expect to be included in the price and market surveys unfortunately were left out. This is a limitation of this study and the position is taken that the analysis is still worthwhile and should

proceed using the available information rather than postponing the analysis pending the availability of more complete information. The next section describes the price data collected by FADP.

Producer and Market Price Surveys

It was mentioned earlier that the price collection surveys were carried out as part of the main surveys discussed above. The earliest price survey provided data during the month of August 1976. The price data collection was carried out starting with FADP and Gusau ADP followed by other projects. In all cases the data collection was part of the farm management surveys.

Two types of prices were collected over the period of 1976 to 1979. (Note: Price collection is still going on.) These two price types were called the producer prices and the market prices. Market prices were also called commodity prices.

Producer Price Surveys

The term producer prices often connotes the idea of a fixed price offered to farmers for their crops by a price fixing agency in developing countries. This has been the case in Nigeria for a long time when referring to the term in relation to cocoa, groundnuts, cotton and other so-called cash crops. However, the use of this term for the data collected at FADP was a misnomer in that it has nothing to do with fixed prices.

Producer price here refers to the price at which a farmer can sell his crop at his farm or household or at the nearest market location. It is more like the concept of farmgate price than that of a fixed price

since the crops concerned are sold in the open market and there are multiple outlets for the crops rather than a monopoly purchasing agency.

Nonetheless, producer price here is not precisely the same as farmgate price since there are various locations involved at which the price was quoted and it is not possible to convert all the prices to a farmgate basis. Suffice it to state here that the producer prices used in this study only serve as very rough proxy for farmgate prices.

The survey procedure for collecting farmgate or producer prices involved selecting a sub-sample of two houses per village from those households participating in the main farm management surveys. Information about the prices was obtained from the household head who is often in charge of most household decision-making, particularly with affairs that relate to issues outside the household.

The prices collected from the household head were those which he expected to receive if the particular crop was sold that day or the actual price received that day if a sale had actually been made (Hesling, 1980). This manner of questioning has probably introduced some error in that the prices of more commonly traded goods were likely to have been more accurately reported. In fact, upon examining the data, it became apparent that the more common crops of the area such as millet, sorghum, groundnuts, and cotton were more adequately and completely reported than other crops, including maize.

All prices were collected in local units and later converted to standardized units of Kobo per kilogram for the crop items and to Naira per unit for livestock items. The price information was further converted to Naira per kilogram via a computer program.

This series of conversions is not unusual for price data collected in developing countries and various examples can be cited (Hays, 1973; Ejiga, 1977; Thodey, 1969; and Gilbert, 1969). Even though conversions from local units to standardized units are common, there are no standardized ways of carrying out such conversions since the units of local measure vary from one area to another and in some cases from one farmer to another. Such conversions, no matter how carefully carried out, probably tend to introduce some error in the data. The more care taken in the conversion process the greater the likelihood of reducing such errors.

A table giving some idea of the conversion factors used in the data collection for this study is attached in the appendix section. In general a number of ways were used for the weight conversions: (1) using standard mean weights derived from market price surveys, (2) using mean weights derived from agronomic surveys, and (3) using weight from items sold by the farmer.

The producer price survey locations varied from one survey year to another since the households sampled are drawn from the sample of households participating in the larger farm management surveys, which vary their sample households from one survey year to another.

The survey procedures made it necessary to group the village data by district so as to obtain a more continuous time series over the years of the survey. However obtaining a time series was not the only rationale for the district level aggregation in this study. It was felt that

in most cases the district is the logical unit for analysis of the producer price data even though information is lost relating to intra-district price structure.

Place of Produce Sale

Besides collecting price information the producer price surveys also recorded the location of sale under six categories. The six categories are shown below. A large proportion of the data recorded in the survey relates to prices at the farmer's local market or the market nearest to the farmer (under 5 kilometers).

Place of Produce Sale

1. On respondent's farm
2. In respondent's household
3. In respondent's local market
4. In nearest market under 5 kilometers
5. In nearest market between 5 and 10 kilometers
6. In a market over 10 kilometers away

Of all the sales made between 1976 and 1979, over 47 percent were in the farmer's own local market. An additional 18 percent were in a market less than 5 kilometers away. Less than 2 percent of the farm produce was sold directly on the farm. House trade accounted for over 13 percent of sales confirming an earlier study by Hill[16] that emphasized the importance of such trade. The distribution of sales (Table 4.3) greatly point out the importance of rural village markets as a first point of sale for the producers. Less than 20 percent of the

---

[16]Polly Hill, Rural Hausa: A Village and a Setting. (Cambridge: Cambridge University Press, 1972).

Table 4.3

Frequency Distribution of Sale Location
for Staple Foods, FADP

Location	Absolute Frequency	Relative Frequency (Percent)	Cumulative Frequency (Percent)
1. On Own Farm	267	1.69	1.69
2. In Own Compound	2,078	13.18	14.87
3. In Local Market	7,512	47.66	62.53
4. Market Less than 5 km	2,930	18.59	81.12
5. Market Less than 10 km	1,097	6.96	88.08
6. Market Over 10 km away	1,877	11.91	99.99
Total	15,761	99.99	—

Source: Original data from FADP producer/retail Price Surveys.

Note: This price data is made up of about 94 percent producer prices and about 6 percent retail prices.

total sales reported were made in a market that was more than 10 kilometers from the farmer's village. However, it is unfortunate the questions did not enquire further as to why farmers sold their products in the places they did and not somewhere else. There is need to understand whether they were selling in the closest market due to lack of transportation, lack of information on prices in the more distant markets, and/or for other reasons.

Answers to the above questions are important since one of the major allegations of the marketing system is that even though competitive forces may be operating well at the very local level, there is very little opportunity for the farmer to market his crops elsewhere.[17] The producer price surveys were conceived partly as a means of comparing them with the market prices to determine the level of margin involved. Initial investigation of the data by APMEPU and the senior evaluation officers of projects indicated no significant margin existed between the two prices.

Market Price Surveys

The market price survey was more broad in its coverage of items than the producer price surveys. About 200 items were covered under seven major groups. The groups covered were (1) crops and livestock, (2) prepared and manufactured food, (3) household and furniture, (4) clothing and personal items, (5) building materials, (6) farming items, and (7) transport.

---

[17] FADP Appraisal Report, op. cit., p. 23.

The market prices are the prices for the various commodities on a given market day of the village concerned. The prices were collected once every month. The village selection, as in the case of the producer price surveys, was also based on those villages selected for the major farm management surveys with the exception that certain important markets in the project area were included continuously from season to season.

Problems with the market survey as it relates to this study are that the survey did not have enough data and that the periods covered do not always coincide from one location to another for a long enough time to carry out time series analyses. Thus, this study will make more use of the producer price surveys than the market surveys since the former offers a more complete set of data. Market survey data will be used to corroborate the producer price analyses where necessary.

The general approach in the study is based on the "Food System Approach" to the study of marketing issues in low-income countries. Emphasis is on the removal of the dichotomy currently being maintained between production and distribtution. Actions relating to farm production have direct implications on distribution. Consideration of one without the other is a futile exercise.

CHAPTER 5

INPUT PROCUREMENT AND DISTRIBUTION SYSTEM

Introduction

This chapter examines the input procurement and distribution system at three levels: the national level, the state level and the project level (Funtua Agricultural Development). Emphasis is placed on fertilizer, since it is the most important farm input at all the above-mentioned levels.

A great deal of the increased benefits anticipated from the project were expected to materialize as a result of increased use of non-farm produced inputs such as fertilizers, improved seeds and extension advice. Increased use of fertilizer has been accepted as the most important indicator of technological change in a developing nation's agriculture. Mellor indicated that while fertilizer use has important positive effects on the output obtained, it has an even bigger impact on the level of the amount that is marketed.[1]

It is sad to note that the utilization of non-farm produced inputs in Nigerian farming is one of the lowest in the world, and well below that of the rest of Africa. For example, while the world average use of fertilizer per hectare for 1977 was 69 kilograms, it was 12.4

---

[1] J. W. Mellor, The New Economics of Growth: A Strategy for India and the Developing World (Ithaca, New York: Cornell University Press, 1976), p. 61.

kilograms for Africa and only 3.1 kilograms for Nigeria.[2] The same is true for other modern inputs such as improved seeds, herbicides, and insecticides.

The level of efficiency with which an input procurement and distribution system operates has considerable weight on whether a project achieves its stated objectives in relation to output levels and distribution of benefits among participating farmers and the rest of society. This is particularly important where one of the aims of the project is to address problems of income inequalities.

Until 1976, the Nigerian Federal government had played a very passive role in establishing policies and intervening in the procurement and distribution of farm inputs. The individual states were allowed to set up their own policies and systems for handling fertilizers. The national government's influence was felt only in terms of the amount of grants allocated to the states for general agricultural development, part of which was used by the individual states in the purchase of their input requirements.

The importation of inputs, particularly fertilizer, was done by the private sector under contracts with the various state governments. Prior to 1976 all of the country's fertilizer needs were imported from abroad, mainly from Western Europe. The imported fertilizer, once cleared through the ports of Nigeria, then moved to the various state government warehouses which were generally located in the state capitals. The states then took over title from the importers and engaged private

---

[2]For comparative siutation of the fertilizer situation in West Africa see Zalla et. al., "Economic and Technical Aspects of Fertilizer Production and Use in West Africa," African Rural Economy Working Paper No. 22, Michigan State University, East Lansing and International Fertilizer Development Center, Muscle Shoals, 1977.

transporters to transport the fertilizer to government divisional main stores and sub-stores as well as to other sales agents spread across the state. Sales agents had sub-agents who sold directly to the farmers. The government stores also sold directly to the farmers.

A small component of the total fertilizer imports went to private estates and companies such as the Sugar Companies, the Nigerian Tobacco Company and Phillip Morris.[3] These companies engaged in direct agricultural production of their raw materials or else had various kinds of production contracts with farmers. They were very keen in securing their fertilizer and other input supplies and closely observed the timing of the arrivals of the inputs.

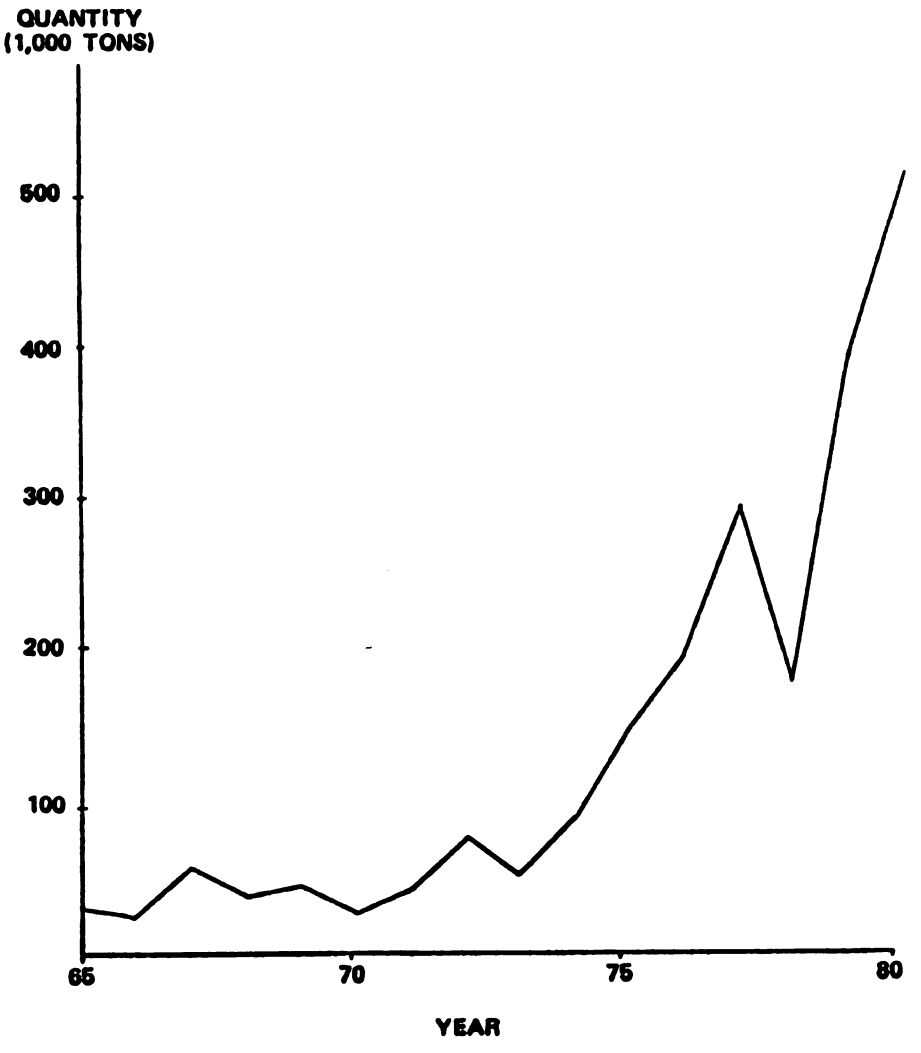
The low fertilizer and other farm input use in Nigeria described above is changing quickly with the introduction of agricultural development projects throughout the country. The importance of farm inputs is increasingly being realized by farmers. This situation is reflected in the recent trends in fertilizer imports shown in Figure 5.1. From 1965 to about 1975 total imports of fertilizer averaged about 50,000 tons for the whole country. There was a steep increase from 1975 to 1980. The rapid increase in fertilizer imports during the period of 1975 to 1980 coincided with the investment period of some of Nigeria's pioneer ADPs. The government has helped in achieving an increase in fertilizer use through large subsidies, often amounting to about 80 percent of the final cost of the fertilizer at the farmgate.

---

[3] A documented case study of such production contracts can be found in Peter O. Agbonifo and Ronald Cohen, "The Peasant Connection: A case study of the Bureaucracy of Agri-Industry," Human Organization Vol. 35, No. 4, 1976, pp. 367-379.

Figure 5.1

Imports of Fertilizer in Nigeria, 1965-1980



Source: Falusi and Williams, op. cit., p. 56.

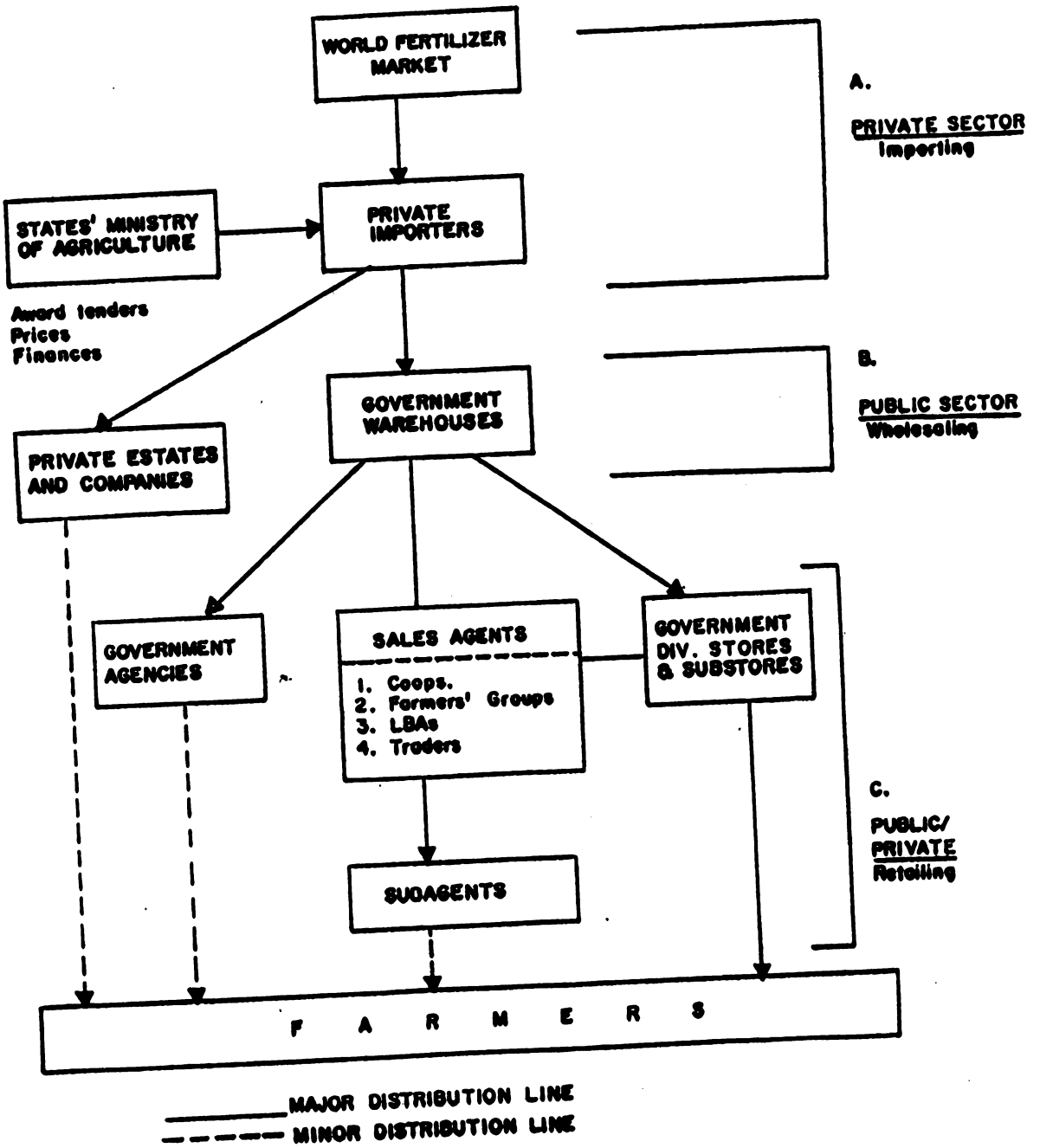
Channels of Fertilizer Procurement and Distribution, 1967-76 and 1976-80

Figures 5.2 and 5.3 show the organization of the channels for fertilizer distribution prior to and after 1976. The figures indicate the following major differences for the two time periods. The first difference is the pattern of procurement. In 1976-77 the procurement process was under individual state's Ministry of Agriculture which awarded tenders to private importing firms. After 1976 procurement was centralized under the Federal Fertilizer Procurement Unit (FFPU), a subdivision of the Federal Ministry of Agriculture and Water Resources. State demands were submitted to FFPU which in turn coordinated and scheduled the fertilizer procurement through private importers. In this respect there was a centralization of the procurement process.

Secondly, the federal government replaced the state governments as the leading distributor of fertilizers at the wholesale level. This can be viewed as a lengthening of the fertilizer distribution channel. Another difference is the appearance of domestic fertilizer production as a portion of the available supplies of fertilizer after 1976. As far as the retail aspect of the distribution process is concerned there has been very little change. But private traders that used to participate in final sales to farmers have been eliminated in the 1976-80 organization. New retail distributors were the agro-service centers that were constructed and run under the National Accelerated Food Production Program.

Figure 5.2

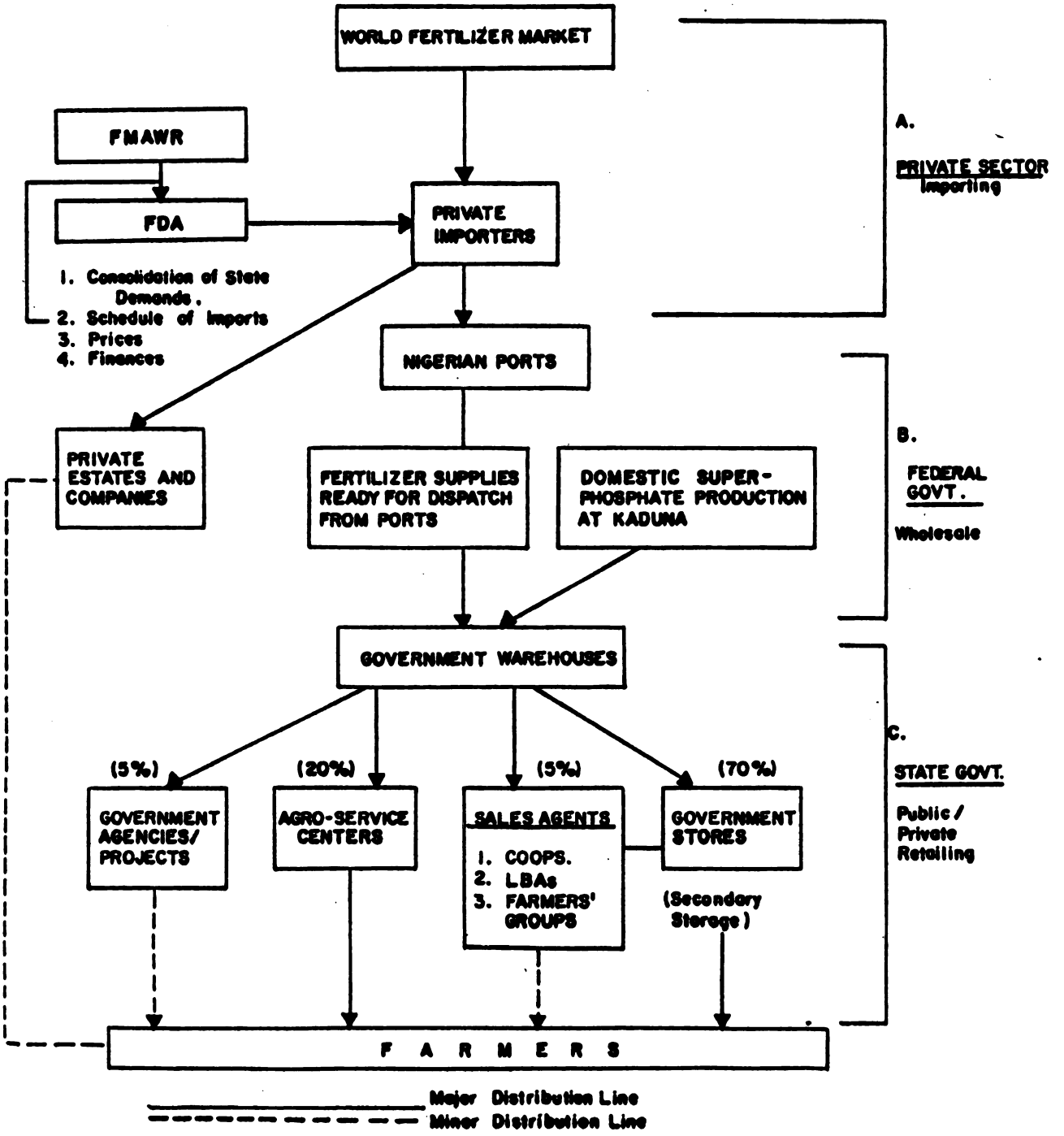
Channels of Fertilizer Distribution, Nigeria, 1967-1975



Source: Falusi and Williams, op. cit., p. 63.

Figure 5.3

Channels of Fertilizer Distribution, 1976-1980



Source: Falusi and Williams, op. cit., p. 65.

The 1976-80 arrangement indicates that the agro-service centers have a considerable portion of the total fertilizer supplies for distribution (20 percent) when compared to the 5 percent each for project and sales agents. It appears that the projects handle more than the estimated 5 percent indicated.

The change from the pre-1976 system of fertilizer procurement to the present one is seen as an improvement by Falusi and Williams (1981). The new system is said to benefit from cost reductions stemming from bulk purchasing and handling of the fertilizers. This is normally the case but the problems of running large scale public corporations must be brought out when assessing the benefits. Other costs, both monetary and otherwise, could escalate elsewhere in the system and thus obliterate the gains experienced in the bulk purchasing process. This seems to be the case in Nigeria and many complaints have been voiced by various state agencies in charge of fertilizer distribution. The agencies contend that the fertilizer delivery system is extremely inefficient. Deliveries arrive too late in the season to be useful and quantities delivered by FFPU are often incorrect.

In the case of the World Bank-sponsored agricultural development projects such as the Funtua ADP, which formerly procured its own fertilizer, the shift to the new system has caused a great deal of problems as we shall see later when we review fertilizer procurement and distribution under FADP.

Costs in the Procurement and Distribution of Fertilizers

Transportation costs are very important when a product for distribution is bulky, heavy, and has a low value/unit ratio. This is the case with many raw agricultural products such as sugarcane, bananas, maize, etc. The same is also true with fertilizers. A majority of the cost of fertilizer distribution is embedded in the cost of transportation plus handling charges. According to Falusi and Williams, 70 to 80 percent of the country's internal distribution cost of fertilizer is accounted for by transportation costs. At the time of their study the costs were estimated at 8 to 15 kobo per ton per mile by road and 1 kobo per ton per mile by rail.

In addition to the transport charges mentioned above, there are costs related to clearance and handling at the ports. These costs can be substantial if there are delays in the clearing process. These charges, although reduced since the reorganization of the port at Lagos after the cement scandal, have to be borne in mind when imports of goods, including fertilizer, are concerned. The first six days after arrival at the ports are free but thereafter the demurrage charges are as follows:

1 to 6 days	15 kobo/ton/day
7 to 12 days	30 kobo/ton/day
More than 12 days	60 kobo/ton/day

Handling costs were estimated at about 2 Naira/ton for loading and unloading.

The description of the costs is obviously sketchy. A detailed cost breakdown for the entire channel, from the entrance of a ton of fertilizer at Lagos or another port, up to the farm household in a northern Nigerian village would be beneficial. These costs could provide more concrete evidence of the actual levels of subsidies involved in fertilizer distribution. There is a strong possibility that the amount of administrative costs involved are tremendous. Any approaches to reduce the costs involved in the national system will have to consider not only the more visible costs listed above, but also the nature and extent of the administrative costs involved.

Domestic Fertilizer Production

It is disappointing that Nigeria has always claimed agriculture as the main trust of its national development, and yet only one operational fertilizer plant is located in the country. Admittedly setting up fertilizer plants prior to the emergence of oil as a major source of revenue would have been very difficult due to the very high capital costs involved. But with the high levels of subsidy that have been operating in the country since the early 1970's, the availability of some petroleum by-products needed for the manufacture of fertilizer, and the existence of raw materials in nearby neighboring countries, one would have expected the domestic production of fertilizers to have received more attention.

The existing domestic fertilizer plant, the Federal Superphosphate Fertilizer Company (FSFC), is located in Kaduna, the capital of Kaduna

State. Production began in May of 1976 with a maximum operating capacity of 100,000 tons per year of superphosphate and 42,000 tons per year of sulphuric acid. The major raw materials are sulphur and phisogate (P-rock), and both are imported.

In spite of the availability of special rail wagons for transporting the imported raw materials from the port at Lagos to the plant, one of the major problems the plant experiences is the poor movement of the raw materials from the port to the plant. Another chronic problem is the frequent power failures due to electricity supply cut-offs from the National Electric Power Authority (NEPA).

These constraints facing the plant have shortened the expected lifetime of the plant and the rated operation capacity is reduced from 100,000 tons of superphosphate to about 70,000 tons per year. The actual production has been below 40,000 tons per year due to the above-mentioned problems. Thus the plant has been operating at less than 40 percent of its initial rated capacity. All efforts were being made to raise the yearly production to approximately 60,000 tons per year which is about 85 percent of the current confirmed achieveable capacity of 70,000 tons.

The efforts to achieve higher plant capacity utilization are directed at reducing the impact of the constraints mentioned, such as the irregularity of electricity supplies which is now minimized through on-site installation of standby power generators. The company is also in the process of building its own water supply sources to eliminate water shortage problems that the company had been experiencing. Efforts

are also being made to import rock-phosphate from nearby Niger Republic which has the third largest known deposits of this material in Africa.

These efforts will greatly reduce the cost of transportation of raw materials for the plant and also reduce the amount of uncertainty involved in input procurement for the plant. However, this process of eliminating constraints facing the company may substantially increase production costs. This point should be considered. The venture should be made profitable without relying on heavy subsidy from the government. These start-up problems of the fertilizer manufacturing industry should be studied to assess factors which may affect the planning of subsequent plants--one of which is already under construction in the south eastern part of the country.

Market for FSFC Fertilizer

The major customer for the FSFC plant output is the Federal Ministry of Agriculture which buys all the fertilizer produced ex-factory to channel into the country's Green Revolution Program. The company has no problem in disposing of its output, in fact it is unable to fulfill the demand for its products.

The price of fertilizer, however, has nothing to do with demand and supply conditions in the marketplace since the fertilizers are sold to farmers at a heavy subsidy of up to 80 percent of the cost of production or import. The company stands to benefit if and when this level of subsidy is reduced, so as to reflect more closely the actual economic cost of fertilizer. This condition is the only way that the company

could survive as a self-supporting operation. Presently getting the fertilizer to the farmer is the greatest concern to the government and thus operation of the company is willingly subsidized.

The experiences of the Kaduna plant indicate that there is a clear need to closely study the operations of the plant using both economic as well as financial criteria to look at the foreign exchange savings involved due to the plant operation. Such evaluation should have been done prior to setting up the plant; however, the situation at the pre-startup period was different than present circumstances. The suggested review exercise should still be conducted and could be regarded as part of an ongoing evaluation system to guide the establishment of other plants.

Fertilizer Demand in Nigeria

As can be inferred from earlier discussions dealing with the Kaduna Fertilizer Plant, the national demand for fertilizer is increasing very rapidly. Thus it is important to look at the types of fertilizer usage in the country. Fears have already been expressed with regard to the likely long-term effect of fertilizer use on the environment.

Although only superphosphate is produced in the country, there are many types of fertilizers imported. As of 1981 there were 12 kinds of fertilizers in use in the country. One million tons of these various types of fertilizers were imported in the Green Revolution Program. The potential requirement for fertilizers, however, is probably much greater

than this level of imports and is expected to keep growing as more farmers realize the benefits that can result from fertilizer use.

It is not known what the actual demand for fertilizers will be when subsidies are removed. This is an important concern since the country is unlikely to be able to maintain the current level of subsidy--the government currently subsidizes over 70 percent of the total cost of all the fertilizer used. Table 5.1 shows the relative demand for fertilizer by states in 1979.

Kaduna State System of Fertilizer Procurement and Distribution, Before and After 1976

Prior to the establishment of the Federal Fertilizer Procurement Unit in the Ministry of Rural Development in 1976, the individual states of the Federation had the responsibility of procuring and distributing their own fertilizer needs. The semi-autonomous ADPs such as the FADP were also allowed to operate like the state governments in procuring and distributing their own fertilizer needs.

The Kaduna state government followed the procedure of offering tenders for the delivery of the fertilizer to its stores in Kaduna. From there the fertilizer was then transported to various local government areas through the Operation Feed the Nation committees of the local governments (LGAs). The committees were responsible for the sale of the fertilizers to the individual farmers in their areas. For the purpose of storage the LGAs had the use of Agro-service Centers which were built around the country under the National Accelerated Food Production Program.

Table 5.1

Fertilizer Consumption by States, Nigeria, 1979 (tons)

State	Bulk Product	Nutrient Equivalent			Total Nutrients
		N	P205	K	
Anambra	7,071	1,027	963	1,050	3,040
Bauchi	32,500	6,129	2,875	637	9,641
Bendel	1,855	340	71	345	756
Benue	14,819	3,462	863	624	4,949
Borno	12,000	1,297	1,538	520	3,355
Cross River	1,500	101	58	139	298
Gongola	15,125	3,585	1,478	734	5,797
Imo	10,048	1,376	945	1,530	3,851
Kaduna	36,700	5,923	3,986	752	10,661
Kano	36,935	5,782	5,277	203	11,262
Kwara	7,150	1,652	734	830	3,216
Lagos	107	20	10	5	35
Niger	15,200	2,756	1,477	180	4,413
Ogun	3,698	653	329	406	
Ondo	8,000	1,508	916	623	3,047
Oyo	10,827	2.108	1.697	1,301	5,106
Plateau	25,475	4,719	1,798	364	6,881
Rivers	1,200	366	90	90	546
Sokoto	23,754	3,415	2,407	986	6,808
NIGERIA	263,964	46,219	27,512	11,319	85,050

Note: Includes amounts used by World Bank ADPs, Nigerian Tobacco Company, and Nigerian Sugar Company.

Source: A. O. Falusi and L. B. Williams, "Nigeria Fertilizer Sector: Present Situation and Future Prospects." IFDC Technical Bulletin T.18, International Fertilizer Development Center, Muscle Shoals, 1981, p. 42.

Thus, the state had the power to procure, distribute and sell fertilizer--including the power to decide the price at which the fertilizer should be sold. The state was directly responsible for the final level of subsidy received by farmers. This same arrangement for the state was also extended to the FADP as a semi-autonomous body within the state and as such as empowered to undertake similar activities for fertilizer procurement, distribution, sale, and price fixing within the project area.

The third National Development Plan noted that fertilizer was imported in bulk by each state and then distributed through the extension service and local agents by the State Ministries of Agriculture. The plan also noted that the system had many shortcomings and proposed the use of farmer-cooperatives in the distribution of inputs, particularly fertilizer. Beginning in 1975 private traders were prohibited from participation in the distribution of fertilizers. Prior to this period commission agents were heavily involved in the distribution of fertilizer at the final stage of the distribution channel, i.e., at the farmer-agent level.

The system the state developed after 1976 led to the involvement of local village leaders in the distribution process. This is considered to be a step in the right direction in the sense that these village leaders know the farmers well and would be expected to allocate the scarce product more equitably. The level of subsidy is such that if the distribution is left to the open market, many farmers would not be able to obtain fertilizers. It is conceivable that some of the affluent farmers/traders purchase everything on arrival and sell it back to the less well-to-do farmers at prices well above the subsidized prices.

Where credit sales are involved it is also useful to have the involvement of the local leaders since they know the farmers intimately and this personal contact would be a factor in loan repayment.

Since 1976 fertilizer has been distributed from the main depots located at Kaduna to various local government headquarters based on estimated allocations. The local governments have estimates for onward distribution to villages and hamlets. Village leaders then sell the fertilizer to the farmers at subsidized prices. Table 5.2 shows the allocation of fertilizer to the various local governments in Kaduna state over the 1976-77 to 1979-80 period.

The table indicates that the largest allocation of fertilizer goes to the Katsina and Dutsinma local governments, although there seems to be no consistency of the allocation from one year to the next as one would have expected if the allocations are based on the number of farmers in a local government. Perhaps this indicates that other criteria are used in determining allocations year to year. The average number of tons distributed over the period was approximately 23,000 tons per year for all local governments except the two FADPs. During the same period, the average annual allocation to FADP was 15,000 tons. FADP allocation was over 65 percent of the allocation to all other areas in the state.

Table 5.2 also indicates the problems faced by the state in terms of getting its planned allocations from the FFPU. In all years the issued quantity of fertilizer was less than that planned. This was particularly acute in the 1979/80 season when only 5,616 tons of fertilizer were issued as compared to a planned 34,762 tons.

Table 5.2

Fertilizer Distribution in Kaduna State by LGA, 1976-77 to 1979-80 (in 1,000 tons)

LGA	1976-77 Issued	1977-78 Planned	1977-78 Issued	1978-79 Planned	1978-79 Issued	1979-80 Planned	1979-80 Issued
Katsina	1.92	3.29	3.09	4.00	2.50	4.35	0.71
Dutsinma	2.66	3.57	2.10	4.00	2.44	4.07	0.71
Kankia	2.32	3.70	2.68	3.67	1.82	4.02	0.65
Zaria	2.29	3.96	2.58	3.67	2.02	3.10	0.59
Mani	2.27	3.31	2.53	3.34	2.46	3.44	0.59
Kachia	2.62	2.61	3.02	3.34	2.01	2.68	0.51
Ikara	2.24	3.21	2.50	2.67	1.46	2.71	0.47
Kaduna	0.54	1.25	1.01	1.33	0.74	1.43	0.24
Daura	1.53	2.55	2.03	2.35	1.34	2.27	0.42
Jema'a		2.23	1.86	2.34	1.48	2.11	0.38
Saminaka	1.41	2.23	2.02	2.01	1.65	1.83	0.30
B/Gwari	0.61	0.51	0.61	0.67	0.52	0.29	0.06
Others						2.47	
Total	23.00	32.42	26.02	33.39	20.43	34.76	5.62

Note: Table does not include Funtua ADP

Source: M. S. Krishnaswamy, "Agricultural Project Management in Kaduna State (1970-1979)." Admadu Bello University, 1979, p. 72.

The heavy state government involvement in fertilizer procurement and distribution is being reviewed with intentions to introduce private sector participation via a newly formed Kaduna State Farmers Supply Company (KARSCOM). This is a new and welcome idea in which farmers control the decision as to the amount of inputs required and they carry out the distribution process at the lowest cost possible. The organization of the input distribution system via the KAFSCOM is also expected to reduce the state government's manpower involved in the distribution process. Some of the details of the new KAFSCOM are described below.

Kaduna State Farmers Supply Company

The original concept for KAFSCOM is a result of the degree of success achieved at FADP in input procurement and distribution, and the realization that since the life of FADP was to expire in 1980 there was a need to establish a more long-term system to serve farmers. Alternatives were evaluated including the establishment of projects such as the FADP to cover the entire state. This was regarded as feasible and is in fact done in the sense that the original FADP concept now covers the whole state in four zones. However, as far as the handling of inputs is concerned, the system cannot serve in a permanent capacity.

The second alternative examined was to go completely private and let private trade deal with all aspects of the procurement and distribution of farm inputs. This alternative was found to be unacceptable at the present developmental stage since the inputs are heavily subsidized and sell at prices that have nothing to do with the market supply and

demand situation. Private trade will not be able to cover costs let alone make a profit. Subsidizing private trade to conduct the business is also prone to other problems. KAFSCOM was seen as a solution in that it will initially be a state-financed company run on behalf of the farmers, but later, as management and organizational skills are developed, it will be completely controlled and operated by the farmers.

The company is to procure and distribute farm inputs to farmers in all local governments in Kaduna State. Later it is also hoped to expand its business to buying farm produce and supplying basic farm needs unrelated to the actual farm operation. This is a lofty scheme that needs to be handled very carefully. Government schemes such as this are known to have a high rate of failure. But KAFSCOM has an advantage in that it is going to be farmer-oriented and their direct participation is important for its success.

The company has already been established. It has taken over the operation of all the FSCs under the former FADP as well as the agro-service centers of the state Ministry of Agriculture and Rural Development in non-FADP local governments. Many more FSCs or ASCs are to be built to serve as operating locations for KAFSCOM. The same operational procedures at FADP are being applied, i.e., allocating FSCs as close as possible to the farmer. The staff of the commercial unit of the FADP also formed the nucleus of the staff needed to manage the increased number of FSCs and ASCs; the training of new personnel is an on-going necessity.

The Kaduna State government is enthusiastically in support of KAFSCOM in the new plan that started in 1981 and will continue through

1985. In this plan the government has indicated that KAFSCOM is the leading institution in the state's efforts to get inputs to the farmer in the most efficient manner. Of the 307 million Naira allocated to the agricultural sector, 234 million Naira was earmarked for the state's Integrated Rural Development Program which was KAFSCOM as the leading institution. The allocation of funds according to the new zone structure of the Kaduna State agricultural projects is given in Table 5.3.

Table 5.3

Funding Allocations by Zones, Kaduna State
IRDP, 1981-1985
(Millions of Naira)

Zone I		Zone III	
Katsina	19.21	Zaria	18.92
Mani	18.28	Ikara	17.05
Daura	15.50	B/Gwari	11.50
		Kaduna	10.65
Zone II		Zone IV	
Dutsin-Ma	19.46	Saminaka	15.31
Kankia	18.55	Jema'a	16.24
Malumfashi	15.76	Kachia	18.10
Funtua	19.47		

Source: Fourth National Development Plan, 1981-1985: Kaduna State Program, Ministry of Economic Development, Kaduna.

The main thrust of the new plan is the provision of a management structure well supplied with trained staff to both implement the state project and evaluate the project's progress. KAFSCOM is to operate along commercial lines as a wholesale distributor with the ASCs as the

retail outlets. KAFSCOM is also to work closely with already established cooperative societies. The latter directive presumably means the cooperatives will serve as retail outlets in addition to the ASCs, thereby enhancing the number of choices available to the farmer.

A new extended role has also been devised for KAFSCOM. It has assumed the responsibility of building grain storage reserves and purchasing and storing grains on behalf of the Nigerian Grains Board. This is a clear indication of the importance of the new company in the overall agricultural program of the state. The success of this organization will no doubt affect the establishment of similar schemes elsewhere in the country.

Input Procurement and Distribution at FADP

The FADP input procurement system, as in the case of the state and national system, went through a change following the 1976 Federal centralization of fertilizer procurement under FFPU. Prior to that change FADP was responsible for procuring its own fertilizer supplies. The system worked very well and fertilizer delivery was on time--allowing adequate time to permit the farmers efficient and timely use of the material. The only restriction put on the FADP prior to 1976 was that the project had to sell its fertilizer at the price set by the state government. Thus, FADP could not unilaterally declare prices for sale of fertilizers to farmers.

This system easily arranged for the efficient procurement of 15,000 to 20,000 tons of fertilizer by including delivery dates to the FSCs in the details of supply contracts and directly monitoring

contractor progress. The quantity needed was large enough to benefit from large scale economies without being too large for diseconomies to set in. Very few contractors could conveniently handle quantities larger than about 15,000 tons at a time.

It was a disappointment and a source of project problems when the system of procurement was moved to the Federal Fertilizer Procurement Unit (FFPU) in 1976. Delays in arrival of needed fertilizer were encountered as well as cuts by FPU on the amounts requested by the project. These cuts on the requested amounts were seen by FADP management as arbitrary and unjustified. Cuts were based on FFPU's criteria with no feedback or consultations. Availability of funds at the Federal level seemed to be the sole criteria. An ignored alternative would have been some cuts in the high subsidy levels.

The new system turned out to have many inefficiencies--overcentralization, remoteness, lack of flexibility for the requirements of specific areas, and heavy involvement of government in handling the supplies for which it was unsuited. Much of the government's manpower assigned to this process could have been used more effectively in other areas.

An example of the problems involved with the new arrangement follows. During the 1978 growing season, of the 20,000 tons ordered by FADP via FFPU for the season none had been received by the first of May, which is the beginning of the rainy season. The same situation also affected the state request in which of the 50,000 tons ordered, only 6,428 tons were received by May 31.

The announced levels of subsidies by the state and Federal governments were paid back to the FADP after fertilizer sales to the farmers at subsidized prices. There were problems at times in recovering these subsidy refunds from the federal government, which in some cases amounted to close to 2 million naira for FADP. The amount was large enough to cause cash flow problems for the project management.

Relative Importance of Farm Inputs at FADP

When considering farm inputs handled by the project, farmers were mostly concerned with fertilizer availability. Other inputs such as herbicides, insecticides, tractors, ox plows and even extension advice, took secondary position when compared to the considerations given to fertilizer availability. There are instances reported where farmers rejected extension advice based on the assumption of fertilizer availability since the farmers were unable to obtain the recommended fertilizers.

The importance of fertilizers in the adoption of recommended practices cannot be overemphasized. The total sales figures for the various farm inputs at FADP over the period of 1976-80 are shown in Table 5.4.

Table 5.4

Input Sales at FADP, 1976-1980

Item	Millions of Naira
Fertilizers	10.6
Insecticides, Seeds & Batteries	4.5
Farm Equipment	3.0
Total	18.1

Source: FADP files.

The system of fertilizer distribution at FADP utilized the large number of farm service centers established by the project. These FSCs supplied not only extension advice to the farmers, but also supplied them with the needed inputs for farm production. Fertilizers, certified seeds, insecticides and some farm implements were sold via the FSCs. Since these centers are spread all over the project area, the farmers did not have to walk a long distance to get to the nearest source for their needed inputs and extension advice. A survey carried out by the evaluation unit of FADP showed that over 63 percent of the farmers have purchased something from the FSCs, and only 0.4 percent of the farmers said they did not know of the existence of the FSC system. Table 5.5 gives the results of the survey.

The table shows that the farmers in the project area were aware of the existence of the FSCs and were making substantial use of the services provided by the centers. Most farmers obtained at least some of their inputs from the FSCs. The majority of farmers (75 percent) were aware that the project was there to help them solve their problems (See Table 5.6). However, there were some farmers who held the belief that the project objectives were to assist the government or even to take their land away. Others had the idea that the project was to help the urban population. As to the importance of fertilizer in the role of the FADP, over 60 percent of the farmers surveyed said that the project was there to provide them with fertilizers (Table 5.6).

The survey reveals the expectations that farmers had about the project. Most of the expectations are positive and legitimate in terms

Table 5.5

Farmer Use of FSCs for Input Purchase, FADP, 1978

Reason	Percent	Number of Farmers
Purchased Something	63.7	54,455
Did Not Know FSC	0.4	342
Did Not Know Inputs Sold at FSC	0.8	684
Not Enough Money	26.5	22,654
Do Not Need Inputs	2.1	1,795
Can Buy Inputs Elsewhere	0.8	684
Had Supplies from Last Season	2.9	2,479
Other	2.7	2,308
Total	100.0	85,401

Source: Extension Survey, FADP.

Table 5.6

Purpose of FADP as Seen by Farmers

Purpose	Percent of Respondents Agreeing
Help Farmers	76.2
Help Government	14.6
Build Roads	47.6
Supply Credit	39.2
Take Away Land	2.9
Supply Fertilizer	60.8
Help Only "Big Men"	7.5
Provide Water	32.0
Provide Jobs for Town People	6.9
Other	6.1

Source: Fertilizer Purchase Survey, FADP.

of what a project of such magnitude could provide or at least issues that should be addressed by project management. For example, although only a few farmers had the view that the project might take away their land (2.9 percent), the project should make it clear that it is not a threat to land ownership.

There was high expectation that the project would deal with the issuance of farm credit. This is not unexpected since most of the farmers are low-income, small farmers who, in spite of the large subsidies involved, would not be able to benefit from some of the inputs supplied by the project without some form of credit arrangement.

The most popular inputs purchased by the farmers during the survey period were various kinds of fertilizers. Table 5.7 shows purchases of inputs from the Farm Service Centers.

Table 5.7

Purchases of Inputs from Farm Service Centers, FADP

Item	Percentage of Farmers Purchasing Item	Total Number of Farmers
Fertilizer		
Superphosphate	59.3	50,693
Calcium-Ammonium Nitrate	46.6	39,836
Compound	37.8	32,314
Seed (All Types)	12.9	11,028
Insecticide	14.0	11,968

Source: Extension Survey, FADP.

A more detailed breakdown of the fertilizer purchases made at the farm service centers is given in Table 5.8. The table is useful in clarifying some of the complaints with regard to inequities alleged in the distribution of fertilizer. It identifies the types of farmers who purchase the inputs as well as the quantities the FSCs deal with per transaction. The major distinction is between farmers termed as "progressive" based on their adoption of project recommendations, and other farmers who were said to be using traditional farming methods.

Table 5.8

Fertilizer Purchase by Progressive and Non-Progressive Farmers, FADP

	Progressive	Non-Progressive	All Farmers
1. Percent Wanting to Buy from FSC	100	88	89
2. Percent Going to FSC to Try and Buy	76	62	64
3. Average Number of Bags Wanted by (2) Above	46	23	25.8
4. Average Number of Bags Obtained by (2) Above	6.7	3.2	3.6
5. Percent of Farmers Obtaining	38	20	22
6. Average Number of Bags Obtained by (5)	13.4	9.8	10.2

Source: Fertilizer Purchase Survey, FADP.

The table indicates that although there is a higher percentage of progressive farmers wanting to obtain fertilizer as compared to those from the non-progressive category, there was not much difference in the

average quantity obtained by the two groups. More important, however, is the fact that only a small fraction of the total number of farmers who wanted fertilizers could get it (22 percent). This is a reflection of the acute shortage of the product as well as the heavily subsidized price of fertilizer. Under such circumstances the administrative task of minimizing abuse is made very difficult indeed.

Fertilizer shortage of the magnitude described would be expected to lead to an illegal market for fertilizer. This problem is intensified when one couples the shortage with the existence of a large subsidy on fertilizer. There is evidence showing that the more well-to-do farmers have some edge in getting fertilizers as well as obtaining larger quantities. The possibility of these larger farmers reselling the product at a higher cost to other farmers cannot be ignored.

A small survey looked into the problem of illegal fertilizer markets at FADP. The survey revealed that illegal markets in fertilizers were extremely rare. Of 150 farmers questioned, only 8 said they bought their fertilizer from a source other than the FSCs. Of these eight, three obtained the fertilizer from other farmers and three others from local shops, while two obtained it from sellers in a local market. The illegal market price was 6.12 naira/50 kilogram-bag as against the FSC price of 1.5 naira/50 kilogram-bag.

The survey sample estimated about 800 kilograms of fertilizer made its way into the illegal market. When extrapolated to the whole FADP, this implied a total illegal market quantity of about 300 tons. These results probably underestimated the actual sales in the illegal market since the farmers sampled were probably reluctant to divulge their sources of inputs when they purchase from illegal suppliers.

Other Farm Inputs

While fertilizer dominated other inputs in importance, the other inputs cannot be said to be unimportant. One case in point is insecticides in the production of cotton. The project location is the country's leading area for cotton production. The Nigerian Cotton Board headquarters is located at Funtua. The insect pests that attack cotton can only be dealt with properly via the application of insecticidal treatments scheduled regularly according to extension recommendations. However, since cotton growing still takes a secondary role when compared to the production of food crops for home consumption, insecticide demand was relatively modest compared to the soaring demand for fertilizers which could be applied to both the so-called cash as well as food crops. The demand for insecticides was generally confined to the larger, more commercially oriented farmers.

The situation described for insecticides also applies with even greater force in the case of farm implements, particularly the purchase of tractors. Special arrangements had to be made with financial institutions for such purchases. Improved seeds have not been well accepted among the project area farming communities. Farmers preferred to keep aside some of their own production for use as seeds in the next growing season. As farmers realize the importance and the difference between farmer-owned seed and specially grown seed, their attitudes are expected to change. Achievement of this goal will require a considerable extension campaign.

CHAPTER 6

INTER-TEMPORAL GRAIN PRICE RELATIONSHIPS AT FADP

This chapter presents and discusses the results of temporal price analysis using data from FADP districts. The analysis of price over time is an important way of assessing the efficiency of the marketing system. Under the perfect competition model the price spread over time should equal the cost of storage. When results fail to show this correspondence between price increase over time and the cost of storage, then there is a clear need to investigate further as to the reasons for the divergence.

The seasonal and longer time temporal price variation is examined here using single equation least squares regression and the method of moving averages. Trend analysis is carried out using data for the period of August 1976 to December 1979 to test the short-term price trend. This analysis could help in supporting or rejecting the hypothesis that increased production in the FADP area has led or contributed to a general decline of prices in the area, particularly in the case of maize. In an analysis of price trends one has to bear in mind the general inflationary trend in the economy as a whole. So results of both nominal and real price trend analysis will be presented.

Moving average method was used to calculate seasonal indices for maize, millet and two sorghum varieties. The seasonal indices will be used to calculate price spread over a typical season of the price data.

This is then compared to the estimated storage costs to make inferences on the efficiency of the marketing system in allocating products over time. A second way of estimating price spread over a season of a time series data is to use simple regression similar to the one used for trend analysis, but fitted only to the rising portion of the price data in each year of the series. This method has also been tried here for the sake of comparing estimates with those from seasonal indices and storage cost estimates.

Time Series Variations or Movements[1]

Any time series can be decomposed into a number of variations that make up the series, at least theoretically. These component variations are listed individually and discussed here as a background setting to the chapter.

1. Long-term or secular movements: these movements are generally called trends. They refer to the direction in which a graph of the series appears to be heading. If the series is made up of prices, then the trend will indicate if prices are increased or decreasing over a long period of time. Long term is variable depending on the kind of series one is dealing with. In the case of annual crops long-term could be regarded as a period longer than two production seasons.[2]

---

[1]Murray R. Spiegel, Schaum's Outline Series: Theory and Problems of Statistics. (New York: McGraw-Hill Schaum's Outline Series), Ch. 16, pp. 283-312; Richard L. Kohls and Joseph N. Uhl, Marketing of Agricultural Products, 5th Ed., (New York: MacMillan, 1980), Ch. 10, pp. 201-219; Wayne D. Purcell, Agricultural Marketing: Systems, Coordination, Cash and Futures Prices, (Reston, Virginia: Reston Publishing Company, 1979), Ch. 7, pp. 137-194.

[2]Purcell, op. cit., p. 138.

2. Cyclical movements: these refer to a long-term oscillation about a trend line. Cycles are sometimes periodic, like the hog cycle in the United States. In economics the most often discussed cycle is the so-called business cycle.

3. Seasonal movements: these are variations that refer to patterns which a time series apparently follows during corresponding months of successive years. They reflect events that recur annually like the harvest of annual crops, certain religious occasions, etc.

4. Random movements: this is the residual component of a time series after the effects of the other components are removed. Random movements arise due to chance events.

This study will only estimate the trend and seasonal components. The series of data is not long enough for the computation of price cycles for the crops.

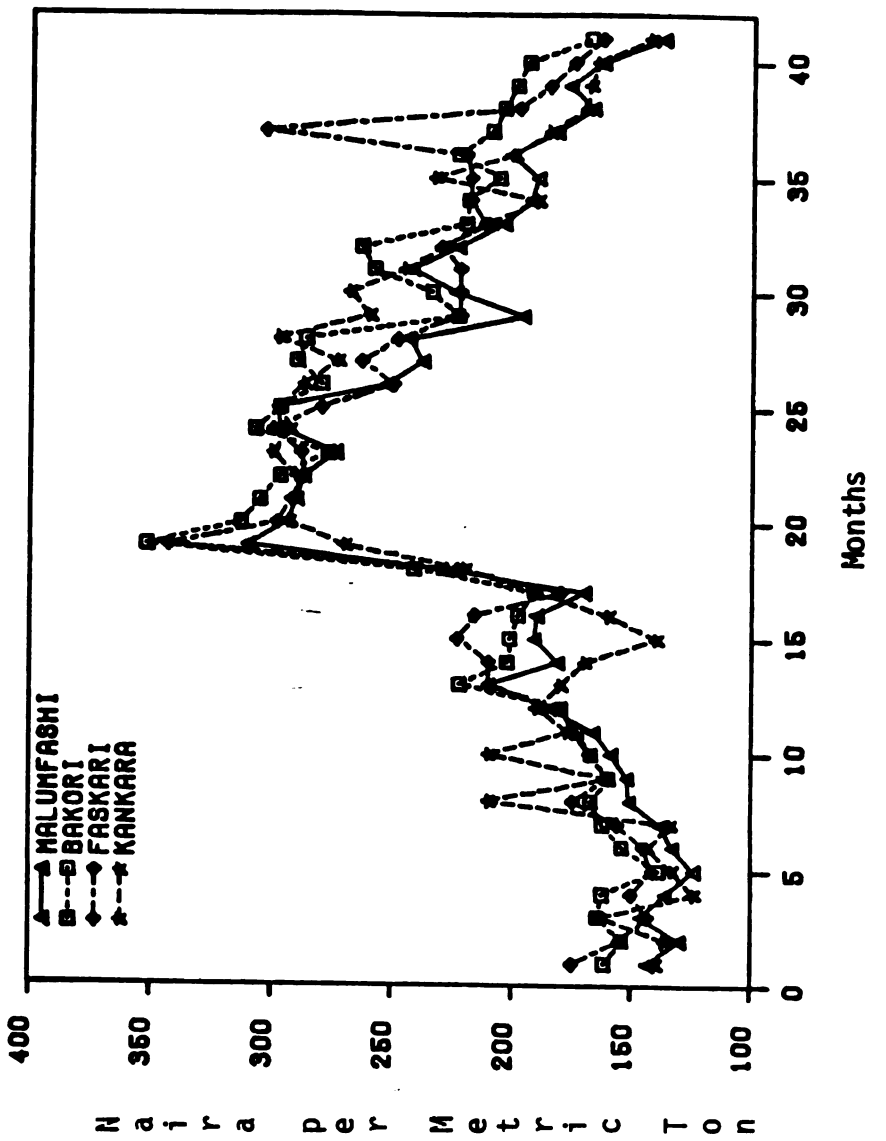
Trend Analysis

Visual Method

A visual indication of the trend in prices of food crops in the FADP area over the period of 1976-1979 is provided in Figures 6.01-6.05. The prices do not indicate any clear trend over the entire period. The data, however, when divided into two periods, present a distinct trend in all crops. The first 20 months of data present an upward trend in prices while the second half of the data show a clear downward trend. The downward trend in the second half of the data for maize and millet is masked by price fluctuations but is still discernible.

Figure 6.1

Farfara Producer Prices at FADP, 1976-1979



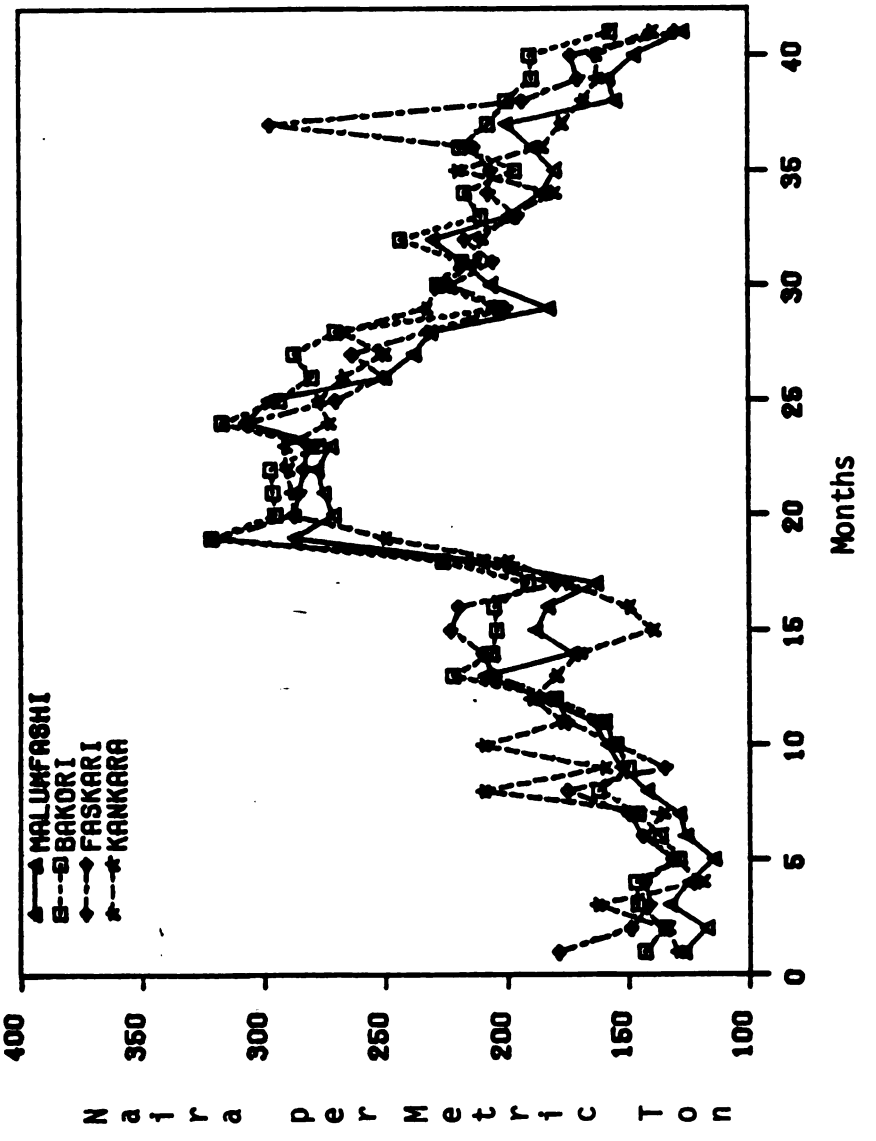


Figure 6.2
Kaura Producer Prices at FADP, 1976-1979

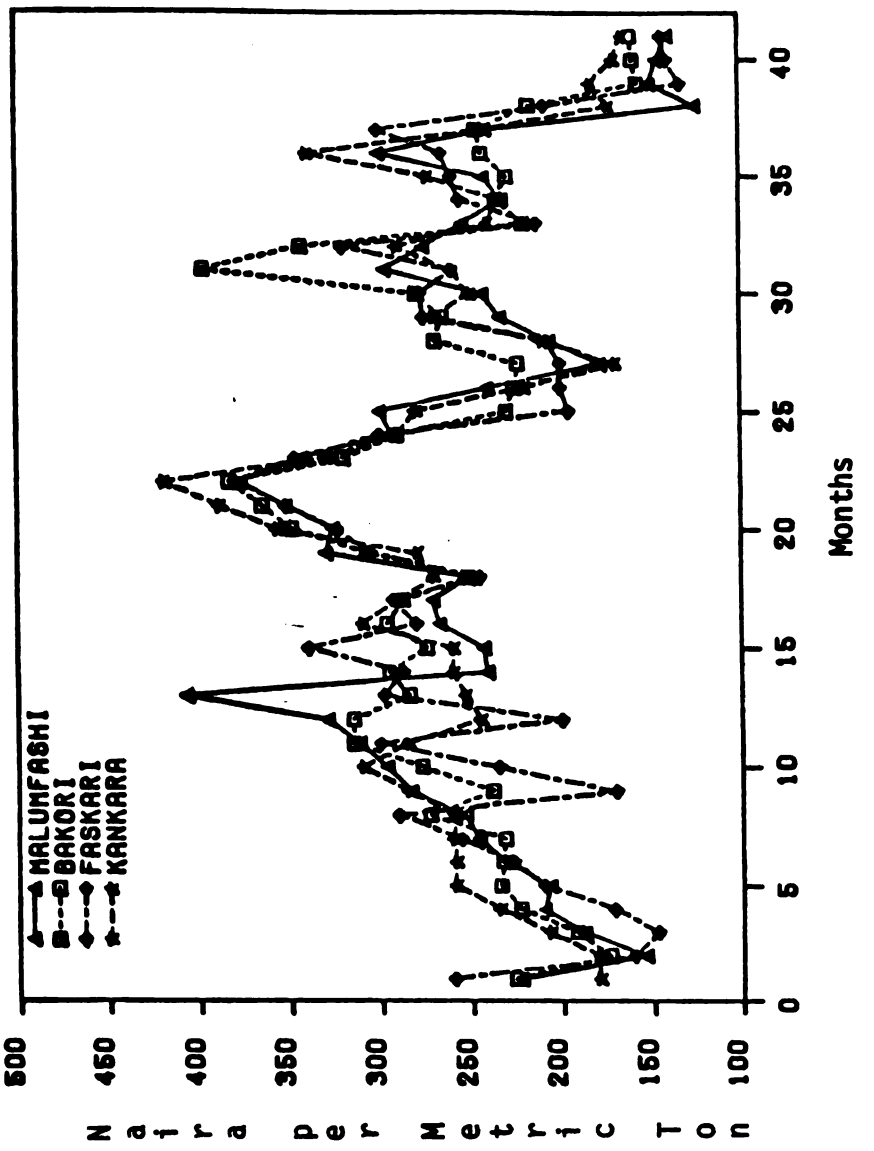


Figure 6.3

Maize Producer Prices at FADP, 1976-1979

Figure 6.4

Millet Producer Prices at FADP, 1976-1979

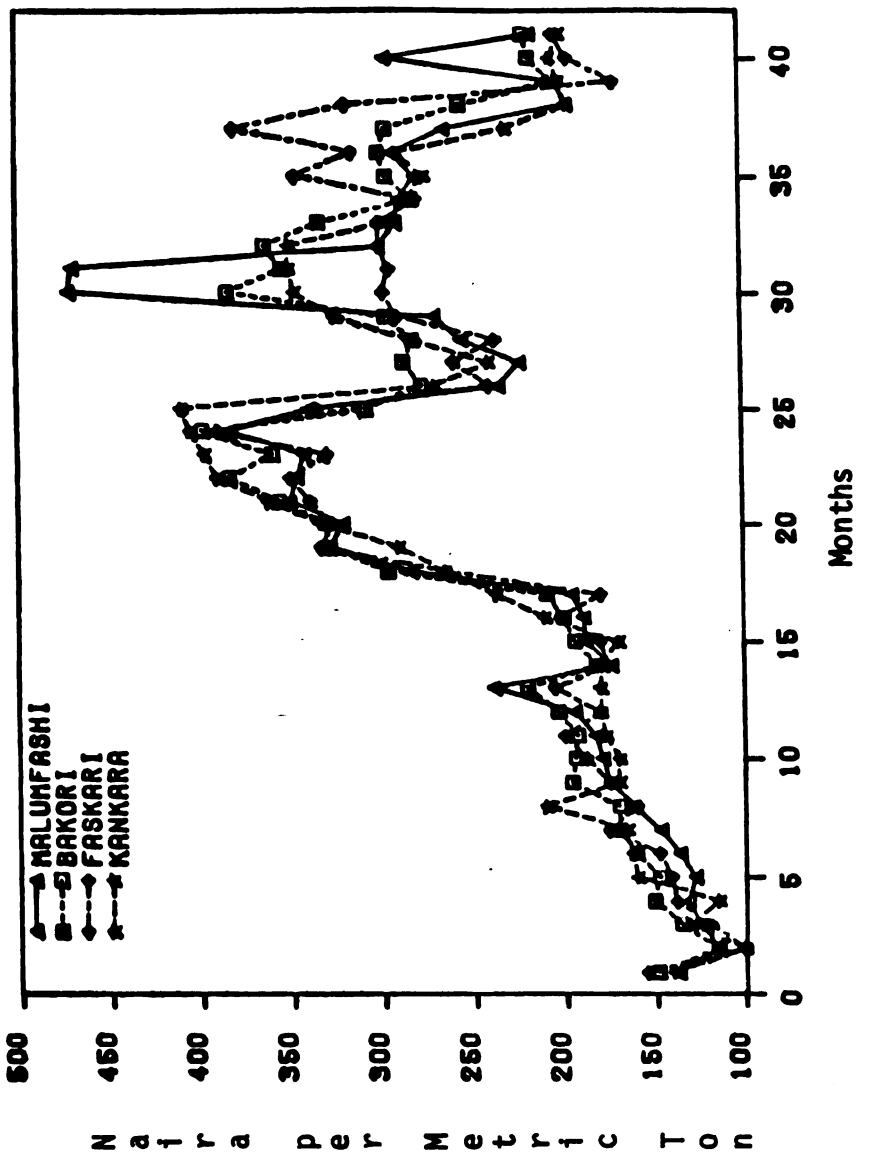
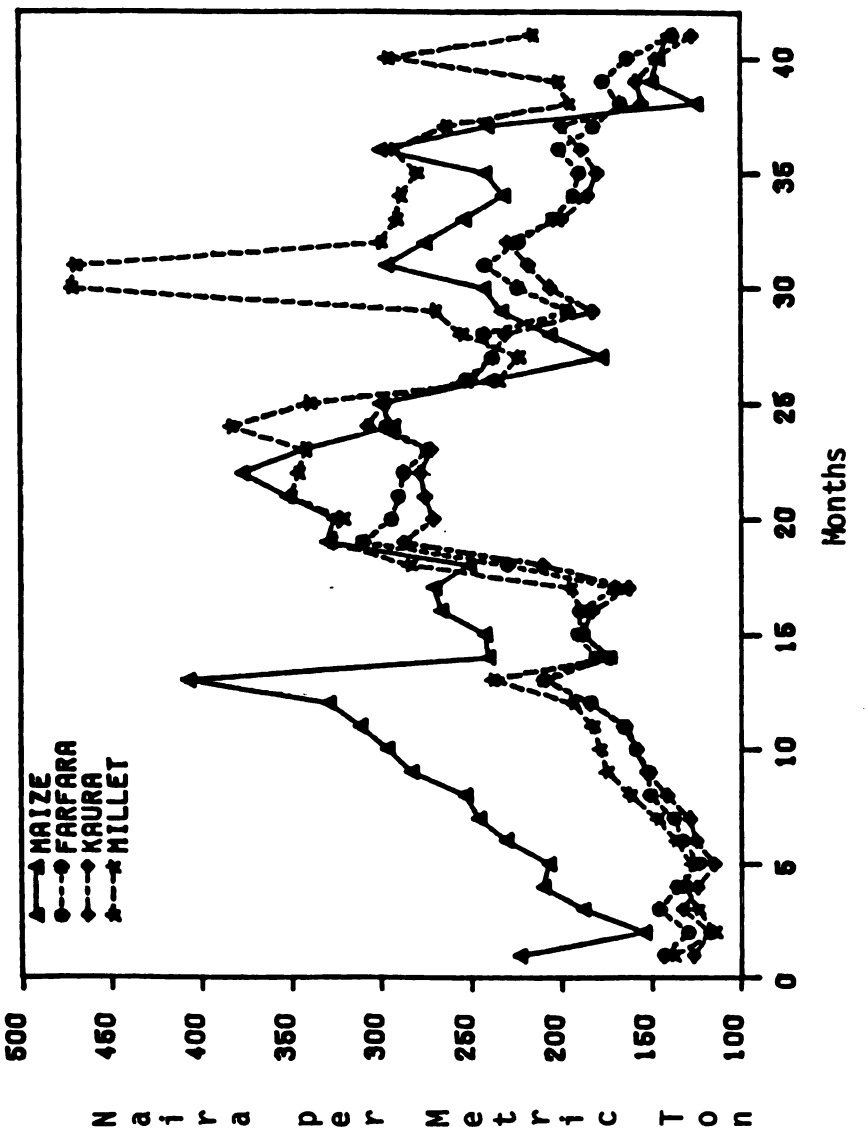


Figure 6.5

Food Crop Prices at Malumfashi, 1976-1979



The seasonal fluctuations appear more prominent than trend, particularly in the case of millet and maize over the period. The relationships among crop prices for Malumfashi[3] district are charted in Figure 6.05. It is clear that the relative price of maize has declined over the period. Maize started costing much more than sorghum and millet in 1976/77, but ended up at approximately the same price as the two sorghums. It is possible this occurred due to the increase in maize production relative to the demand for the product.

Trend Analysis Using Regression Methods

To investigate the existence of short-term trends least squares regression equations of the prices against time in months were estimated. The equations were estimated in nominal terms as well as in real prices after deflating with the Consumer Price Index.

The prices were regressed with time as the independent variable in a simple regression equation of the form:

$$P_t = b_0 + b_1 T + U$$

Where, P_t = price of a crop for the month t

b_0 = constant term of the equation

b_1 = coefficient of the time variable

T = time in months ordered from 1 to 41

U = error term

Results of estimating the regression equation are shown in Table 6.1. Of the 16 estimated equations, seven were significant at 10 percent

---

[3]Malumfashi district will be used for specific examples. The district is chosen due to its importance in the FADP area in terms of population, amount of data available for the district and the author's personal familiarity with the district.

Table 6.1 Regression Equations for Trend Estimates in Real Producer Prices in FADP Districts, 1976-1979

District	Crop	Dependent Variable	Intercept	Trend	DW	R^2	F Ratios
1. Malumfashi	Farfara	Price (N/MT)	183.914	-2.266 (1.285)	1.785	.016	1.652
2. Bakori	Farfara	Price (N/MT)	171.381	-1.449+ (1.449)	1.848	.002	1.080
3. Faskari	Farfara	Price (N/MT)	150.109	-0.793 (0.793)	1.999	.010	0.629
4. Kankara	Farfara	Price (N/MT)	170.689	-1.679 (1.127)	2.562	.007	1.271
5. Malumfashi	Kaura	Price (N/MT)	187.892	-2.518+ (1.419)	1.895	.025	2.013
6. Bakori	Kaura	Price (N/MT)	175.477	-1.743 (1.134)	2.159	.007	1.286
7. Faskari	Kaura	Price (N/MT)	147.211	-0.931 (0.877)	2.061	0	0.769
8. Kankara	Kaura	Price (N/MT)	162.385	-1.585 (1.348)+	2.520	.046	1.816
9. Malumfashi	Maize	Price (N/MT)	234.389	-3.261** (2.596)	1.827	.128	6.737**
10. Bakori	Maize	Price (N/MT)	229.253	-2.859** (2.614)	1.675	.130	6.835**
11. Faskari	Maize	Price (N/MT)	197.899	-1.942* (2.139)	1.857	.084	4.576*
12. Kankara	Maize	Price (N/MT)	245.518	-3.435** (3.314)	1.511	.204	10.985**
13. Malumfashi	Millet	Price (N/MT)	140.031	0.507 (0.353)	1.654	0	0.125
14. Bakori	Millet	Price (N/MT)	184.400	-.981 (0.483)	1.844	0	0.233
15. Faskari	Millet	Price (N/MT)	141.662	0.282 (0.201)	1.800	0	0.040
16. Kankara	Millet	Price (N/MT)	200.292	-1.687 (0.663)	1.693	0	0.439

Key: ** Significant at 1 percent level
* Significant at 5 percent level
+ Significant at 10 percent level

Note: 1. All equations estimated using Cochrane-Orcutt weighted least squares.
2. Prices were converted to real prices before estimation. For CPI data used in deflating the prices see Appendix E.

or better. However, only four were significant at the 5 percent level. All four significant equations were for maize. The three other equations, those significant only at the 10 percent level, were for sorghum farfara (2) ans sorghum kaura (1). All the seven significant equations showed negative trend in prices. Only two equations showed a positive trend--millet in Malumfashi district as well as in Faskari district. However, the positive trend coefficients were not significant.

It is clear that trend is not an important explanatory variable in food crop prices in the area when it is estimated over the whole period. This is supported by the low value of the coefficient of determination (R^2)[4] associated with the significant equations. The rising trend in the first half of the data is cancelled by a declining trend in the second half.

---

[4]The coefficient of determination, R^2, is defined as:

$$R^2 = 1 - [U_t^2 (P_t - \bar{P})^2]$$

Where, P_t = price in month t

$\bar{P}$ = the overall mean monthly price of the series

U_t = error term

A perfect fit of the estimated regression equation will give an R^2 of 1 since $U_t = 0$. When the mean price will do equally well in predicting the dependent variable, then $R^2 = 0$. R^2 simply gives the proportion of the variation in the dependent variable explained by the regression equation. It is cautioned here that R^2 is sample-specific as well as model specific. See Eric A. Hanushek and John E. Jackson, Statistical Methods for Social Scientists. (New York: Academic Press, 1977), pp. 58-59. $\bar{R}$ is simply R^2 that is adjusted to take into account the number of estimated variables in the regression equation.

$$\bar{R}^2 = 1 - \frac{n-1}{n-k}(1 - R^2)$$

Where, n = sample size

k = number of estimated coefficients including the constant term

Thus $\bar{R}^2$ is generally lower than R^2. While R^2 can not be negative, $\bar{R}^2$ can. All reported R^2 in this study are adjusted and are hence $\bar{R}^2$s.

The significance of these results is that for all crops considered, the trend coefficients are mostly negative and will be much more so for periods including months 20 to 40.

Under the assumptions of the perfect competition model prices over time vary only by the cost of storage. The cost of storage thus serves as a means of evaluating such price variations. Factors influencing storage decisions are of paramount importance in the analysis.

Gilbert[5] in his discussions of factors affecting storage decisions by farmers in the northern parts of Nigeria mentioned the following as the most important factors:

1. The timing of harvest of each crop in relation to the harvest of other crops,
2. The importance of the subsistence component of each crop,
3. The timing of the need for cash on the part of producers,
4. The timing and importance of cash income from the sale of other non-staple food crops and from secondary occupations,
5. The expectations regarding the timing and size of the new harvest.

The above factors were found to affect the storage of food crops in the following manner: the timing of harvest of a crop in relation to other crops is important in that if the crop is the first to be harvested in the season, then there is very little tendency for storing it since it is probably needed for immediate consumption to cover possible shortages in diet over the long dry season. There is also anticipation of other crops coming soon.

---

[5]Elon H. Gilbert, "Marketing of Staple Foods in Northern Nigeria: A Study of the Staple Food Marketing Systems Serving Kano City," Ph.D. Dissertation, Stanford University, 1969, pp. 218-224.

The indication of the eagerness with which farmers welcome the ripening of new millet is reflected in the tradition of tumu.[6] A sample of the heads of the just ripened millet are roasted on fire and served to family members before the period of full-scale harvest. This procedure is followed in the case of maize as well, although the term tumu is not applied. Maize is also an early crop like millet. Thus, other things being equal, one would expect less storage of millet and maize when compared with late crops like sorghum.

The importance of a crop in the subsistence of the farm family affects the level of storage undertaken. The more important the crop in subsistence, the higher the amount that will be stored for later use. The reverse is the case with a non-subsistence crop. This could account for the differences in the storage pattern of sorghum as compared with groundnuts or cotton.

The timing of cash receipts from other sources is important in storage decisions. The more the availability of income from other sources, the higher the likelihood of storing the food crop for later use.

Finally, the expectation with regard to yield prospects of crops in the field could increase or decrease the amount of staple food set aside for storage. Gilbert pointed out that the number of factors that influence storage decisions are many and introduce a lot of uncertainty regarding the process.[7]

---

[6] Tumu refers to the just-ripened heads of millet as well as the roasting tradition.

[7] Gilbert, op. cit., p. 222.

With this as a background the results of seasonal price analysis of producer prices in FADP districts are presented in Table 6.2. The seasonal indices were calculated using the method of moving averages. Figures 6.6-6.9 give a visual representation of the seasonal indices.[8] The figures show that for sorghum farfara and sorghum kaura price indices were lowest in the month of December, which is the month of harvest for these crops. Prices during this period average about 75 to 95 percent of their yearly average, depending on district. Prices of sorghum, both kaura and farfara, show a smaller decline in seasonal prices at harvest in Kankara than in other districts.

From December to February prices show a strong upward movement for sorghum while after February they show a gradual decline until the month of May. From May to August, prices increase again. From August to December the prices of sorghum decline to their season low. Thus, there is a strong correlation between the timing of the low prices for sorghum and the harvest period. Similar strong correlation of the timing of high prices with the period just before harvest is not evident. There appears to be two distinct peaks in the price of sorghum over the season, with the first peak just two months after harvest and the second one about four months before the harvest of new crops. Gilbert observed only the second peak and thus maintained that timing of highs and lows in prices followed closely the period just before harvest and immediately after it.

A likely explanation of the seasonal price behavior observed may be related to increased production of staple food crops (See Appendix B) which might have led to accumulation of local stocks as the project developed. If this was the case then the realization of the existence of

---

[8]Calculation of the seasonal indices was based on nominal prices.

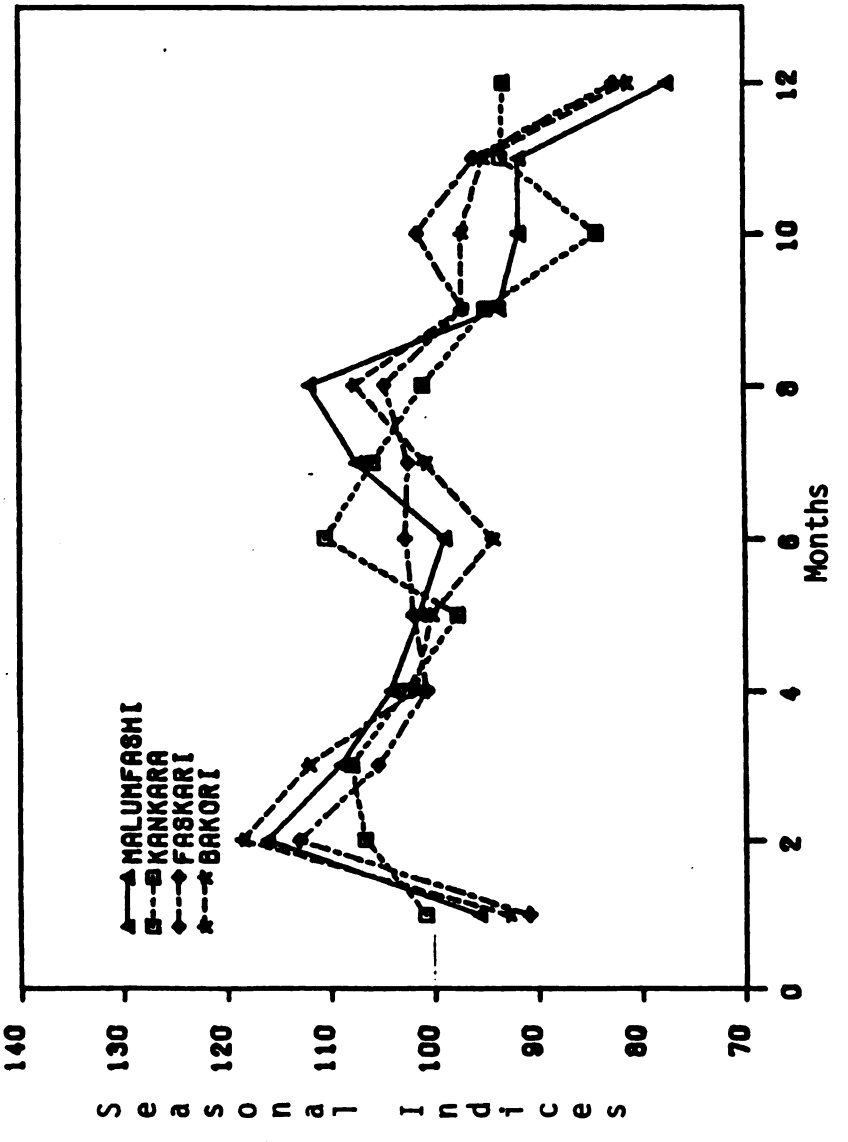
Table 6.2 Further Analysis of Seasonal Price Indices

Crop and District	Index Low Value	Index Low Month	Index High Value	Index High Month	Range of Index	Range Percent of Low	No. of Months in Range	Price Increase Per Month (Percent)
Kaura								
Malumfashi	76	Dec.	116	Aug.	40	52.63	8	6.58
Bakori	80	Dec.	110	Aug.	30	37.50	8	4.69
Faskari	80	Dec.	108	Feb.	28	35.00	2	17.50
Kankara	85	Oct.	113	Aug.	28	32.94	8	4.12
Average	80.25	-	111.75	-	31.50	39.52	6.5	6.08
Farfara								
Malumfashi	77	Dec.	112	Aug.	35	45.45	8	5.68
Bakori	81	Dec.	119	Feb.	38	46.91	2	23.46
Faskari	83	Dec.	113	Feb.	30	36.14	2	18.07
Kankara	84	Oct.	111	Aug.	27	32.14	8	4.02
Average	81.25	-	113.75	-	32.50	40.16	5.0	8.03
Maize								
Malumfashi	72	Oct.	122	Aug.	50	69.44	10	6.94
Bakori	83	Oct.	123	Feb.	40	48.19	4	12.05
Faskari	86	Nov.	118	May	32	37.21	6	6.20
Kankara	76	Oct.	114	June	38	50.00	8	6.25
Average	79.25	-	119.25	-	40.00	51.21	7.0	7.32
Millet								
Malumfaski	74	Oct.	133	Feb.	59	79.73	4	19.93
Bakori	81	Sept.	112	Mar.	31	38.27	6	6.38
Faskari	81	Sept.	115	June	34	41.98	9	4.66
Kankara	73	Oct.	113	Mar.	40	54.79	5	10.96
Average	77.25	-	118.25	-	41.00	53.69	6.0	8.95

Source: Calculated from original data supplied by FADP/APMEPU.

Figure 6.6

Seasonal Price Indices for Sorghum Farfara, 1977-1979



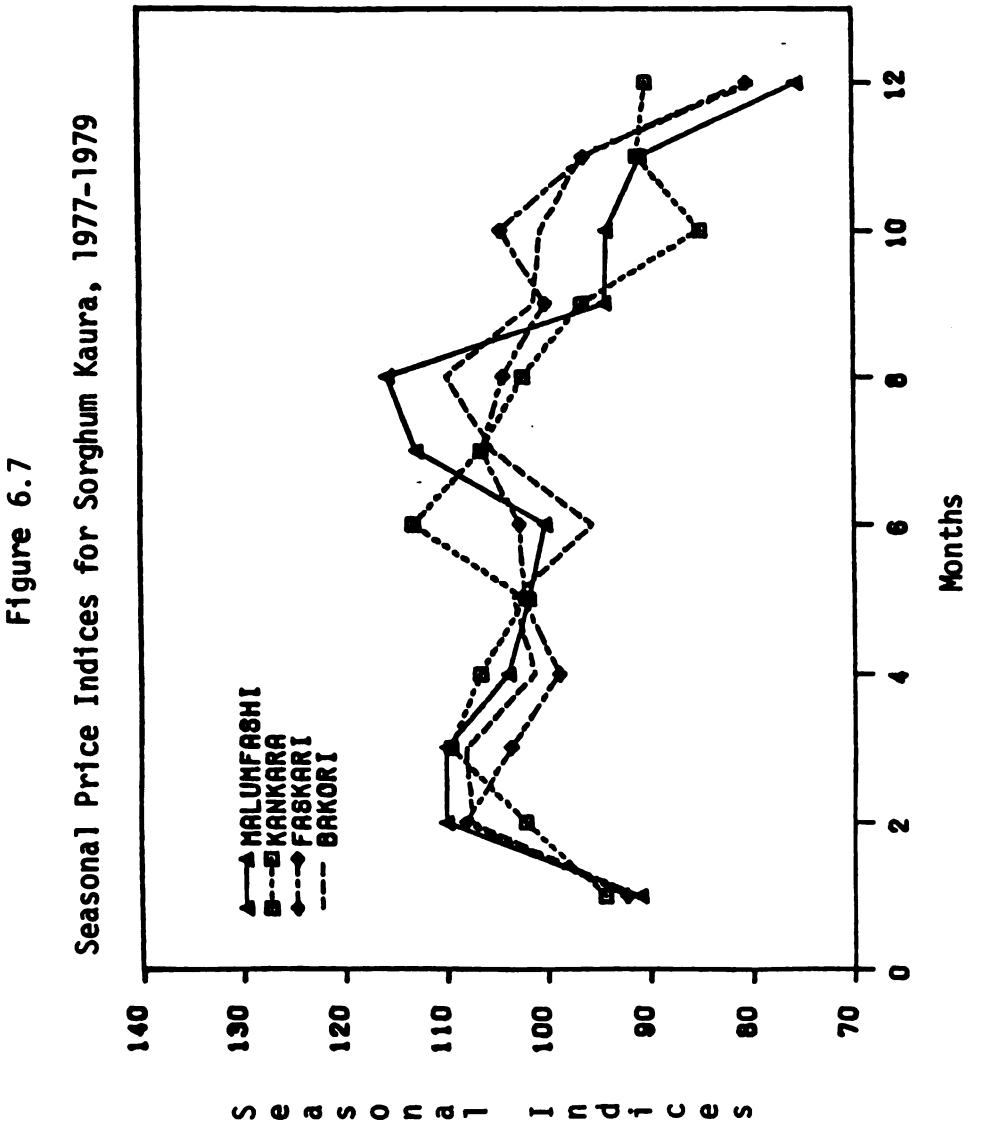
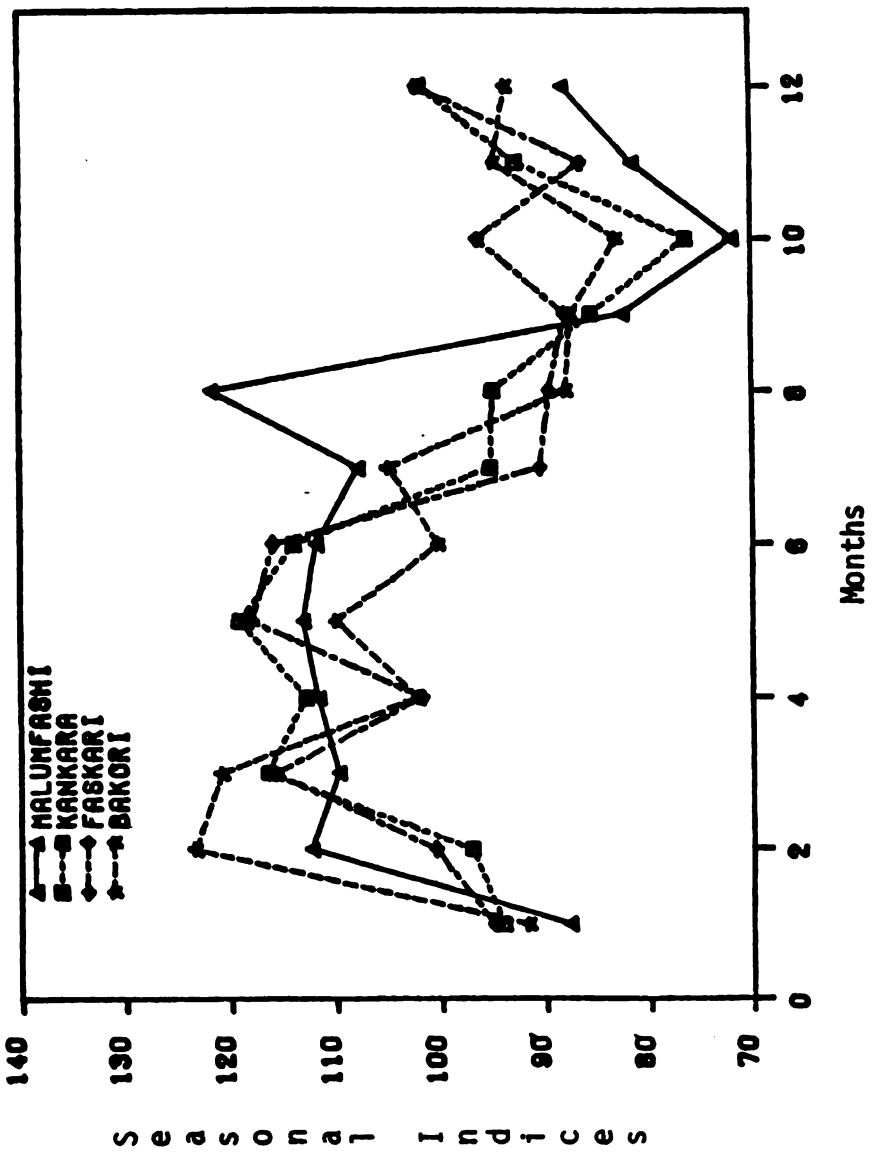


Figure 6.7

Seasonal Price Indices for Sorghum Kaura, 1977-1979

Figure 6.8

Seasonal Price Indices for Maize



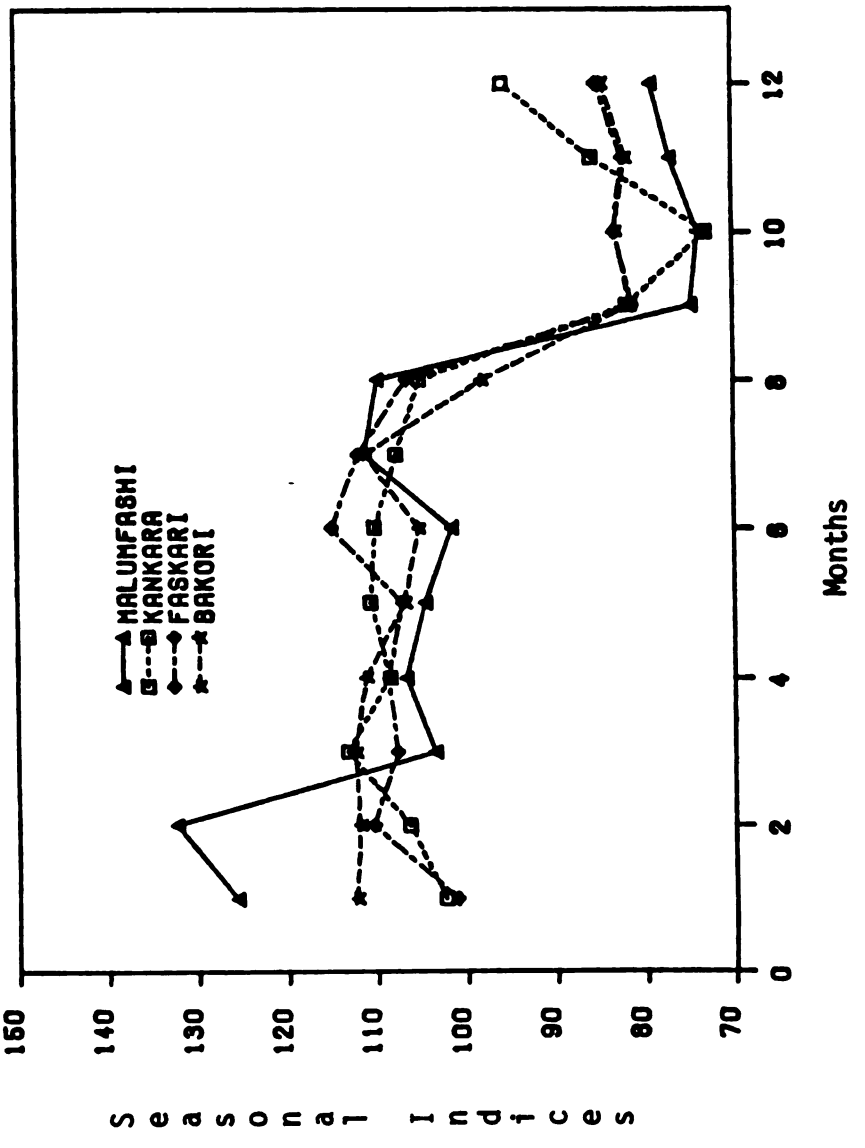


Figure 6.9

Seasonal Price Indices for Millet, 1977-1979

surpluses, more than needed to see producers through the dry season, could have led to the early weakening of prices observed. It appears that the marketing system was not moving surpluses to other deficit areas, leading to slightly depressed prices in the FADP area.

It is also interesting that the prices of sorghum start to decline months before the harvest of the new crop as can be seen in the seasonal plots. This is due to the substitution between sorghum and early crops like millet and maize which are harvested from the end of August to about the middle of October. Expectations in terms of the harvest of these early crops, as well as on the prospects of the new sorghum crop, could also lead to an early drop in sorghum prices. By the end of August the prospects of new crops are determined.

No similar pattern of dual price peaks are shown in the case of millet or maize, the two early crops in the area. The drop in price at harvest seems to be greater for millet and maize than in the case of sorghum. For millet the sharpest drop in price occurs between August and October, the period of harvest. During the month of October prices begin to rise, continue upward, and finally reach a plateau in February, at which time they remain up until the month of August when another cycle is started. Prices in August do not appear much different from those in February; hence the use of the term "plateau" to describe prices between February and August. The individual districts, of course, show slightly different levels of prices. For example, the price increase in Malumfashi district was much higher between January and February than in other districts. Nevertheless, the increase in the price of sorghum from harvest to the period just before the next harvest does not seem to depend on the length of time.

Maize had its lowest prices in October (the time of harvest) except for Bakori district which had the low in November. Prices increase steadily to the month of March and then hold steady until the end of July, from whence they start to decline in anticipation of a new crop. In Malumfashi district prices did not decline until after the month of August.

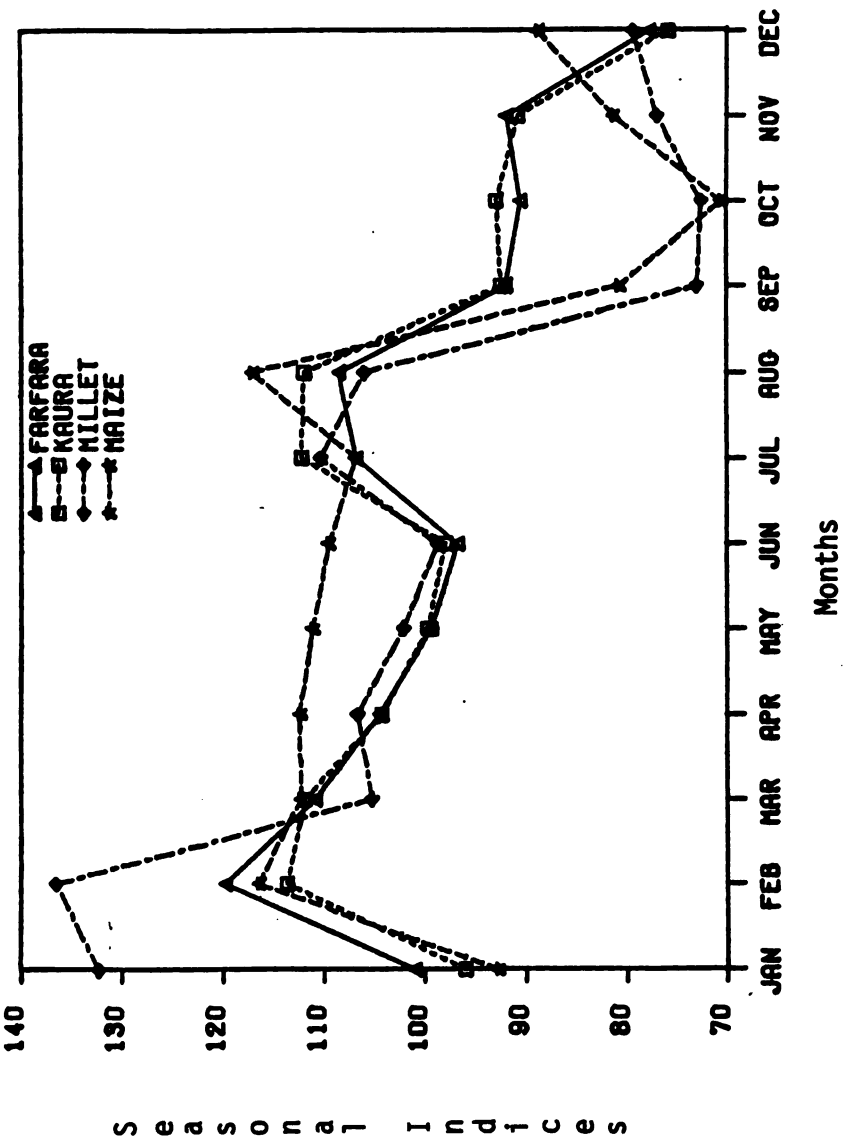
It is clear that month-to-month variation is a big factor in prices and these variations are distinct from crop to crop, with maize and millet having more than other crops. Finally, although each of the crops showed significant seasonal patterns, these patterns are only similar at the time of individual crop harvest, not deep into the season. A comparative look at the seasonal pattern of the crop prices for Malumfashi district are shown in Figure 6.10.

The range of the seasonal indices for each crop were calculated. These give an indication of seasonal price variation. Table 6.2 shows that in all districts maize and millet showed higher price variation than sorghum. The reason for the higher ranges for maize and millet are not clear but probably include the status of millet as an early crop subject to storage decisions different from sorghum. The answer to the difference could only come from a detailed look at the farmer storage decision-making process. Unfortunately there is very little data available in this area which this study can utilize. For maize one can speculate that the recent arrival of the crop in large production quantities is a significant factor. The marketing institutions may not have completely adapted to the specifics of maize marketing yet.

A further breakdown of the range in seasonal indices on a monthly basis based on the number of months between the low and high index yielded a similar result showing seasonal variation in sorghum to be less than in maize or millet. Sorghum farfara showed an increase of 8

Figure 6.10

Seasonal Indices of Producer Prices for Food Crops
Malumfashi District: 1977-1979



percent per month compared to 6 percent for sorghum kaura. On the other hand, millet had close to a 9 percent increase per month while maize had just over a 7 percent average increase in price per month. The 8 percent increase in the case of farfara is due to the occurrence of the high prices in February instead of the normal period in August and thus exaggerated the increase in price on a monthly basis. The actual increase is probably closer to 6 percent as shown in the case of sorghum karua (see Table 6.2).

The variation in the timing of the high price points appears to be due to either poor data quality or due to the complexity of storage decisions and the timing of the release of the crops in small village markets in the FADP districts. Further study on this is required before definite conclusions can be made regarding the seasonal patterns observed in this study. A second calculation of the seasonal indices based on real (deflated prices) resulted in a more consistent interval between the low and the high indices. The timing of the low indices is still consistent with the harvest period but the high indices occur much earlier than reported by Gilbert. The high indices for sorghum farfara occurred in February and March rather than in June to October. Similarly the high indices for millet were also in February and March rather than in June and July, as reported by Gilbert.[9] These earlier high prices could be due to localized phenomena which are not clear at this point. This seems to be the case since the prices decline after the initial high and then rise again to the normal or expected period of high prices in June, July or August.

---

[9] Ibid., pp. 231-233.

The early increase in price could be due to initial withholding of the crop from the markets by farmers since other sources of income are generally available to them at the time. Other income sources include the sale of groundnuts, cotton, and cowpeas. Since sorghum is the most important staple crop in the areas, it is stored for later consumption provided cash needs are met from other sources.

Estimation of Seasonal Price Increase Using Regression Procedures

Regression equations fitted to the rising portions of seasonal prices can be fitted to estimate the extent of price increase over a season or an average rise per season based on a number of seasons put together. This procedure has been used by Ejiga.[8] The simple regression equation is given as:

$$P_t = a + bT + u$$

Where, P_t = the average seasonal price at time t

T = time in months starting from the lowest average seasonal price

a,b = constants for intercept and slope, respectively

u = time error term

A summary of fitting this equation to data covering the period of 1976-1979 for various crops and FADP districts is shown in Tables 6.3 and 6.4. Results in Table 6.3 were obtained using deflated prices (1970 = base). The period of rising prices varies from crop to crop and so the periods used for the estimation is indicated for each crop.

---

[8] N. O. Ejiga, "Economic Analyses of Storage, Distribution and Consumption of Cowpeas in Northern Nigeria," Ph.D. Dissertation, Cornell University, 1977, p. 285.

Table 6.3

Regression Results Fitted to the Upward Sloping Portions of Average Seasonal Producer Prices for Food Crops at FADP, 1976-1979
(Prices in real 1970 value)

District	Crop	Crop Season	Period Covered	Intercept	Slope	$\bar{R}^2$	DW	F-Ratios	Ratio of Slope to Intercept (%)
Malumfashi	Farfara	1976/77	Dec.-Aug.	84.96	3.80	.87	2.30	47.43	4.5
Malumfashi	Kaura	1976/77	Dec.-Aug.	74.97	4.60	.83	2.04	35.88	6.1
Bakori	Kaura	1976/77	Dec.-Aug.	92.78	3.15	.46	1.86	6.95	3.4
Malumfashi	Maize	1976/77	Oct.-June	115.36	11.38	.98	1.74	453.72	9.9
Bakori	Maize	1976/77	Oct.-June	143.76	7.22	.83	2.57	36.17	5.0
Kankara	Maize	1976/77	Oct.-June	168.23	5.80	.71	2.37	18.24	3.5
Malumfashi	Millet	1976/77	Oct.-Aug.	80.24	5.47	.79	1.68	34.02	6.8
Kankara	Kaura	1977/78	Dec.-Aug.	330.59	-6.64	.36	1.96	4.92	-2.0
Malumfashi	Farfara	1978/79	Dec.-Aug.	311.97	-5.93	.78	1.50	25.71	-1.9
Bakori	Farfara	1978/79	Dec.-Aug.	308.31	-5.47	.57	2.01	10.33	-1.8
Kankara	Farfara	1978/79	Dec.-Aug.	356.63	-7.07	.72	1.74	18.94	-2.0
Malumfashi	Kaura	1978/79	Dec.-Aug.	248.58	-4.12	.41	1.26	5.94	-1.7
Bakori	Kaura	1978/79	Dec.-Aug.	223.72	-3.18	.70	2.02	17.29	-1.4
Kankara	Kaura	1978-79	Dec.-Aug.	266.90	-4.70	.77	2.10	25.07	-1.8
Kankara	Millet	1978/79	Oct.-Aug.	596.83	-12.77	.64	2.17	17.76	-2.1

Notes: 1. All t-values for the intercept and the slope are significant at 5% level or better.

2. All equations estimated using Cochrane-Orcutt weighted least squares.

Table 6.4

Regression Results Fitted to the Upward Sloping Portions of Average Seasonal Producer Prices of Food Crops at FADP, 1976-1979 (Nominal 1976-79 Prices)

District	Crop	Crop Season	Period Covered	Intercept	Slope	R^2	DW	F-Ratios	Ratio of Slope to Intercept (%)
Bakori	Farfara	1976/77	Dec.-Aug.	97.37	8.08	.48	1.30	7.42	8.3
Faskari	Farfara	1976/77	Dec.-Aug.	107.44	6.67	.78	1.75	25.43	6.2
Kankara	Farfara	1976/77	Dec.-Aug.	111.04	6.82	.49	1.67	7.61	6.1
Faskari	Kaura	1976/77	Dec.-Aug.	98.80	6.93	.56	1.87	9.96	7.0
Kankara	Kaura	1976/77	Dec.-Aug.	112.00	6.73	.47	1.69	7.23	6.0
Malumfashi	Maize	1976/77	Oct.-June	137.10	15.72	.98	1.93	321.76	11.5
Bakori	Maize	1976/77	Oct.-June	173.44	10.42	.81	2.06	30.38	6.0
Kankara	Maize	1976/77	Oct.-June	206.18	8.38	.75	2.26	22.10	4.1
Malumfashi	Millet	1976/77	Oct.-Aug.	59.88	12.57	.79	1.49	34.58	21.0
Bakori	Millet	1976/77	Oct.-Aug.	115.71	7.61	.96	2.16	234.93	6.6
Faskari	Millet	1976/77	Oct.-Aug.	109.00	7.28	.91	2.28	96.40	6.7
Malumfashi	Farfara	1978/79	Dec.-Aug.	479.72	-8.09	.69	1.95	16.85	-1.7
Bakori	Farfara	1978/79	Dec.-Aug.	459.62	-6.85	.38	2.22	5.27	-1.5
Kankara	Farfara	1978/79	Dec.-Aug.	544.59	-9.69	.68	1.90	15.60	-1.8
Bakori	Kaura	1978/79	Dec.-Aug.	306.45	-2.69	.32	2.19	4.23	-0.9
Kankara	Kaura	1978/79	Dec.-Aug.	390.74	-5.65	.65	2.28	14.13	-1.5
Kankara	Millet	1978/79	Oct.-Aug.	1011.77	-20.86	.56	2.26	12.55	-2.1

Notes: 1. All t-values for the intercept and the slope are significant at 5% level or better.
2. All equations estimated using Cochrane-Orcutt weighted least squares.

The results show a striking inconsistency in price increase from one year to another. For the 1976/77 season all slopes were positive and range from about 3 naira per ton per month to over 11 naira per ton per month. Significant results for 1977/78 and 1978/79 all had negative slopes indicating a decline in real prices for the food crops over those seasons. The extent of the decline ranges from 3 to about 7 naira per ton per month, excluding the 12.77 naira per ton per month recorded for millet in Kankara district.

If the intercepts represent the beginning low prices for the crops, then the ratio of the slopes to the intercepts give the average increase in prices per month over the season.[10] The results of calculating the increases per month from this method are shown in the last columns of Tables 6.3 and 6.4. They show that in the 1976/77 season farfara prices increased an average of 4.5 percent, kaura prices 4.8 percent, millet prices 6.8 percent and maize prices 6.1 percent per month. In the 1977/78 and 1978/79 seasons, however, all prices declined in real terms. The ratios show that kaura prices declined approximately 1.75 percent per month, farfara prices 1.90 percent and millet prices 2.1 percent per month. During these seasons no significant decline in the price of maize was recorded.

These results indicate that only during the 1976/77 season were there significant seasonal price increases. The two subsequent seasons showed a significant drop in seasonal prices for sorghums and millet,

---

[10] See Nathaniel O. Ejiga, "Economic Analyses of Storage, Distribution and Consumption of Cowpeas in Northern Nigeria." Ph.D. Dissertation, Cornell University, 1977.

but not for maize. This raises the issue as to whether the complaints about the saturation of maize markets in the area were genuine. In our results maize fared better than the other food crops. Even though maize prices did not increase significantly in 1977/78 and 1978/79, they did not decline significantly either. However other food crop prices declined as reported above.

The results also show how volatile any decisions regarding speculative storage and hoarding could be from one season to another. While storage was potentially successful in the 1976/77 season, there was no potential for profitable storage in the two subsequent seasons, 1977/78 and 1978/79. The estimated seasonal price increases can be compared with estimated storage costs to indicate the extent of possible profit in the 1976/77 season.

Comparison of Seasonal Price Increase with Estimated Cost of Storage

Comparison of seasonal price increase with the cost of storage is often used to get some idea as to how well a marketing system is allocating resources over time. The comparison is useful in clarifying accusations pointed at middlemen as the underlying cause of price increases. Although there was no case of a price doubling over a single season in the data in this study, it is often claimed that this doubling of price occurs between harvests.

The general indication is that if the seasonal increase in price is higher than the cost of storage, then there is an indication that traders

or other participants in the marketing system could make abnormal profits from the storage process.[11]

Unfortunately the cost of storage is an area that is greatly under-researched and thus very little concrete information is available in this regard. This lack of information weakens the strength of seasonal price variation studies. The shortage of information with regard to storage is even more acute at the producer level in northern Nigeria, even though it has been shown that most of the storage undertaken in the area is generally done by the farm producers rather than urban or rural traders.[12]

In the FADP survey data no storage costs were collected. This is not very surprising since the surveys had other points of emphasis. A solution to this problem is to use estimates from other studies.

Hays (1973)[13] estimated the major components of storage cost based on data collected from traders in the urban market at Zaria and secondary information from Giles.[14] The major cost components were rent, interest, labor cost for guarding the stored food grains, and amount of losses over time. Rent was estimated at about 15 shillings per hundred

---

[11]H. M. Hays, "Organization of the Staple Food Grain Marketing System in Northern Nigeria." Ph.D. Dissertation, Kansas State University, 1973, p. 156.

[12]Gilbert, op. cit., p. 272; Hays, op. cit., p. 163; and Ejiga, op. cit., p. 219. See also Barbara Harriss, "There Is Method in My Madness: Or Is It Vice Versa? Measuring Agricultural Market Performance." Food Res. Inst. Studies, Vol. XVII, No. 2, 1979, p. 205.

[13]Hays, op. cit., pp. 156-164

[14]P. H. Giles, "The Storage of Cereals by Farmers in Northern Nigeria." Samaru Research Bulletin, 42, Institute for Agricultural Research, Ahmadu Bello University, Zaria, 1965.

sacks of sorghum or millet. Interest was taken to be the current rate at which private commercial banks were making short-term loans--1 percent per month or 12 percent annually. Storage loss for sorghum and millet was estimated to be 5 percent per year. These estimates were then converted to the basis of storage cost per ton per month.

Rent facilities:

Stall fees	=	1.5 naira per 100 sacks of grain--sorghum or millet
Guard service	=	2.0 naira per month
Subtotal	=	3.5 naira per ton per month
Interest charges	=	1 percent per month
Storage losses	=	5 percent per year (0.42 percent per month)
Depreciation of sacks	=	0.15 naira per ton per month
Grand Total	=	0.5 naira/ton/month + 1.42 percent of price/mo.

The calculations done by Hays regarding the cost of storage are ambiguous in many instances and it is not clear how the final figures were computed. For example, the final figure regarding rent of facilities was not clearly explained. The same is true in the case of how the percentages relating to interest charges and storage losses were used.[15]

Hays (1975)[16] calculated storage costs in rural areas based on the use of rumbu, which is the common storage structure in rural areas. His total annual estimated storage costs for rumbu use are about 3.48 naira per metric ton. Ejiga[17] has also done some work in trying to assess a

---

[15] Ibid., p. 37.

[16] Hays, op. cit., pp. 156-164.

[17] Ejiga, op. cit., pp. 246-263.

reasonable estimate of the costs of storage for cowpeas, but has met with little success. His estimates varied from less than one-half of a naira to 49 naira, depending on assumptions involved as well as location of the area. Ejiga speculated that the wide divergence could indicate either enjoyment of monopoly conditions by owners of storage facilities or could be due to the availability of poor data. The costs of storage used in these studies are very crude and have to be regarded as indicative pending better estimates.

Given this divergence in the estimates of storage cost an approach is taken here to use a basic rate of 0.5 naira per ton per month as the cost of rent for facilities plus/minus depreciation and losses. In addition, an interest cost of 24 percent per year is assumed to cover the cost of invested capital. The interest rate is divided into 12 equal rates of 2 percent per month. But since the monthly rates are compounded this came to an effective interest rate of 26.82 percent per annum. This rate is not unrealistic given the wide divergence of the sources of funds to farmers and varying rates associated with the different sources. A better way of arriving at an appropriate rate would have been to get the various interest rates and amounts borrowed at each rate and then weight them accordingly to arrive at a weighted interest rate which can then be used for the analysis. This is not possible here since there are no figures on sources of credit. Further justification for the interest charge is provided by FADP which charged 10 percent for its loans plus the intangible cost of having to get certification from village leaders before the loan is approved. The FADP loan was a loan in kind for the purchase of inputs and some farm implements.

The harvest prices plus hypothetical storage costs for food crops at Malumfashi for three seasons are shown in Table 6.5 and graphed with actual food crop prices in Figures 6.11-6.14.

The results indicate that for the two sorghums in two of the three seasons examined, there is an opportunity for carrying out profitable storage activity. The near perfect substitute relationship between the crops is shown in the pattern of the charts which follow identical paths for both crops. The biggest margin between actual and expected price was in 1977/78 with a smaller margin in 1976/77. For 1978/79, there was a positive margin for only the first few months of the season and a loss for the rest of the season. The timing of the period of maximum margin varies but generally it comes toward the end of the crop season--just before a new harvest. This was not the case for farfara in the 1977/78 season when the maximum margin occurred much earlier in the season (See Figure 6.11).

For maize and millet all seasons showed a margin of actual prices over expected prices. For maize the largest margin was in the 1976/77 season, while for millet it was in the middle of the latest season, 1978/79.

The margins shown in the charts are more than the actual margins in real terms since nominal prices were used. Inflation rate in the economy at the rate of 17 percent per annum reduces the margins considerably.

As pointed out by Hays[17] the presence of excess after subtracting actual price from expected price only indicates the possibility of

---

[17]H. M. Hays, "The Marketing and Storage of Food Grains in Northern Nigeria." Samaru Miscellaneous Paper, 50, Institute for Agric. Research, Ahmadu Bello University, Zaria, 1975, p. 89.

Table 6.5

Harvest Prices Plus Hypothetical Storage Costs for Food Crops FADP, 1976-1979

	Maize	Kaura	Farfara	Millet
		(Naire per ton)		
Aug. 1976	-	-	-	-
Sept.	154.0*	-	-	115*
Oct.	157.58	-	-	117.8
Nov.	161.23	-	-	120.66
Dec.	164.96	115*	124*	123.57
Jan. 1977	168.76	117.8	126.98	126.54
Feb.	172.63	120.66	130.02	129.57
Mar.	176.59	123.57	133.12	132.66
Apr.	180.62	126.54	136.28	135.82
May	184.73	129.57	139.51	139.03
June	188.93	132.66	142.80	142.31
July	193.20	135.82	146.15	145.66
Aug.	197.57	139.03	149.58	149.07
Sept	241*	142.31	153.07	174*
Oct.	246.32	145.66	156.63	177.98
Nov.	251.75	149.07	160.26	182.04
Dec.	257.28	163*	170*	186.18
Jan. 1978	262.93	166.76	173.9	190.40
Feb.	268.69	170.60	177.88	194.71
Mar.	274.56	174.51	181.94	199.11
Apr.	280.55	178.50	186.07	203.59
May	286.66	182.57	190.30	208.16
June	292.89	186.72	194.60	212.82
July	299.25	190.95	198.99	217.58
Aug.	305.74	195.27	203.47	222.43
Sept.	312.35	199.68	208.04	227.38
Oct.	178*	204.17	212.70	223*
Nov.	182.06	208.75	217.46	227.96
Dec.	186.20	182*	196*	233.02
Jan. 1979	190.43	186.14	200.42	238.18
Feb.	194.73	190.36	204.93	243.44
Mar.	199.13	194.67	209.53	248.81
Apr.	203.61	199.06	214.22	254.29
May	208.18	203.54	219.00	259.87
June	212.85	208.12	223.88	265.57
July	217.60	212.78	228.86	271.38
Aug.	222.46	217.53	233.94	277.31
Sept.	227.40	222.38	239.12	283.36
Oct.	-	227.33	244.40	-
Nov.	-	232.38	249.79	-

Note: * Actual harvest price for the season

Figure 6.11

Actual and Expected Prices for Farfara, Malumfashi District, 1976-1979

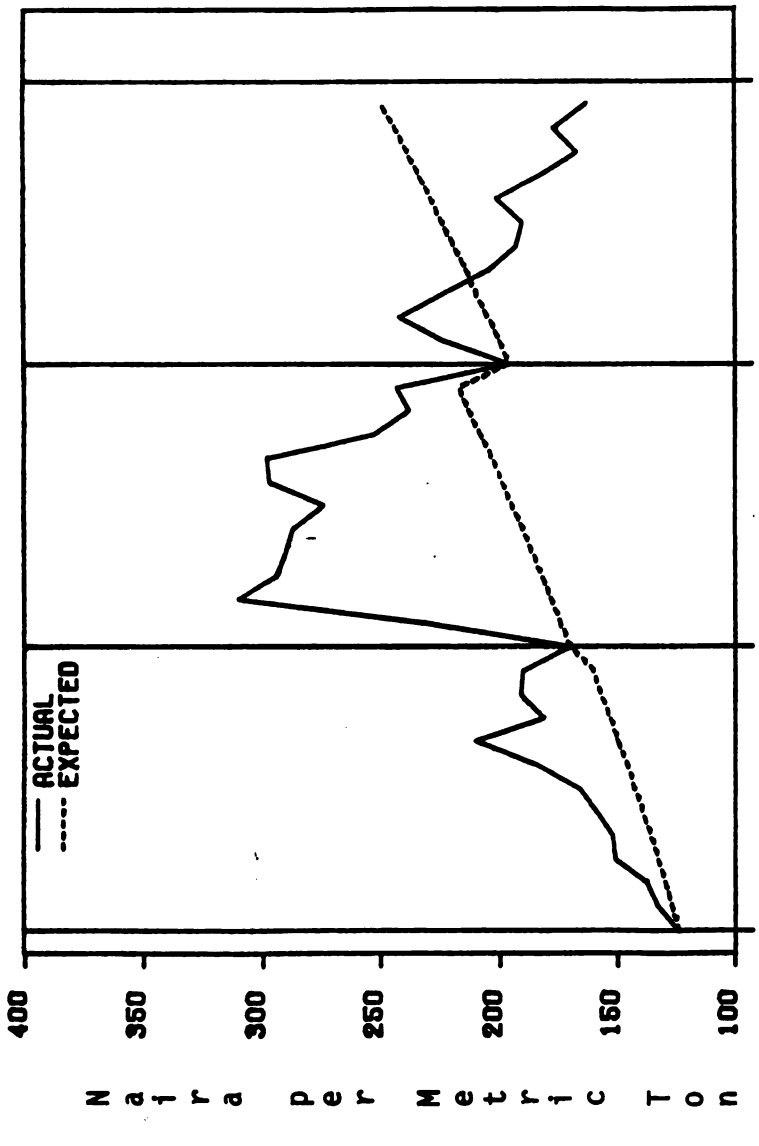


Figure 6.12

Actual and Expected Prices for Kaura, Malumfashi District, 1976-1979

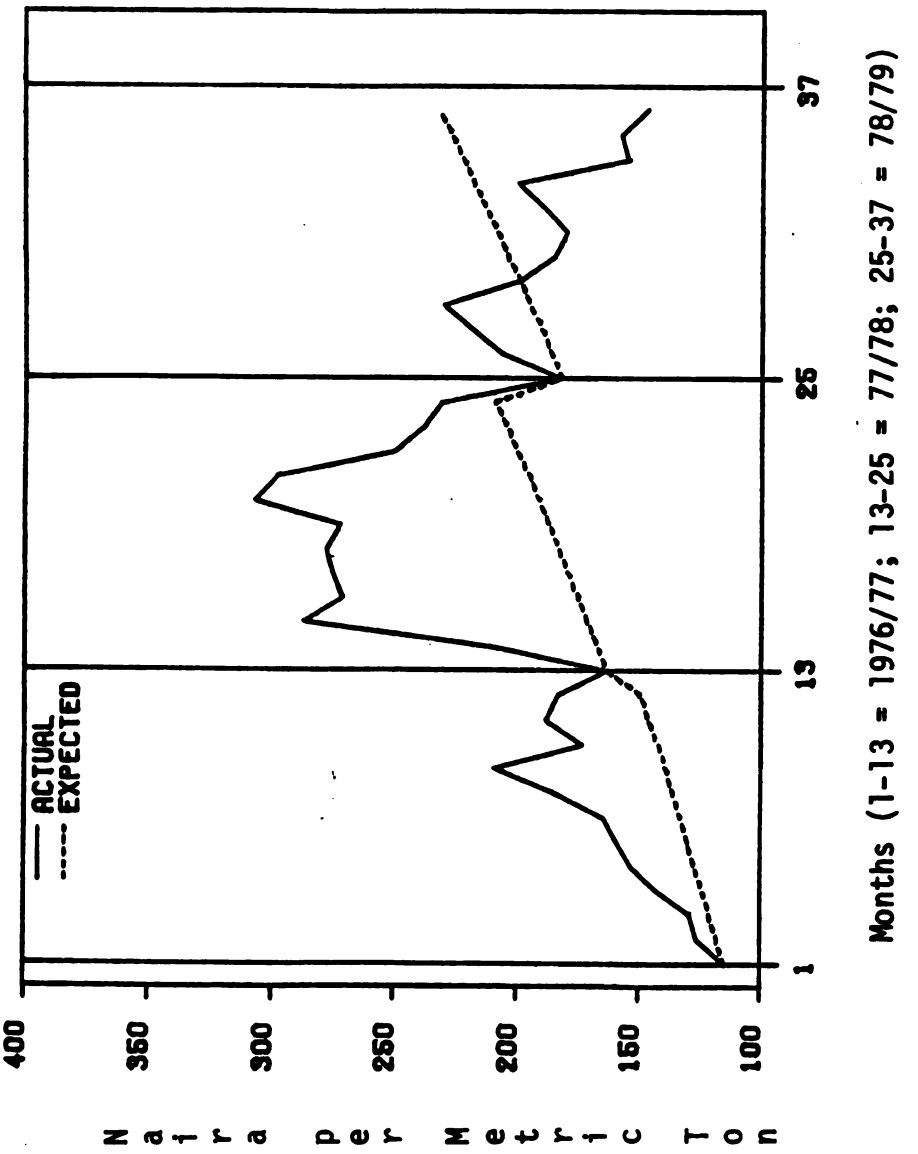


Figure 6.13

Actual and Expected Prices for Maize, Malumfashi District, 1976-1979

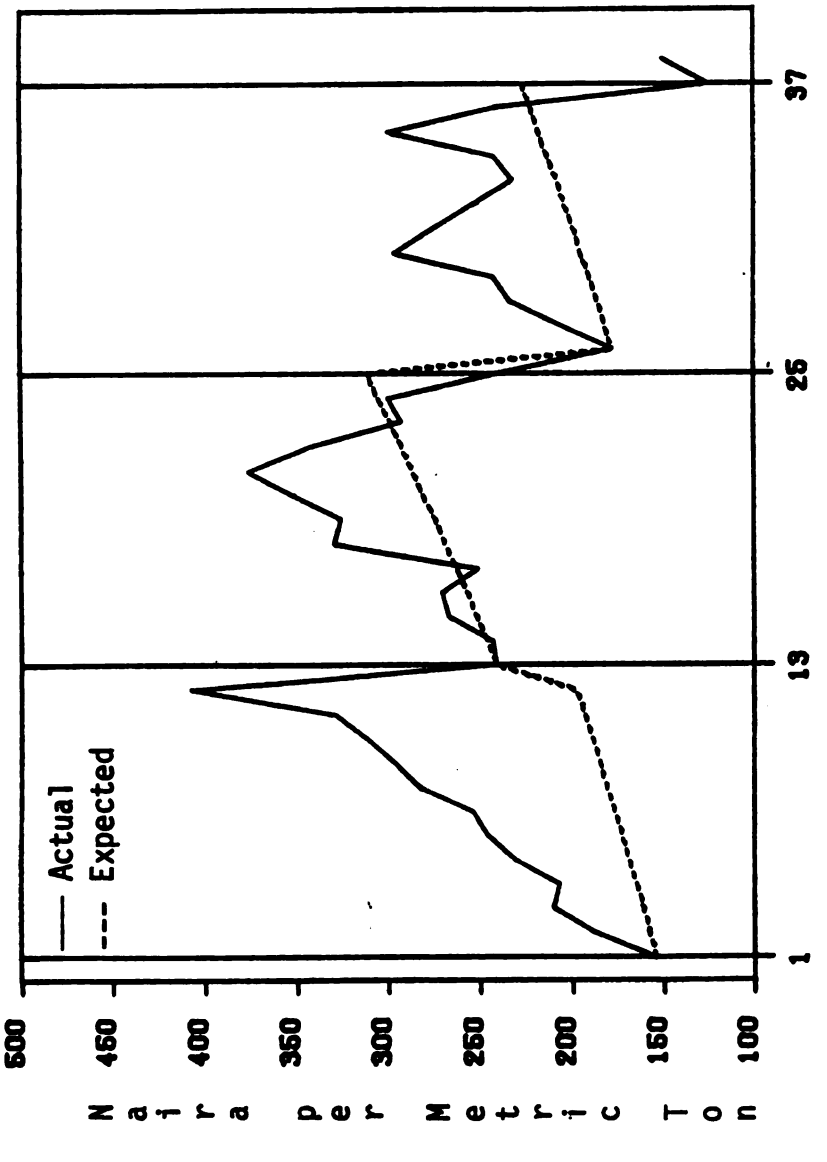
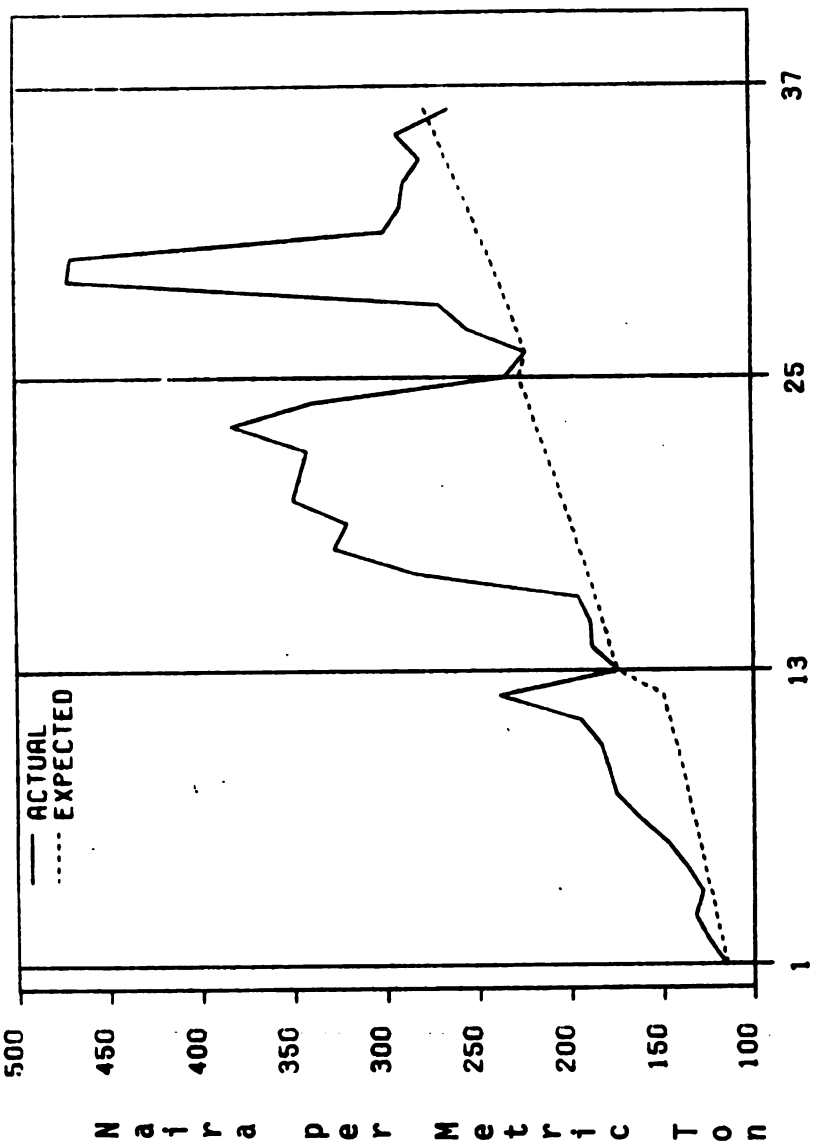


Figure 6.14

Actual and Expected Prices for Millet, Malumfashi District, 1976-1979



profits and does not show whether they were actually attained by traders. In fact his study of traders indicated that they do not engage in any substantial storage beyond a turnaround stock of approximately one month. Thus, if there is any profit to be made from seasonal price increase, it is likely to be made by the farm population who carry out storage.

Summary

The analyses carried out in this chapter indicated that food crop prices at FADP area increased only during the 1976/77 season but thereafter declined as the project developed. The decline in food crop prices are even more prominent when real prices are considered. Analysis of seasonal price increases indicate that significant increases in prices were recorded only during the 1976/77 season. Thereafter prices declined 1.8 percent per month for sorghum farfara, sorghum kaura and millet. Within individual seasons maize prices did not decline significantly.

Comparison of seasonal price increases with estimated storage costs did not show the existence of excessive profits for sorghum or millet. Estimated seasonal price increases in real terms were positive only during the 1976/77 season. The increases were 3.80 naira per ton per month for farfara, 3.88 naira per ton per month for kaura and 8.13 naira per ton per month for maize. The estimated storage cost per month (on the basis of 27 percent interest for 8 months and storage overhead costs of 0.5 naira) came to about 4.00 naira per month per ton for sorghum and millet and 6.5 naira per ton per month for maize. Thus in the 1976/77 season maize showed an excess of about 1.63 maira per ton increase in price over storage costs. This suggests a potential for profit in

maize storage for that season. The subsequent two seasons indicated clear losses relating to storage of sorghums and millet, and possible losses for maize.

Since the above results were based on real prices, taking into account an inflation rate of about 17 percent, another method of comparison was done based on nominal prices. These are plotted with expected prices given estimated storage costs. The plots showed ample room for profiting from storage of foodcrops in all three seasons except for sorghums in the 1978/79 season. However, these possible gains would be less than depicted by the charts when considered in real terms.

CHAPTER 7

SPATIAL PRICE ANALYSIS

This chapter discusses and analyzes the pattern of staple food price behavior across space within the project area of FADP. The chapter also looks at inter-commodity price relationships. The intention is to test the hypothesis of spatial pricing efficiency within the FADP districts.

The results of such analyses could serve in pointing out weaknesses of the system and hence indicate a possible avenue for remedial action. If on the other hand the system turns out to be operating efficiently, given the criteria of the analysis, this could help in dispelling some of the allegations of inefficiency often directed at the system.[1]

Efficiency is not an end in itself. Although a marketing system is deemed efficient, it may still operate at high costs. Given the prevailing conditions, it would be considered efficient since no other combinations of resources will lower costs. Therefore efficiency in this context means that marketing services are being provided at the lowest current costs.[2] Similarly a system is efficient in terms of pricing

---

[1] See S. M. Essang, "The Middlemen in the Domestic Marketing of Palm Oil: Asset or Liability." Bull. Rur. Econ. and Soc., Vol. 3, No. 1, 1968. Essang came to the conclusion that ". . . far from proving harmful to the producers, the distributors' functions are essential to continued and increased production of palm oil." See also The World Bank, "Appraisal of Funtua Agricultural Development Project, Nigeria," (Washington, D.C.: The World Bank, 1974), Annex 12, pp. 12-13.

[2] Van Roy Southworth, "Food Crop Marketing in Atebubu District, Ghana," Ph.D. Dissertation, Stanford University, 1981, p. 115.

only given the current conditions. Thus there is more in the analysis than the final decision as to whether the system is efficient or not. There is need to examine ways of changing current conditions in such a way that further reductions in costs of marketing services become possible. There may be cases in fact where marketing costs may have to rise in order to satisfy certain preferences of the consumers. Thus consumer satisfaction is also a legitimate concern of marketing systems analysis. Given this short discussion it can be seen that it is possible to have multiple and conflicting goals in analyzing market performance.

Spatial pricing efficiency is one of the important factors in marketing system performance. The system should be able to allocate commodities across space at minimum cost. If it does not then there is a need to look at the sources of the problem and examine ways of lowering the transfer costs. If the system does act efficiently under the circumstances being considered, then further examination of new circumstances is needed in an attempt to identify an even more efficient operation of the marketing system.

Spatial Price Analysis

Since the prices being analyzed are essentially village-level prices, then there is a need to look at some of the problems alleged to be associated with village-level pricing mechanisms. It is claimed that village-level pricing does not reflect the forces of supply and demand. It is also alleged that cultivators receive prices that are much lower than in town markets. The low prices are said to be due to monopolistic practices of village traders, farmer cash requirements at harvest which necessitates selling most of the crop in the immediate post-harvest

period, activities of village moneylenders, and ignorance regarding prices.[3]

Under the conditions of perfect competition the price spread between two locations that trade with one another cannot exceed the cost of transfer of the product between the locations. If the price temporarily exceeds the cost of transfer, then the commodity will be shipped from the location with the lower price to the one with the higher price until the two prices become the same, thus resulting in no incentive for the product movement.

This is the ideal situation and is rarely met in the real world where the model assumptions are impossible to meet. However, it is still widely used as a guideline in measuring efficiency over space. These analyses use correlation coefficients between market locations as indicators of spatial market integration.[4]

Lele explained the concept of market integration with reference to the work of Cochrane[5] which stated that markets of agricultural commodities in developing countries are closely interrelated in the sense that price formation in one market is related to the prices in another

---

[3]Uma J. Lele, Food Grain Marketing in India: Private Performance and Public Policy. (Ithaca, New York: Cornell University Press), 1971, pp. 21-22.

[4]Muhammad Osman Farruk, "Structure and Performance of the Rice Marketing System in East Pakistan," Cornell International Agricultural Development Bulletin 23, Cornell University, 1972; Lele, op. cit.; H. M. Hays, Jr., "Organization of the Staple Food Marketing System in Northern Nigeria," Ph.D. Dissertation, Kansas State University, 1973; N. O. O. Ejiga, "Economic Analyses of Storage, Distribution and Consumption of Cowpeas in Northern Nigeria," Ph.D. Dissertation, Cornell University, 1977; and Southworth, op. cit.

[5]W. W. Cochrane, "Markets as a Unit of Enquiry in Agricultural Economics Research," Journal of Farm Economics, XXXIX, February 1957.

market. The interrelation in price movement between two markets is what is called market integration.[6]

The extent of the influence of the pricing process in one market on another is measured by the correlation coefficient of wholesale prices in the two markets for a given commodity. Under conditions of perfect competition the value of the correlation coefficient will be 1.00. However, the assumptions of perfect competition are never completely met in real situations and as such the correlation coefficient is generally always below 1.00--often well below the ideal. Lele suggested the following reasons to account for low correlation coefficients of prices between markets:[7]

1. Lack of perfect mobility due to transport costs
2. Existence of transport bottlenecks
3. Uncertainty on the duration of price difference between markets
4. Lack of scientific grading of produce with the result that prices do not refer to equivalent grades in the two markets
5. Poor dissemination of information regarding market conditions

The above factors are expected to have substantial effect on the value of correlation coefficients calculated for the FADP districts. Transportation problems, particularly in rural villages, have been identified as a major constraint. Similarly, grading of staple food crops is rarely performed except by visual, on-the-spot inspection by purchasing consumers. Although project activities included the broadcast of

---

[6]Lele, op. cit., p. 22.

[7]Ibid., pp. 23-25.

market conditions over the radio network, formal price information dissemination to producers, traders, and consumers is minimal. Given these factors correlation coefficients are not expected to come close to the ideal value of 1.00.

Data Problems Relating to Spatial Price Analysis

The major limitation of the data set used for the analysis in this chapter is the grouping of the data on the basis of the five districts of FADP. Since the analysis is based on district level data, the precise location of the prices is taken to be the district headquarter of each of the districts. This is a major limitation; however, the grouping is necessitated by the lack of complete series data for any village.

Since most of the locations with useable data were generally located close to the district headquarters, the aggregation conditions may not pose serious problems. More remote areas tend to have incomplete data and a lot of them had to be rejected for that reason. Nevertheless, it has to be pointed out that the results as depicted cannot be said to apply to any one specific location in the district, but rather are an average for the district as a whole.

Another point is that the prices used are producer prices--an approximation of farmgate prices--not wholesale prices which are preferred in such analyses.[8]

Finally, the sampling methods used in the selection of villages for the survey were based on the needs of agronomic surveys and have little to do with the marketing of staple foods. As such the villages selected

---

[8]Hays, op. cit., p. 127.

cannot be easily categorized in relation to their importance as market centers for staple food crop marketing. There is a big difference in terms of the amount of data collected from individual district villages. The most complete data set came from Malumfashi and Bakori districts while Faskari and Kankara had less representation. In fact Funtua district is excluded from the analyses for lack of complete data. In addition, the villages included in the survey kept changing from one year to the next, thereby necessitating the aggregation of the price data based on districts rather than on individual villages as the ideal situation would have required.

On the other hand the collected data has taken into account varietal differences in the case of sorghum since data was available for the two distinct sorghum varieties in the area (i.e., sorghum farfara, the white sorghum variety, and kaura, the yellowish sorghum variety). This distinction was never tried before in the reported studies. The two are easily distinguishable from one another and have some characteristics that result in subtle differences in the taste of prepared foods. This differentiation between the two sorghums has not been taken into account in earlier studies partly due to lack of detailed differentiated data as well as the apparent high substitution between the two sorghums.

Villages in Spatial Price Analyses Studies

Due to the village selection procedure used in the surveys a large number of villages were included, many of which had complete data records for less than a year. In Funtua district major villages with useful data included Tafoki, Mahuta, Ruwan Godiya, Mairuwa, Goya, and Dandume. In

Malumfashi district the villages included Yaribori, Dandarai, Karfi, Ruwan Sanyi, Dankanjiba, Yargoje and Borin Dawa. Faskari villages included Damari, Sabua, and Yankara. Bakori district included Jiba, Kabomo, Kakumi and Kurami; while Kankara district included Kukasheka, Gatakawa and Zango (See Map 4.1, p. 54).

All the villages listed above, with the exception of district headquarters, are strictly rural in that each is made up of less than 20,000 inhabitants. The villages vary in terms of their proximity to the headquarters as well as the quality of main access road that links the village to the headquarters. Some villages, like Karfi, Kurami and Yankara, are on a main, all-weather, hard surface road; others have portions of the access road that are untarred, dust roads; while in some further cases access is possible only by footpaths, particularly during the rainy season.

Distances between the district headquarters, although generally small, can be up to 65 miles, as in the case of the distance between Faskari and Sabua (See Map 4.1).

Spatial Integration of Staple Food Prices within FADP Districts

A visual indication of the pattern of spatial price behavior can be discerned from Figures 6.01 through 6.05. The figures show that price movements for sorghum and millet are more in consonance[9] with one another across the districts than the prices of maize. The figures also

---

[9]Allen R. Thodey, "Analysis of Staple Food Price Behavior in Western Nigeria." Ph.D. Dissertation, University of Illinois, 1969, pp. 27-29.

indicate that there is considerable difference in price consonance for any of the crops as the time periods change. For example, in the case of millet (Figure 6.04) the prices in different districts were more consonant with one another in the first 30 months of the data indicating that the earlier prices will have a higher correlation coefficient than the last year of price data.

In order to examine the level of inter-district integration in terms of staple food crop pricing, correlation coefficients were calculated for sorghums, millet and maize prices for the FADP districts. As suggested by Jones and many researchers who used the method, the levels of the calculated bivariate correlation coefficients serve as indicators of the level of spatial integration. The coefficients reflect the level of information flow between the two locations involved and measure trading connections (Hays, 1973).

The results of the calculations are shown in Tables 7.1-7.5. The results are for the entire period of 1976-1979. The number of months for the actual calculation was 41. With this quantity of observations for a correlation coefficient to be significant at the 5 percent level, the correlation coefficient only has to have a value of .30 or higher. If, however, the number of observations are limited to 12, then the correlation coefficient has to be higher than .576 for the same level of significance.[10] Thus all the correlation coefficients reported here are significant at the 5 percent level.

All correlations for sorghum and millet are over .80 except for the sorghum farfara correlation between Faskari and Kankara district

---

[10]Ejiga, op. cit., p. 290.

Table 7.1

Correlation Matrix for Monthly Producer Prices of Sorghum Farfara Among FADP District, 1976-1979 (n = 41)

District	Malumfashi	Bakori	Faskari	Kankara	Average Price (N/Ton)	Standard Deviation (N/Ton)
Malumfashi	1.00	0.98	0.92	0.90	200.44	54.06
Bakori		1.00	0.92	0.89	220.05	54.96
Faskari			1.00	0.81	215.17	52.19
Kankara				1.00	208.24	57.65

Source: Calculated from data supplied by FADP/APMEPU.

Note: Funtua district is left out due to too few observations for the district.

Table 7.2

Correlation Matrix for Monthly Producer Prices of Sorghum Kaura Among FADP Districts, 1976-1979 (n = 41)

District	Malumfashi	Bakori	Faskari	Kankara	Average Price (N/Ton)	Standard Deviation (N/Ton)
Malumfashi	1.00	0.97	0.92	0.89	192.23	54.48
Bakori		1.00	0.93	0.87	211.05	55.83
Faskari			1.00	0.79	207.76	52.62
Kankara				1.00	198.39	51.83

Source: Calculated from data supplied by FADP/APMEPU.

Note: Funtua district is left out due to too few observations for the district.

Table 7.3

Correlation Matrix for Producer Prices of Maize
Among FADP Districts, 1976-1979 (n = 41)

District	Malumfashi	Bakori	Faskari	Kankara	Average Price (N/Ton)	Standard Deviation (N/Ton)
Malumfashi	1.00	0.79	0.71	0.81	254.56	65.06
Bakori		1.00	0.80	0.76	261.68	58.02
Faskari			1.00	0.74	249.46	63.67
Kankara				1.00	259.71	57.82

Source: Calculated from data supplied by FADP/APMEPU.

Note: Funtua district is left out due to too few observations for the district.

Table 7.4

Correlation Matrix for Producer Prices of Millet
Among FADP Districts, 1976-1979 (n = 41)

District	Malumfashi	Bakori	Faskari	Kankara	Average Price (N/Ton)	Standard Deviation (N/Ton)
Malumfashi	1.00	0.92	0.81	0.89	245.02	89.73
Bakori		1.00	0.93	0.94	253.63	79.46
Faskari			1.00	0.86	241.98	79.60
Kankara				1.00	245.22	86.01

Source: Calculated from data supplied by FADP/APMEPU.

Note: Funtua district is left out due to too few observations for the district.

Table 7.5

Coefficients of Price Variation for Staples,
FADP Districts, 1976-1979
(Percent)

District	Sorghum Farfara	Sorghum Kaura	Maize	Millet	Average
Malumfashi	26.97	28.34	25.56	36.62	29.37
Bakori	24.98	26.45	22.17	31.33	26.23
Faskari	24.26	25.33	25.52	32.90	27.00
Kankara	27.68	26.13	22.26	35.07	27.79
Average	25.97	26.31	23.88	33.98	27.60

Source: Calculated from data supplied by FADP/APMEPU.

which was .79. Correlation coefficients for maize were lower than for sorghums and millet but all were above .70.

While sorghums and millet showed a large number of coefficients in the range of .90 and above, maize had none in this category. The pattern of trading linkages revealed by the correlation analysis indicates that Malumfashi district is more closely linked to other districts than any other one. Malumfashi producer prices are most closely related to Bakori prices and least related to those of Faskari district. This pattern closely agrees with the pattern of roads in the FADP area. Faskari is more isolated as a district than all others; on the other hand, Bakori, Malumfashi and Kankara are connected to one another via an all-weather, tarred road.

The correlation coefficients are much higher than those obtained by Hays and Gilbert in their studies. For example in the case of Hays' study none of the correlation coefficients were above .90. In fact only 1 percent of the correlations for millet and 1 percent for sorghum were recorded by Hays at .80 or above for the period of 1958-65.[11] However, when considering the Zaria area Hays used personally collected data and found that correlation coefficients were approximately .90 for sorghum while those for millet were all above .70.[12] Thus while competitiveness may be low when markets are spatially separated by long distances, local conditions within individual areas are highly competitive. This conclusion from Hays is partly supported by the results presented in this study with respect to the high degree of interdistrict price integration.

---

[11] Hays, op. cit., pp. 130-132.

[12] Ibid., p. 132.

However there is no corresponding data for a wider geographical calculation to examine the integration of locations at that level.

The results from Gilbert's[13] study also revealed a similar pattern of generally low correlation coefficients with regard to regionally dispersed markets, except for cowpeas which had a well integrated market both regionally as well as nationally in southern markets, particularly Ibadan. This exceptional performance of the cowpea market integration has been further confirmed by Ejiga's study.[14]

There are also indications that in general the level of locational integration is increasing over time. Analysis for the earlier periods tended to have lower correlation coefficients than more recent periods. Part of this is due to the improvement in price data collection methods as well as the improvement in infrastructural facilities available in developing countries which allow for more rapid price information dissemination.

The reasons for these relatively high levels of correlation coefficients could be attributed to a number of factors. First, the data quality is probably much better than earlier data from similar studies in the area. This improvement in data quality over time has also been observed by Hays in his study where he found that the correlation coefficients from data he collected in the early 1970's were higher than those from crop and weather reports of the 1960's.

---

[13]Elon H. Gilbert, "Marketing of Staple Foods in Northern Nigeria: A Study of the Staple Food Marketing Systems Serving Kano City." Ph.D. Dissertation, Stanford University, 1969.

[14]Ejiga, op. cit.

Second, the high correlation coefficients are an indication of integrated local rural markets which does not necessarily imply overall integration at a regional level. The region of the FADP location involved only contiguous districts that attend more or less the same rural and town markets. This could lead to improved trading communications, especially when contrasted to what the case would be if markets outside the project area had been included. Thus this limited geographical coverage likely improved the values of the correlation coefficients obtained.

A recent study by Southworth in Atebubu district of Ghana also reported higher correlation coefficients than those reported by earlier studies in Nigeria by Jones, Hays and Thodey. Southworth also used a wide range of locations across Ghana and thus had a diverse group of markets. Southworth used data collected by the Ghana government which was similar to the crop and weather report used by Hays, Gilbert and Ejiga in their northern Nigerian studies.

In most cases the correlation coefficients, calculated using the data collected by the researchers themselves, turned out to show higher correlation coefficients than the data from the government sources. This indicates that quality of the data is of prime importance in the study of market integration. The fact that the newer data tend to give higher correlations than the secondary data from government sources is an indication that future efforts will require more carefully collected data before one can reaffirm some of the earlier conclusions made regarding the efficiency with which the staple food marketing systems operate.

Data problems in earlier studies has led to criticisms of such studies in terms of the relevance of the data used as related to the

conclusions drawn (Harriss, 1979). One other objection expressed by Harriss is that in carrying out market integration analysis one should not use absolute prices but a number of other alternatives, including residuals after trend and residuals of polynomials which minimize residual elements. Here a method of correlating first differences of the monthly average prices is tried in order to test the stability of the high correlation coefficients obtained based on the use of absolute prices. This reflects the method used by Southworth.[15]

The results alongside the absolute price methods are presented in Table 7.6. The results show a big drop in the levels of the correlation coefficients indicating a lower level of interdistrict integration than found when using the absolute prices.

The reduction is, however, not similar among crops or among the districts. While there are still coefficients in the .70 and .80 levels for sorghum, there are none at that level for millet or maize. All correlation coefficients using the price difference method were less than .90. For sorghum farfara the highest correlation coefficient was .88, between Malumfashi and Bakori districts. For sorghum kaura it was .83, also connecting Malumfashi and Bakori. For millet the highest correlation coefficient was .68, between Bakori and the adjacent Faskari district. Maize has the lowest coefficients--the highest being only .51 between Malumfashi and Kankara districts.

The results of price difference correlation analysis, although still supporting the efficiency with which the sorghum marketing system

---

[15]Southworth, op. cit., p. 135.

Table 7.6

Comparison of Correlation Coefficients of Absolute Monthly Prices and Monthly Price Differences, FADP, 1976-1979

District Pairs	Sorghum farfara		Sorghum kaura		Maize		Millet	
	Absolute	First Differences	Absolute	First Differences	Absolute	First Differences	Absolute	First Differences
Malumfashi-Bakori	0.98	0.88	0.97	0.83	0.79	0.32	0.92	0.60
Malumfashi-Faskari	0.92	0.58	0.92	0.71	0.71	0.29	0.81	0.34
Malumfashi-Kankara	0.90	0.40	0.89	0.28	0.81	0.51	0.89	0.42
Bakori-Faskari	0.92	0.64	0.93	0.67	0.80	0.48	0.93	0.68
Bakori-Kankara	0.89	0.30	0.87	0.26	0.76	0.37	0.94	0.33
Faskari-Kankara	0.81	0.21	0.79	0.23	0.74	0.28	0.86	0.28

Source: Calculated from data supplied by FADP/APMEPU.

within FADP operates, failed to support a similar conclusion for millet and indicated serious shortcomings in the marketing system for maize.

This study tried yet another method of carrying out correlation analysis purported to be more informative than the standard method of correlating absolute prices over a number of years or months. In the improved approach, as reported by Ejiga,[16] correlation analysis is carried out individually for each year of the series. The results provide more insight on the nature of integrated locations within the FADP area. The figures clearly show that the correlation coefficients given for the overall data hide the divergence that exists among the years in terms of the spatial relationships of staple food pricing. The disaggregation of the data shows that the periods of 1976/77 and 1978/79 show considerably smaller correlation coefficients when compared to the middle period, 1977/78.

Secondly, the figures are more revealing in terms of the locations that tend to be more highly correlated with one another than when the aggregated figures are looked at. In this case we now see that of the locations considered, Malumfashi has the largest number of correlation coefficients above .80 with other locations.

Finally, the figures also show that one case had a negative correlation coefficient, even though it was not significant at the 5 percent level. This negative correlation coefficient was for millet between Kankara and Faskari, the two least developed districts in terms of access roads in rural areas.

---

[16]Ejiga, op. cit., pp. 290-291.

The correlation coefficients, on the whole, are still comparatively high in relation to figures from earlier studies in northern Nigeria. Of the 36 pairs of correlation coefficients calculated for each location, Malumfashi had 51.8 percent greater than .80, Bakori had 58.4 percent, Kankara had 38.8 percent and Faskari had 33.3 percent at the same level (See Tables 7.7 and 7.8).

Table 7.7

Correlations of Staple Food Producer Prices at FADP Calculated on a Yearly Basis*

Crop and District	Malumfashi			Bakori			Kankara			Faskari
Kaura:										
Malumfashi		1								
Bakori	.91	.98	.88		1					
Kankara	.75	.92	.73	.74	.91	.79		1		
Faskari	.54	.93	.51	.69	.97	.48	.48	.84	.23	1
Farfara:										
Malumfashi		1								
Bakori	.90	.98	.92		1					
Kankara	.74	.94	.84	.64	.90	.79		1		
Faskari	.77	.95	.23	.75	.97	.33	.64	.84	.20	1
Millet:										
Malumfashi		1								
Bakori	.97	.98	.84		1					
Kankara	.73	.92	.76	.76	.92	.82		1		
Faskari	.89	.97	.08	.93	.98	.11	.74	.93	-.19	1
Maize:										
Malumfashi		1								
Bakori	.93	.54	.54		1					
Kankara	.71	.49	.85	.65	.87	.82		1		
Faskari	.47	.43	.56	.61	.85	.11	.36	.63	.70	1

*The correlations for each entry are for 1976/77, 1977/78 and 1978/79, respectively.

Source: Data for analysis from FADP and APMEPU.

The results indicate that Bakori and Malumfashi are the locations most correlated with other locations while Faskari has the worst correlations (See Table 7.8). Malumfashi and Bakori enjoy a relatively better road network when compared with Kankara and Faskari. As can be seen from Map 4.1, Malumfashi and Bakori are directly connected by the primary road that connects Funtua to Kano and Katsina. Faskari is off the main road linking Funtua to Gusau and Sokoto. Kankara is on a main road more recent than the Funtua-Kano road.

Table 7.8

Distribution of Correlation Coefficients of Producer Prices for Staple Crops at FADP by Location, 1976-1979

Range for r	M/Fashi	Bakori	Kankara	Faskari	Total
.90+	38.9	41.7	19.4	22.2	30.6
.80--.89	13.9	16.7	19.4	11.1	15.3
.70--.79	19.4	13.9	33.3	11.1	19.4
.60--.69	0.0	11.1	11.1	11.1	8.3
.50--.59	13.9	5.6	0.0	8.3	6.9
.40--.49	8.3	2.8	5.6	11.1	6.9
0.0 --.39	5.6	8.3	8.3	22.2	11.1
0	0.0	0.0	2.8	2.8	1.4
Total	100.0	100.1	99.9	99.9	99.9

Source: FADP producer price survey data.

The results indicate that on the whole the marketing system for staple food crops in the FADP districts is closely connected. This conclusion is based not only on the high levels of the correlation coefficients obtained in the study, but on casual observations of the marketing

system operations as well. This is more so in the case of the sorghum farfara and sorghum kaura than for millet and maize.

The correlations when considering maize indicate fair levels of coordination between districts, but at a generally lower level than observed in the case of sorghum or millet. The reason for the lower correlation coefficients for maize among the districts is probably connected to the newness of the crop in the area and, as such, traders in staple food crops have not completely come to grips with the peculiarities of marketing the crop across the districts.

Another factor likely to account for the lower correlation coefficients for maize could be the cost of transportation. It is possible that for some reason transporters may be charging a premium for transporting maize as compared to the other crops. This in turn could lower the correlation of maize prices between any locations involved when compared with crops having lower transportation costs.

In the real world situation, as pointed out by Lele,[17] correlation coefficients are always less than unit (perfect) due to the influence of transportation costs, temporary transport bottlenecks and the uncertainty involved in the time taken for transport.[18] The next step is to look at the actual price differences between the various locations and compare the price spreads with estimated transfer costs. If the price spreads deviate significantly from the estimated transfer costs, one can suspect that the system can be made to operate at a lower cost.

---

[17]Lele, op. cit. p. 23.

[18]Ibid., p. 25.

Interdistrict Price Spread and Transportation Costs

In order to investigate the efficiency of the system as revealed by correlation analysis, price spread between Bakori and other districts were computed for each month of the data and the average price spread for each crop is computed. These are presented in Table 7.9. Bakori district had the highest average price among the districts considered. This is probably a result of excluding Funtua district due to inadequate data. Bakori is only seven miles from Funtua; therefore it is assumed Bakori prices should be closer to those of Funtua than any other district. This is supported by the results of price spread reported in Table 7.9.

In theory the price spreads should reflect the cost of transportation between the pairs of locations. The price spreads are lowest between Bakori and Faskari even though Faskari is furthest away from Bakori. Malumfashi, which is closer to Bakori than Faskari or Kankara, has the highest price spread with Bakori. Part of the explanation for the low price difference between Faskari and Bakori could be the fact that the two towns are connected strongly to the Funtua district markets, particularly the Funtua main market. Another explanation posited is that this single price spread is an average of 41 individual spreads that individually show different monthly patterns. Thus the average price spread masked the characteristics of the individual monthly price spreads.

Estimates of transportation costs were made using the commission rate paid by the government through the Nigerian Grains Board (NGB) to produce licensed buying agents. These transportation allowances paid to the LBAs are considered low and are given on a flat rate irrespective

Table 7.9

Producer Price Differences between Bakori District and Other Districts, FADP, 1976-1979

(Amount less than Bakori district in naira per ton)

District	Sorghum farfara		Sorghum kaura		Maize		Millet	
	Price Difference	CV (Percent)	Price Difference	CV (Percent)	Price Difference	CV (Percent)	Price Difference	CV (Percent)
Malumfashi	19.61	61.30	18.76	73.08	7.12	570.79	8.61	407.90
Faskari	4.88	431.97	3.29	639.82	12.22	315.71	11.66	263.21
Kankara	11.80	225.59	12.66	215.80	1.98	2040.91	8.41	351.49

Source: Calculated from data supplied by FADP/APMEPU.

of agent location or type of operation.[19] Nevertheless, since this was the only data available at the time of analysis, these allowances were used to calculate the costs presented in Table 7.10.

Table 7.10

Expected Transport Cost between Bakori and Other District Headquarters* (Naira per Ton)

District Pairs	Distance (kilometers)	Transportation Cost (naira per ton)	
		Rate 1	Rate 2
Malumfashi-Bakori	38	15.96	23.56
Kankara-Bakori	58	24.36	35.96
Faskari-Kankara	66	27.72	40.92

Sources: Transportation rates based on J. E. Njoku, "A Review of Agricultural Policy in the Context of the Green Revolution." Paper presented at the 1st National Green Revolution Seminar, Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University, Zaria, September 21-24, 1981, p. 8; Distances calculated from R. P. V. Haug, "Map: Kaduna State Agricultural Development Project, Zone 2." Kaduna State Government, n.d.

*Rate 1 is based on Nigerian Grains Board allowances to Licensed Buying Agents of 0.42 naira per ton per mile while Rate 2 is also based on NGB allowance of 0.62 naira per ton per mile for more costly routes.

A comparison of the transportation costs with the price spreads reported in Table 7.9 indicate that for sorghum farfara price spread exceeded transport cost by 3.65 naira per ton. Sorghum kaura also showed a price spread higher than transport cost (by 2.8 naira per ton). For

[19] J. E. Njoku, "A Review of Agricultural Price Policy in the Contest of the Green Revolution." Paper presented at the 1st National Green Revolution Seminar, Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University, Zaria, September 21-24, 1981.

maize and millet, however, the transportation costs are higher than the price spreads in all districts. This is also the case for the two sorghums in Faskari and Kankara. Thus, on the average no undue opportunities for spatial arbitrage is indicated--further confirming the efficiency of the marketing system for staples in the area.

However some caution is in order here regarding the nature of the calculations. The costs of transport were calculated based on the distance between the district headquarters. However, distance alone is not adequate since, as reported by Tomek and Robinson, such costs are not a linear function of distance. So any comparison using these figures is only approximate. It should be noted that the price spreads could differ substantially from those reported for a short period of time. It is also observed that the variation in these spreads are substantial as indicated by the coefficients of variation in Table 7.9.

Summary

This chapter has examined various aspects of spatial price behavior within FADP districts. Correlation coefficient calculations of producer prices for sorghums, millet and maize (using absolute prices) indicated a fairly well organized and integrated market system. However, when calculating the coefficients using first differences of the prices, no similar strong integration was indicated, particularly in the case of millet and maize. Examining price spreads and comparing them with rough estimates of transportation costs did not reveal any serious excess of price spreads over transportation costs. But it is cautioned that short-term conditions can easily result in a situation where the spread may exceed cost of transportation.

CHAPTER 8

SUMMARY AND CONCLUSIONS

Nigeria is facing acute problems in its agricultural sector. These problems are related to declining agricultural production in the face of increasing intensification of land use without corresponding measures to maintain soil fertility, to slow down rural-urban migration and to create an effectively coordinated food system needed for a growing and increasingly urbanized population. These conditions have led to increased domestic food prices and a rapidly growing food import bill. This situation has prompted a number of government-sponsored programs aimed at stimulating agricultural production, particularly food production, and general rural development. Most prominent among these programs are the Operation Feed the Nation, National Accelerated Food Production Program, Large-Scale Agricultural Development Projects (ADPs), Irrigation Schemes, Guaranteed Minimum Price Scheme for Food Crops and the most recent one, the Green Revolution Program.

The experiences gained with these programs has been accumulating. The Agricultural Development Projects have succeeded in increasing the production of staple food grains, particularly sorghum, millet and maize. However, as a result of the successes of the ADPs in localized areas, problems of marketing have emerged that threaten the gains that have been made.

Within Nigeria there has been very little analysis of the impacts of large-scale ADPs on the traditional marketing system for food crops. Earlier food marketing studies in the country described and analyzed the performance of the traditional private-sector based marketing systems. These studies concluded that under the prevailing conditions in the country, the private-sector food marketing systems were operating efficiently. These studies, however, did not examine the systems under the pressure of substantial increases in food production. Most of the studies, in fact, took place in the late 1960s and early 1970s when stresses of change were minimal on the marketing system. In addition, none of the earlier food marketing studies examined the performance of the input distribution system. However, at the time the studies were carried out, there was very little use of non-farm produced inputs, like fertilizer, improved seeds, herbicides and insecticides. The situation, since the earlier studies, has changed greatly and farm input supply issues have emerged to occupy an important position in recent efforts to increase agricultural production in the country.

This study has attempted to examine the performance of the staple food crop marketing system under conditions of rapid increases in food production in the Funtua Agricultural Development Project (FADP) area in Kaduna State, Nigeria. The study is one of the first in Nigeria that includes an evaluation of the input procurement and distribution system at the local, state and national levels. To provide the setting for the performance studies of the staple food crop marketing system and that of the input procurement and distribution, the study has

also provided a detailed description of some of the FADP activities, achievements and problems.

Data and Limitations of the Study

The study used data collected by the Agricultural Project Monitoring, Evaluation and Planning Unit of the Nigerian Department of Rural Development. Some of the data came from the evaluation unit of the FADP. Other sources have provided supplementary data and information.

A major limitation of the study has been the limited availability of data directly relevant to the evaluation of the food crop marketing system. This is largely a result of the low priority accorded the product marketing component at FADP. Thus, the analysis of the food crop marketing system was limited largely to an examination of system performance in terms of price behavior over space and time. Essential elements such as the costs of storage, location of storage structures and the characteristics of those who undertake storage of staple food crops, were not collected by the project. These had to come from secondary sources and there was only a limited opportunity for field study by the author. Similarly, there was very little data on existing transportation costs and the operations of market participants. The most adequate data set relevant to this study was from price surveys carried out at the farm and market levels for staple commodities. Even with these, it was necessary to aggregate the prices by district due to the survey methods used.

Agricultural Input Distribution System

The examination of the performance of the input distribution system concentrated on fertilizer. This was done because of the overwhelming importance of fertilizer as compared to other non-farm produced inputs. Other input distribution systems differ somewhat from that for fertilizer.

The FADP system of fertilizer procurement prior to the centralization of all procurement under the Federal Fertilizer Procurement Unit (FFPU) worked very well. The project was able to procure and distribute about 20,000 tons of fertilizer per year; FADP directly awarded contracts to the private fertilizer importers. The contracts included details on delivery dates and locations. FADP was also able to supervise the contractors directly and monitor their progress. This system was changed in 1974 when the FFPU took over procurement of fertilizer for the whole country. FADP could no longer specify delivery and procurement terms. Under the new system FADP sends its request for fertilizer to the state and then the state sends total state requirements, including that of FADP, to the FFPU. FFPU then coordinated and adjusted the individual state requests and awarded the contracts to private importers for procurement. FFPU was also responsible for clearance of the fertilizer at the ports and transportation to individual state warehouses. Since FFPU did not own warehouses or transportation vehicles, these services had to be hired.

The most important problems of the system of procurement under FFPU relate to over-centralization and poor management. Individual fertilizer requests from states and projects were arbitrarily adjusted downwards

by FFPU. Deliveries were often late and wrong quantities and types of fertilizers were delivered.

Distribution of the 20 to 23 thousand tons of fertilizer per year at the FADP level was found to be fairly efficient. The project used its network of Farm Service Centers to sell the fertilizers, initially on cash or credit basis, but later on cash basis only, when all credit for input purchases were stopped. Trained staff were on hand at each FSC for the sale of inputs and extension staff were available to consult with farmers on the use of fertilizers. The problems at this level mainly related to the withdrawal of credit sales making fertilizer, cheap as it was, inaccessible to the poorest of the farming population. The development of a "black market" for fertilizer was found to be minimal, based upon a survey of farmers in the area. Among 150 farmers surveyed only eight obtained fertilizer from a source other than FADP. This constituted about five percent of the sample. Prices they paid, however, were four times the controlled prices at FADP. Other farm inputs like improved seeds, herbicides and insecticides did not enjoy the wide acceptance noted for fertilizer. On the whole, the system of input distribution at the FADP level was well organized and operated smoothly. The procurement function also operated well until it was removed from the project.

Procurement system performance at the state level paralleled that at the FADP level with a fairly efficient system operating before centralization under FFPU. The same problems of cuts in requests for fertilizer and late deliveries or wrong kinds of fertilizer noted under FADP were also evident at the state level after FFPU took over the procurement process. In the 1978 growing season only 6,428 tons of the 50,000 tons of fertilizer requested by the state was received from FFPU by the beginning of the rainy season.

The state distribution system for fertilizer initially used a number of outlets including cooperatives, private agents and the state extension service network. However, this sytem was changed in 1976 to exclude private traders from the distribution process. The distribution became largely a government monopoly with 70 percent of the fertilizer being distributed via government stores. Government sponsored agro-service centers distributed an additional 20 percent while the remaining 10 percent was distributed via government projects, cooperatives, licensed buying agents and farmer groups. The local government secretaries received allocations from the state and allocated it to individual villages within their areas. At the village level, village heads influenced allocations to individual farmers.

The system seemed to have operated well, and the involvement of village heads in the distribution was seen as a progressive step since it was argued that the village leaders had good knowledge of the farmers in their jurisdiction and could do a good job in making equitable allocations of the scarce input. But it is observed in this study that the system was still open to abuse. For example, it was not clear how much political considerations entered into the allocation of fertilizer to local governments, then to villages and finally to individual farmers. Given the extreme shortage of the product and the high government subsudies involved, it is argued that it is very difficult to maintain an equitable distribution system.

New arrangements being made by the Kaduna State Government to hand over the distribution of all farm inputs to a farmer-onwed enterprise presents an alternative that could alleviate some of the distribution problems mentioned above. The company, KAFSCOM, will operate on com-

mercial lines through a network of farmer cooperatives and agro-service centers. With the merger of ASCs and FSCs under KARSCOM, the company can provide inputs to farmers at convenient nearby locations. KARSCOM does not have to construct many additional retail outlets given this arrangement.

At the national level the input procurement and distribution system is plagued by a number of operational and policy problems. The powers given to FFPU in the procurement of fertilizers had led to serious problems in coordinating the delivery of the product to state and project-level agencies. Furthermore, the administrative costs involved, even though not documented, are believed to be very high.

The federal subsidy policy on fertilizers coupled with subsidies at the state level also need to be re-evaluated. The governments are at present shouldering about 80 percent of the farmgate cost of all the fertilizer used in the country. Availability of the fertilizer within easy reach of the farmers and a credit scheme for purchase may be a better alternative to the high subsidy level that has contributed to fertilizer shortages. So far domestic fertilizer production has made little contribution to total fertilizer supply due to numerous managerial and technical problems.

Temporal Price Behavior

Food crop prices in the FADP area increased during the 1976/77 crop season but then declined sharply during the 1977/78 and 1978/79 crop years. Nominal prices of millet declined from about 350 to 400 naira/metric ton to about 200 to 250 naira/metric ton. Nominal prices of maize declined from 300 to 400 naira/metric ton down to about 150 naira/metric ton. Nominal prices for sorghum (farfara and kaura) declined from about 300 naira/metric ton to about 150 naira/metric ton. The decline in real prices was even more pronounced since inflation was running at approximately 16 percent annually. The declines were mainly due to the pressure of increased production and the inability of the marketing system to move enough surplus grains out of the FADP area to deficit regions elsewhere in the country.

Seasonal price indices for food crops based on four years of FADP data showed patterns that differed in important ways from the patterns reported in previous Nigerian studies. Lowest prices occurred at harvest time which is the same situation as reported in previous studies. However, highest prices occurred as early as February to May. This was different from price patterns reported by Gilbert (pp. 225-248) and Hays (p. 158), which indicated June, July and August as the months of highest food grain prices. Possible explanations for the different patterns observed in this study include the following: 1) The accumulation of stocks in the FADP area as production increased. With large stocks producers were able to release larger quantities of grain early in the post-harvest period. 2) Since producers carry out most of the grain storage their uncertainty about levels of stock and the size of the expected harvest could have contributed to the new selling patterns, and 3) The occurrence of

cash needs for input purchases around the months of March to June could also have contributed to the new sales pattern.

Seasonal fluctuations based upon FADP price data showed average increases from low to seasonal high of 40 percent for sorghum, 51 percent for maize and 54 percent for millet. These seasonal price increases were greater than those reported in previous studies and occurred over a shorter time interval of three to four months as against seven to ten months in the earlier studies. Gilbert (p. 232) reported a seasonal increase of 24 percent for sorghum and a 40 percent increase for millet. Hays (1973, p. 158) reported seasonal increases of 23 percent and 40 percent for millet during the seasons of 1969/70 and 1970/71 respectively. Hay's figures for the seasonal increase for sorghum were 85 percent and 42 percent for the two seasons.

Comparison of monthly price increases during the 1976-79 period with estimated storage cost, suggested that there were opportunities for profits from storing food grains. However, knowing when to sell is important, and maximum profit could have been made by selling about three to four months after the harvest low. But there was some variation from crop year to crop year as to how much profit could be made and profits varied by food crop. In general it would have been more profitable to store maize and millet than to store sorghum. The apparent high profitability of maize storage may be associated with higher risks due to lack of prior experience in storing the grain. In conclusion, it is difficult to state that storage was profitable during the period. The storage costs used in the study could have underestimated actual costs of storage leading to the results obtained.

Without more reliable estimates of storage costs a firm conclusion on the profitability of storage cannot be made.

Spatial Price Behavior

Prices at different geographic locations within a well adjusted system of markets should be closely related. Adjustments in one location should quickly influence prices elsewhere in the market area. Thus, values of correlation coefficients between pairs of markets in such a system are expected to be high. Correlation coefficients were calculated in this study to examine the integration of the marketing system among FADP districts. Values of the calculated correlation coefficients were between .71 and .98.

Sorghum and millet showed relatively higher correlation coefficients than maize. The coefficients for millet and sorghum were between .81 to .98, while those for maize were between .71 to .81. In an earlier study, Gilbert reported that about 85 percent of the correlations for sorghum as well as millet in this study were lower than .70. Hays also reported a similar set of correlation coefficients, with over 90 percent of the correlations at less than .70 for millet and sorghum.

The reasons for the higher correlation coefficients observed in this study include better data quality, a network of traders who travel over the FADP district markets regularly for purchases and sales of grain and an improved transportation and communication system in the FADP area.

Correlation coefficients based on first differences were lower than those obtained using absolute prices. The relative position of the crops with respect to the integration of prices remained the same, i.e. sorghum coefficients were higher than those for millet and millet correlations were higher than those for maize. Southworth (1981) reported a similar drop in the values of correlation coefficients when he used first differences instead of absolute prices. In conclusion, the food grain marketing system at FADP showed a high level of integration among districts particularly for sorghum and to a lesser extent for millet and maize.

Given the above performance of the system, based on the spatial integration of prices, one would expect that price margins between pairs of districts would reflect the cost of transportation. The prices in the Bakori District (located near the main market center of the FADP) were compared with prices in other districts and with corresponding transportation costs. The results supported the hypothesis that price differences between districts did not significantly exceed transportation costs. This further supported the earlier conclusion that the market was well integrated.

Conclusions and Recommendations

Marketing System for Staple Food Crops

The staple food marketing system run by private traders in the FADP area has performed reasonably well. However, under the pressure of increased production, the prices of staple food grains have declined during the final years of the project. This decline in prices was observed for all food grains, but was particularly acute for maize. This decline in maize prices might have been greater if all or a large proportion of produced maize had reached the market. However, most of the increased production was apparently used for farm-family consumption.

If the FADP policy continues to emphasize expansion in the production of maize, then efforts should be made to further expand the market demand for the product in 1) local human consumption, 2) livestock feed, and 3) movement of maize to southern Nigerian markets.

The prospects for a large increase in local human consumption of maize appears to be limited given that consumption of maize in the area has already increased substantially. There is also a general preference for the well-established grains of the area--particularly sorghum. Thus, for any sustained increases in maize production reliance has to be placed on increasing the market demand in livestock feeding and for human consumption in southern Nigeria. The Nigerian livestock industry is growing rapidly and consequently a number of livestock feed mills have been set up through the country, particularly in southern Nigeria. One of the major problems of the industry is with raw material availability.[1]

---

[1] See Anthony Ikpi, "The Structure of the Nigerian Livestock Sector." Department of Agricultural Economics, University of Ibadan, n.d., pp. 29-33.

Maize is being imported for use in these feed mills. There is need to examine the feasibility of shipping surplus FADP maize to the feed mills. High domestic prices compared to import prices are a major deterrent to the ultilization of domestic maize supplies for livestock feed. If the policy of increasing maize production is to be continued, then there is a need to revise the policy on importations. It makes little sense to have surpluses within the country and still import the product. There is also a need to carry out feasibility studies, including cost competitiveness, consumer preferences, and level of potential demand for FADP maize in southern Nigeria. No such studies are currently available.

Other possible avenues for policy measures with regard to the increased FADP production of food crops include the development of storage and processing facilities. Since most of the storage is now being undertaken by the private sector in rural areas, in small scattered quantities, there is a need to encourage the private sector to adopt better methods of storage at the farm, village and district level centers. The Nigerian Grains Board could contribute to the disposal of FADP surplus by purchasing surplus grain from the area and adding to its small Food Security Stocks. However, the NGB and Guaranteed Minimum Price Scheme Board will have to offer higher prices than they have in the past if they are to serve any useful purpose in the marketing of staple food grains.

The processing of food grains into flour and other grain-based products, like starch, presents a way of increasing demand for staple grain crops. With the emphasis that Nigerian federal and state governments are putting on agro-industries, these grain-based processing industries should be given a high priority.

The network of rural roads built by the project needs proper maintenance if the roads are to continue to serve the transportation needs of the rural population and the efficient operation of the staple food marketing system. There is also a need to expand the rural road network so as to bring into the network some of the more isolated villages in the FADP area.

The Marketing System for Inputs

At the FADP level the system of fertilizer distribution operated reasonably well. The system relied on the network of Farm Service Centers built by the project throughout the area. The longest distance for any farmer to an FSC was less than six kilometers. The major problem of the system was that demand for fertilizer greatly exceeded the available supplies and thus some form of rationing had to be used at the FSCs. This problem coupled with the large subsidy on fertilizer makes it difficult to eliminate distribution inequities.

Arrangements made by the Kaduna State Government to entrust all input procurement and distribution to a company that will be transferred to the farmer-shareholders seems to be a step in the right direction. The company has already started operating. Its operations, according to the plan, will be along commercial lines. It has inherited the agro-service center and FSC network for its retail outlets. Other outlets will be based on farmer cooperative stores. The company will also participate in the purchase and storage of grains on behalf of the Nigerian Grains Board.

Recommendations at the FADP and state levels focus on finding ways to minimize problems of distribution inequities. The major cause of the problem is the shortage of fertilizer given the level of subsidies. It is suggested that means of increasing the supply of this input be looked at as a priority issue. Improvement in the management of domestic plants (Kaduna and the new plant in southern Nigeria) could increase the available fertilizer supply. However, since the plants can supply only a small percentage of the total demand and the Kaduna plant operates at well below the rated capacity, reliance will for some time be placed on imported fertilizers. To reduce the heavy cost of the fertilizers to the government there is need to examine the possibility of reducing the levels of subsidies and to use the money to purchase more fertilizers and thereby reduce the existing gap between the demand for and the supply of the product. At the present time very little is known about the likely effect of a reduction of the subsidies on fertilizer use.

Poor performance of fertilizer procurement at the national level under FFPU negatively influenced the performance at the state and FADP levels. Involvement of the public sector, at the national level, led to diminished sensitivity to local conditions leading to uncoordinated policies. Individual states are better able to determine their input needs, acquire the inputs and distribute them at the lowest cost possible. It is highly recommended that the pre-1976 system of fertilizer procurement under state control be readopted. A second, but less promising avenue, is to reorganize and improve the operations of

FFPU. There is also a need to investigate and improve the transportation system for fertilizer distribution within the country, with emphasis on the comparative advantage among rail, road and river transport.[2] On a more general note, there is need to enhance farmer education in the use of fertilizer and other inputs as well as an urgent need to examine the impact of reduced or eliminated subsidies on the demand for fertilizer in the country.

Project Planning and Implementation

The results of this study and the discussion suggest a number of issues that need to be considered in planning future projects or in the modification of existing ones. At FADP the marketing efforts were concentrated mainly on inputs and the so-called commercial crops, cotton and groundnuts. There was no plan for the project to participate directly in the marketing of food crops. The provision of food crop marketing advice at FSCs was done with a hostile eye towards the activities of the private traditional marketing system which was believed to be inimical to producer interests despite FADPs reliance on it to take care of increased food production.

The hostility towards the traditional marketing system at FADP probably led to the neglect of the system in project plans leading to uncoordinated actions and resulting declines in prices, particularly for maize. A better working relationship between FADP and traditional marketing system participants, like grain wholesalers, retailers and transporters could have helped in minimizing or even eliminating some

---

[2] See Falusi and Williams, 1981.

of the marketing problems that arose.

Future projects should adequately examine the prospective demand for the crops whose production is likely to be increased substantially. Since there are likely to be unintended increases, as in the case of sorghum and millet at FADP, the prospective demand for all major crops in the area should be examined before the onset of the project. Monitoring of the demand situation for the crops should also be continued as the project progresses.

This study has shown the necessity for a well-organized retail distribution network for inputs manned by trained personnel. Many of the policy issues regarding procurement and timing of input supplies is now in the hands of the federal government. If present policies continue, future projects will have to take this into account in their plans.

Future ADPs need to seriously consider ways and means of cooperating with both the public and private sectors in planning input and product marketing activities. Occasional surveys of the private sector activities and expectations with regard to the ADPs are highly desirable. Consulting with participants of the private marketing system and public officials on a formal or informal basis should also go a long way in helping to achieve better coordination of project, private sector and public sector initiatives. There is also a need for future projects to regard marketing activities as a necessary complement to production activities and to train marketing extension agents who can in turn educate farmers and farm household members in marketing and market processes.

Finally, project plans should carefully consider the adequacy of storage and other facilities at the farm, village and regional levels as well as the system of transportation that will be needed to undergird agricultural and rural development.

Suggestions for Further Research

The results of this study, as well as the discussion of its limitations, suggest a number of areas for further research. There is a need to carry out similar studies in other ADPs so as to gather more information on the relationships between ADP activities, the private food marketing system and the public sector. This could also serve as a basis for a comparative study across the various ADPs.

Further research in the area of food crop storage and processing is greatly needed. This should accompany studies on consumer demand and preference for staple food grains. There is also a need to study the possibilities of introducing a system of standard measures and grades in the food crop marketing system. Studies providing answers to the most feasible way of doing this will hasten progress.

The input marketing system needs to be studied further with regard to price policies, particularly the government subsidy programs. Other inputs like improved seeds, herbicides and insecticides as well as farm production credit are additional areas for research.

In general, there is a need to develop methodologies for applied research that will guide the market development components of Agricultural Development Projects. As an initial step in this direction, it is

important to assemble and analyze information on the various agricultural subsectors, like grains and livestock. A number of the subsector studies could be initiated by faculty members in the various Nigerian universities' agricultural faculties in cooperation with senior students who could execute the studies as part of their training. Due to the large number of areas needing urgent studies, the involvement of students is an appropriate step. There is no need to await the availability of specially trained research staff. Appropriate compensation to serve as incentives needs to be worked out for students and their faculty supervisors.

It is in the longer-term interests of the country's development program to establish comprehensive but flexible research policies relating to agricultural marketing. The current research programs in marketing are uncoordinated and depend mainly on the initiatives of individual researchers. Funding has been a major problem in carrying out agricultural marketing research. The latter is partly due to the total dependence on the government for funds. There is need to look at how the private sector could help in financing research projects in the Nigerian universities. These problems cannot be solved within a short time, but an early start in this direction is essential.

APPENDICES

APPENDIX A

RESULTS OF ESTIMATING TRENDS IN ACTUAL UNDEFLATED FOOD CROP PRICES AT FADP, 1976-1979

APPENDIX A

Results of Trend Analysis Using Cochrane-Orcutt Procedure: Sorghum Kaura

Dependent Variable: Producer Price in Naira/KG				
Location:	Malumfashi	Bakori	Kankara	Faskari
Constant Term	.337 (2.38)	.281 (2.57)	.267 (3.01)	.207 (3.16)
Trend Coef.	-.0043 (-1.07)	-.0022 (-0.64)	-.0023 (-0.79	0.0001 (-0.05)
R-Squared	.03	.01	.02	.00
Adj. R-Squared	.00	-.02	-.01	-.03
D.W. Statistic	1.94	2.21	2.51	2.12

Source: Original data from FADP and APMEPU

Note: Figures in parenthesis are t-values

Results of Trend Analysis Using Cochrane-Orcutt Procedure: Sorghum Farfara

Dependent Variable: Producer Price in Naira/KG				
Location:	Malumfashi	Bakori	Kankara	Faskari
Constant Term	.337 (2.28)	.267 (2.64)	.312 (2.46)	.204 (3.51)
Trend Coef.	-.0041 (-0.98)	-.0015 (-0.47)	-.0033 (-0.85)	-.0005 (-0.21)
R-Squared	.03	.01	.02	.00
Adj. R-Squared	.00	-.02	-.01	-.09
D.W. Statistics	1.83	1.94	2.55	2.12

Source: Original data from FADP and APMEPU

Note: Figures in parenthesis are t-values

Results of Trend Analysis Using Cochrane-Orcutt Procedure: Millet

Dependent Variable: Producer Price in Naira/KG				
Location:	Malumfashi	Bakori	Kankara	Faskari
Constant Term	.178 (2.60)	.283 (2.12)	.335 (1.84)	.184 (2.55)
Trend Coef.	0.0030 (1.21)	-.0004 (-0.09)	-.0023 (-0.42)	0.0026 (0.98)
R-Squared	.04	.00	.01	.03
Adj. R-Squared	.01	-.03	-.02	0.00
D.W. Statistics	1.67	1.84	1.59	1.87

Source: Original data from FADP and APMEPU

Note: Figures in parenthesis are t-values

Results of Trend Analysis Using Cochrane-Orcutt Procedure: Maize

Dependent Variable: Producer Price in Naira/KG				
Location:	Malumfashi	Bakori	Kankara	Faskari
Constant Term	.318 (5.08)	.315 (5.04)	.332 (5.99)	.262 (5.31)
Trend Coef.	-.0028 (-1.21)	-.0023 (-1.03)	-.0029 (-1.43)	-.0008 (-0.41)
R-Squared	.04	.03	.05	0.00
Adj. R-Squared	.01	0.00	.03	-.02
D.W. Statistics	1.91	1.69	1.56	1.95

Source: Original data from FADP and APMEPU

Note: Figures in parenthesis are t-values

APPENDIX B

STATISTICS ON MAIZE AND OTHER CEREALS

APPENDIX B

Relative Importance of Maize, Sorghum and Millet

Item	Kaduna State	Oyo, Ondo and Ogun	Nigeria
Maize			
% of cultivated hectares	2.43	27.11	6.89
Consumption (Kg/Capita/Wk)	0.08	1.67	
Sorghum			
% of cultivated hectares	32.07	5.75	27.11
Consumption (Kg/Capita/Wk)	1.93	0.01	
Millet			
% of cultivated hectares	27.15	--	23.57
Consumption (Kg/Capita/Wk)	1.46	0.01	

Source: Norman et al. "The Feasibility of Improved Sole Crop Maize Production Technology for the Small-scale Farmer in the Northern Guinea Savanna Zone of Nigeria." Samaru Miscellaneous Paper, No. 59 (1976).

Note: Production data are for 1970 cropping year while the consumption data is for 1963-64.

Farmers Growing Maize as a Percentage of Total by State, 1970-71

State	Percentage of Farmers Growing Maize	Area Under Cultivation (HA Per Farmer) Sole	Mixed
Kaduna	16	--	.29
Bornu/Bauchi/Gongola	20	.01	.01
Sokoto/Niger	15	--	.03
Kano	11	--	.05
Benue/Plateau	19	--	--
Kwara	73	.05	.86
Oyo/Ondo/Ogun	65	.16	.34
Lagos	50	.02	.18
Bendel	75	.04	.83
Rivers	25	--	.28
Cross Rivers	51	.01	.20
Anambra/Imo	52	--	.24

Source: Rural Economic Survey, Federal Office of Statistics, Lagos.

Note: Area per farmer figures are in hectares.

Areas Occupied by Maize, Sorghum and Millet in Kaduna (1977)

Cropping Pattern	Maize Area	Maize % of Maize Area	Millet Area	Millet % of Millet Area	Sorghum Area	Sorghum % of Sorghum Area
Sole Crop	32.9	20	78.8	19	842.6	54
2 Crop Mix	107.9	65	249.5	61	577.0	37
3 Crop Mix	22.5	13	72.0	18	115.8	7
4 Crop Mix	3.5	2	10.8	3	12.2	1
Total	166.8	100	411.1	101	1547.6	99

Source: FADP Evaluation Unit, "Land Use, Cropping Patterns and Area Covered by Individual Crops in Kaduna State," 1977.

Note: 1. Area in thousand hectares
2. Millet figures probably underestimated due to survey method used

Imports of Maize by Quantity and Value, Nigeria
1974-1977

Year	Quantity (Kg)	Value (Naira)	Price (Naira/Kg)
1974	2,440,336	608,289	.2493
1975	2,211,110	419,999	.1899
1976	9,861,382	1,422,338	.1423
1977	20,171,827	3,490,112	.1730
1978	97,000,000	12,698,413	.1309
1979	111,000,000	15,672,092	.1412

Sources: Quantity and value data for 1974-1977 from G. O. Abalu and B. D'Silva, "Nigeria's Food Situation: Problems and Prospects." Food Policy, Vol. 5, No. 1, (1980), pp. 49-60; Quantity and value data for 1978 and 1979 from Food and Agriculture Organization, FAO Trade Yearbook, Vol. 33, (Rome: RAO, 1980), p. 123; Price figures calculated by author from the Quantities and Values.

Crop Production at FADP, 1976/77 to 1979/80

	Sorghum	Millet	Maize	Cotton	Groundnuts
1976/77					
Area	219.7	9.4	5.1	61.4	13.2
Yield	848	688	643	523	646
Production	186.4	54.7	3.3	32.1	8.5
1977/78					
Area	201.1	60.5	10.5	65.7	22.0
Yield	659	535	1265	242	489
Production	132.5	32.4	13.3	15.9	10.8
1978/79					
Area	220	71.8	15.9	49.8	20.2
Yield	886	839	1483	341	409
Production	194.9	60.3	23.6	17.0	8.3
1979/80*					
Area	225	72.0	30.8	29.8	16.0
Yield	902	840	1857	406	720
Production	203	60.5	57.3	12.1	11.5

Source: FADP, "Quarterly Report, January-March 1980 and Summary of Development Progress during the five year investment period 1975-1980."

Notes: Units: Area in thousand hectares
Yield in kilogram per hectare
Production in thousand tonnes

* = Estimated figures

All calculations based on sole crop equivalents.

Crop Production: 1979/80 Compared to Appraisal Estimates, FADP

	Sorghum	Millet	Maize	Cotton	Groundnuts
Production					
Pre-project	90	48	NIL	24	14
Appraisal	96.9	(48)*	65.8	59.7	27.7
Actual	206.3	60.5	57.3	12.1	11.5
Value					
Pre-project	19.8	11.5	-	7.7	4.9
Appraisal	21.3	(11.5)*	14.5	19.1	9.7
Actual	45.1	14.5	12.6	3.9	4.0

Source: FADP "Progress Report for Five Year Investment, 1975-80"

Notes: Production figures in thousand tonnes
Value of Production at current prices in 1000 Naira
No appraisal estimates. Therefore based on current level.

*No appraisal estimates were made. Therefore pre-project figures were assumed as appraisal estimates.

Number of Maize Growers, FADP 1976-1979

Year	No. of Growers
1976	11,350
1977	17,820
1978	28,521
1979	51,657

Source: FADP Quarterly Report, Jan-March 1980.

APPENDIX C

SEASONAL AND INTERCROP PRICE ANALYSES, ZARIA AREA

APPENDIX C

Quarterly Seasonal Indices at Zaria Sabongari Market: Wholesale Prices, 1971-1977

	Sorghum	Millet
Jan-Mar	93.8	98.9
Apr-June	100.1	107.4
Jul-Sep	108.9	105.0
Oct-Dec	97.2	88.8
Seasonal Increase	15.1	18.6

Source: Data from Abalu, 1979 "Food situation in Nigeria: An Economic Analysis of Sorghum and Millet."

Bivariate Correlation Coefficients Between Retail and Wholesale Prices for Sorghum and Millet in the Zaria Area 1971-1977

	(1)	(2)	(3)	(4)	Mean P
Sorghum RP(1)	1				13.39
Sorghum WP(2)	.99	1			12.55
Millet WP(3)	.94	.95	1		12.14
Millet RP(4)	.94	.96	.97	1	12.86

Source: Original data from Abalu (1978)

Notes: RP = retail price; WP = wholesale price
Mean P = Mean Price in Kobo/Kilogram

APPENDIX D

GUARANTEED MINIMUM PRICES FOR FOOD CROPS

APPENDIX D

Guaranteed Minimum Prices for Staple Crops (Naira/Ton)

Crop	1977/78	1978/79	1979/80	1980/81	% Change
Beans	180	180	207	345	66.6
Cassava	110	110	-	-	-
Maize	130	130	150	100	-33.3
Millet	110	110	126.5	220	73.9
Rice:					
Milled	400	400	460	570	23.9
Paddy	240	240	276	329	19.2
Sorghum	110	110	126.5	210	66.0
Wheat	-	-	200	-	-
Yam	120	120	-	-	-

Source: J. M. Baba, "Towards a Green Revolution in Nigeria: Issues on Agricultural Pricing and Marketing Policies." Seminar on Green Revolution, Ahmedu Bello University, Zaria, September 21-24, 1981.

APPENDIX E

CONSUMER PRICE INDICES USED TO DEFLATE FOOD CROP PRICES, 1976-1979

APPENDIX E

Consumer Price Indices Used to Deflate
Food Crop Prices, 1976-1979

August 1976	124.5	May 1978	169.3
September 1976	124.5	June 1978	171.2
October 1976	127.9	July 1978	170.1
November 1976	124.2	August 1978	170.9
December 1976	126.3	September 1978	171.6
January 1977	126.5	October 1978	173.5
February 1977	126.5	November 1978	173.0
March 1977	124.1	December 1978	174.5
April 1977	127.6	January 1979	172.8
May 1977	127.2	February 1979	178.1
June 1977	133.3	March 1979	181.5
July 1977	143.9	April 1979	185.1
August 1977	155.1	May 1979	189.2
September 1977	155.4	June 1979	190.5
October 1977	156.8	July 1979	190.4
November 1977	157.8	August 1979	190.3
December 1977	159.5	September 1979	189.3
January 1978	149.7	October 1979	188.9
February 1978	155.1	November 1979	189.4
March 1978	159.1	December 1979	189.2
April 1978	162.9		

Source: Nigeria, Federal Office of Statistics and Central Bank of Nigeria, "Economic and Financial Review," Various issues.

APPENDIX F

ACTUAL FOOD CROP PRICES AT FADP, 1976-1979

Producer Prices of Farfara, FADP, 1976-1979

	Malumfashi	Bakori	Faskari	Kankara
1	143.000	161.000	175.000	140.000
2	130.000	154.000	155.000	136.000
3	146.000	164.000	143.000	163.000
4	136.000	162.000	150.000	124.000
5	124.000	139.000	141.000	133.000
6	133.000	154.000	145.000	143.000
7	138.000	162.000	156.000	134.000
8	151.000	167.000	175.000	210.000
9	152.000	160.000	160.000	160.000
10	159.000	167.000	168.000	210.000
11	166.000	173.000	175.000	177.000
12	184.000	180.000	180.000	190.000
13	210.000	222.000	210.000	180.000
14	181.000	202.000	210.000	170.000
15	191.000	201.000	223.000	140.000
16	190.000	198.000	216.000	160.000
17	170.000	191.000	180.000	190.000
18	230.000	241.000	223.000	220.000
19	310.000	352.000	343.000	270.000
20	294.000	313.000	298.000	293.000
21	290.000	305.000	292.000	291.000
22	287.000	297.000	287.000	290.000
23	274.000	277.000	288.000	300.000
24	297.000	307.000	300.000	293.000
25	298.000	297.000	280.000	297.000
26	253.000	280.000	250.000	287.000
27	238.000	290.000	263.000	273.000
28	243.000	286.000	248.000	297.000
29	196.000	223.000	222.000	260.000
30	224.000	234.000	222.000	268.000
31	242.000	258.000	222.000	245.000
32	223.000	263.000	230.000	230.000
33	204.000	220.000	212.000	210.000
34	193.000	219.000	218.000	190.000
35	190.000	206.000	218.000	233.000
36	201.000	223.000	220.000	200.000
37	182.000	209.000	303.000	185.000
38	167.000	204.000	198.000	170.000
39	177.000	199.000	185.000	168.000
40	163.000	194.000	175.000	165.000
41	138.000	168.000	163.000	143.000

Note: Nos. 1-41 refer to months. Month 1 = August 1976 and Month 41 = December 1979.

Producer Prices of Kaura, FADP, 1976-1979

	Malumfashi	Bakori	Faskari	Kankara
1	127.000	143.000	179.000	130.000
2	118.000	135.000	149.000	134.000
3	133.000	146.000	141.000	163.000
4	125.000	147.000	143.000	120.000
5	115.000	129.000	132.000	131.000
6	126.000	137.000	144.000	143.000
7	129.000	146.000	150.000	136.000
8	142.000	162.000	175.000	210.000
9	153.000	150.000	135.000	160.000
10	159.000	155.000	155.000	210.000
11	164.000	160.000	175.000	177.000
12	184.000	180.000	180.000	190.000
13	209.000	222.000	205.000	180.000
14	173.000	206.000	210.000	170.000
15	188.000	204.000	223.000	140.000
16	183.000	205.000	220.000	150.000
17	163.000	191.000	180.000	175.000
18	210.000	226.000	215.000	200.000
19	287.000	321.000	320.000	250.000
20	271.000	295.000	287.000	287.000
21	275.000	296.000	285.000	288.000
22	278.000	297.000	283.000	290.000
23	272.000	277.000	281.000	291.000
24	307.000	317.000	307.000	273.000
25	298.000	293.000	270.000	277.000
26	250.000	280.000	250.000	267.000
27	238.000	287.000	263.000	250.000
28	231.000	270.000	232.000	267.000
29	182.000	202.000	200.000	233.000
30	206.000	228.000	223.000	227.000
31	218.000	218.000	205.000	212.000
32	230.000	243.000	217.000	210.000
33	199.000	210.000	195.000	198.000
34	185.000	217.000	207.000	180.000
35	180.000	196.000	206.000	220.000
36	189.000	219.000	213.000	185.000
37	200.000	207.000	297.000	177.000
38	155.000	200.000	193.000	168.000
39	158.000	189.000	170.000	162.000
40	147.000	190.000	173.000	163.000
41	127.000	157.000	130.000	140.000

Note: Nos. 1-41 refer to months. Month 1 = August 1976 and Month 41 = December 1979.

Producer Prices of Maize, FADP, 1976-1979

	Malumfashi	Bakori	Faskari	Kankara
1	223.000	226.000	260.000	180.000
2	154.000	174.000	160.000	180.000
3	188.000	192.000	147.000	207.000
4	210.000	223.000	171.000	235.000
5	207.000	234.000	210.000	259.000
6	231.000	233.000	227.000	259.000
7	246.000	232.000	256.000	260.000
8	254.000	273.000	290.000	260.000
9	283.000	238.000	170.000	285.000
10	297.000	277.000	235.000	310.000
11	312.000	315.000	300.000	285.000
12	329.000	315.000	200.000	245.000
13	407.000	284.000	298.000	253.000
14	241.000	295.000	287.000	260.000
15	243.000	274.000	340.000	260.000
16	267.000	296.000	280.000	310.000
17	271.000	287.000	293.000	290.000
18	251.000	251.000	245.000	270.000
19	330.000	307.000	305.000	280.000
20	326.000	349.000	324.000	357.000
21	352.000	365.000	352.000	389.000
22	377.000	383.000	380.000	420.000
23	343.000	320.000	347.000	330.000
24	293.000	290.000	300.000	290.000
25	300.000	230.000	195.000	280.000
26	240.000	225.000	200.000	220.000
27	178.000	223.000	200.000	170.000
28	206.000	269.000	207.000	210.000
29	233.000	265.000	275.000	270.000
30	243.000	279.000	277.000	250.000
31	297.000	397.000	260.000	260.000
32	275.000	343.000	320.000	290.000
33	254.000	220.000	213.000	240.000
34	232.000	235.000	255.000	235.000
35	242.000	229.000	260.000	273.000
36	300.000	243.000	265.000	340.000
37	241.000	246.000	300.000	245.000
38	125.000	217.000	208.000	173.000
39	150.000	156.000	133.000	183.000
40	146.000	159.000	140.000	170.000
41	140.000	160.000	143.000	165.000

Note: Nos. 1-41 refer to months. Month 1 = August 1976 and Month 41 = December 1979.

Producer Prices of Millet, FADP, 1976-1979

	Malumfashi	Bakori	Faskari	Kankara
1	138.000	149.000	155.000	140.000
2	115.000	116.000	100.000	101.000
3	125.000	136.000	120.000	131.000
4	132.000	151.000	139.000	115.000
5	128.000	148.000	141.000	160.000
6	137.000	161.000	148.000	163.000
7	147.000	170.000	176.000	166.000
8	162.000	170.000	160.000	210.000
9	175.000	196.000	175.000	170.000
10	179.000	194.000	188.000	170.000
11	183.000	193.000	200.000	177.000
12	194.000	203.000	180.000	180.000
13	239.000	220.000	205.000	180.000
14	174.000	182.000	176.000	180.000
15	188.000	194.000	180.000	170.000
16	189.000	200.000	202.000	210.000
17	195.000	209.000	180.000	237.000
18	284.000	296.000	265.000	265.000
19	328.000	329.000	333.000	290.000
20	321.000	330.000	327.000	333.000
21	350.000	356.000	339.000	362.000
22	346.000	383.000	350.000	390.000
23	342.000	360.000	330.000	397.000
24	383.000	398.000	390.000	405.000
25	340.000	308.000	335.000	410.000
26	235.000	277.000	240.000	270.000
27	223.000	287.000	260.000	240.000
28	255.000	282.000	237.000	283.000
29	270.000	297.000	290.000	325.000
30	472.000	384.000	298.000	347.000
31	470.000	354.000	295.000	350.000
32	300.000	363.000	300.000	350.000
33	291.000	333.000	300.000	297.000
34	289.000	282.000	280.000	285.000
35	280.000	296.000	346.000	275.000
36	293.000	300.000	315.000	290.000
37	264.000	296.000	380.000	230.000
38	196.000	255.000	318.000	195.000
39	202.000	204.000	170.000	200.000
40	296.000	217.000	195.000	205.000
41	216.000	220.000	203.000	200.000

Note: Nos. 1-41 refer to months. Month 1 = August 1976 and Month 41 = December 1979.

APPENDIX G

EXCHANGE RATES, NAIRA PARITY WITH U.S. DOLLAR, 1973-1979

APPENDIX G

Exchange Rates, Naira Parity with U.S. Dollar, 1973-1979

Year	One Naira Equivalent in U.S. Dollars
1973	1.520
1974	1.588
1975	1.625
1976	1.596
1977	1.551
1978	1.575
1979	1.659

Source: FAO, FAO Trade Yearbook, Vol. 33, (Rome: FAO, 1980), p. 20.

REFERENCES

REFERENCES

Abalu, G. O. I., "The Food Siutation in Nigeria: An Economic Analysis of Sorghum and Millet," Samaru Miscellaneous Paper No. 80, Institute for Agricultural Research, Ahmadu Bello University, 1978.

Abalu, G. O. I. and B. D'Silva, "Nigeria's Food Situation: Problems and Prospects," Food Policy, Vol. 5, No. 1 (1980): 49-60.

Abdullahi, A., "The Problem and Prospect of The Green Revolution for Agricultural and Rural Development of Nigeria--Technical and Environmental Perspectives," paper, First National Seminar on the Green Revolution in Nigeria, Ahmadu Bello University, Zaria, September 21, 1981.

Agbo, Chris I., "Towards the Success of the Nigerian Green Revolution Programme -- Some Lessons from the Failure of the 'Operation Feed the Nation' Scheme," paper, First National Seminar on the Green Revolution in Nigeria, A.B.U., Zaria, 21st-24th September 1981.

Agbonifo, Peter O. and Ronald Cohen, "The Peasant Connection: A Case Study of the Bureaucracy of Agri-Industry," Human Organization Vol. 35, No. 4, 1976, pp. 367-379.

Ahmed, Raisuddin, "Agriculture in Integrated Rural Development: A critique," Food Policy, May 1977.

Akinwumi, J. A., "Costs and Returns in Commercialized Maize Production in the Derived Savanna Belt of Western Nigeria," Bulletin of Rural Economics and Sociology, Vol. 6, No. 2, 1971.

Al-Sudeary, Abdelmuhsin, M., Forward to Investment Projects in Agriculture, by McDonald P. Benjamin (Harlow, Essex: Longman, 1981).

Anthonio, Q. B. O., "The Marketing of Staple Foodstuffs in Nigeria: A Study in Pricing Efficiency." Ph.D. dissertation, University of London, 1968.

Agricultural Project Monitoring, Evaluation and Planning Unit "Funtua Agricultural Development Project: Completion Report," APMEPU, Kaduna, 1982.

Baba, J. M., "Towards A Green Revolution in Nigeria: Issues on Agricultural Pricing and Marketing Policies," Seminar on Green Revolution, Ahmadu Bello University, Sept. 21-24, 1981.

Bain, Joe S., Industrial Organization (New York: Wiley, 1959).

Baker, E. F. I. and Y. Yusuf, "Mixed Cropping Research at the Institute for Agricultural Research, Samaru, Nigeria." In Intercropping in Semi-Arid Areas Editied by J. H. Manyo, A. D. R. Ker and M. Campbell (Ottawa: International Development Research Center).

Balcet, J. C. and Wilfred Candler, "Farm Technology Adoption in Northern Nigeria: Summary and Conclusions." World Bank Research Project, RPO 671-88, 1981.

Benjamin, McDonald P., Investment Projects in Agriculture, (Harlow, Essex: Longman, 1981).

Berg, Elliot, "Reforming Grain Marketing Systems in West Africa," Center for Research on Economic Development, University of Michigan, 1979.

Bienen, Henry and V. P. Diejomaoh, The Political Economy of Income Distribution in Nigeria, (Holmes & Meier Publishers, Inc., 1981).

Breimyer, Harold F., Economics of the Product Markets of Agriculture (Ames, Iowa: Iowa State University Press, 1976).

Caldewell, T. J. and C. Okonjo (eds), The Population of Tropical Africa, (London: Longmans, 1968).

Cochrane, W. W., "Market as a Unit of Enquiry in Agricultural Economics Research," Jour. of Farm Economics, XXXIX, February, 1957.

Cohen, J. M., "Rural Change in Ethiopia: The Chilalo Agricultural Development Unit," Econ. Dev. and Cultural Change, Vol. 22, 1974.

Cohen, John M., "Effects of Green Revolution Strategies on Tenants and Small-Scale Landowners in the Chilalo Region of Ethiopia," Jour. Developing Areas, Vol. 9, (April, 1975).

Crawford, Eric W., "A Simulation Study of Constraints on Traditional Farming Systems in Northern Nigeria." M.S.U. International Development Paper No. 2, Michigan State University, East Lansing, 1979.

Dejene, Tekola, "Integrated Rural Development in Africa: Planning and Evaluation," Masters Thesis (Plan B), Michigan State University, 1973.

D'Silva, Brian C. and M. Rafique Raza, "Integrated Rural Development in Nigeria - The Funtua Project," Food Policy, Vol. 5, No. 4, November 1980.

Eicher, Carl K. and Doyle C. Baker, "Research on Agricultural Development in Sub-Sahara Africa: A Critical Survey," M.S.U. International Development Paper #1, Department of Agricultural Economics, M.S.U., East Lansing, 1982.

Eicher, Carl K. and Carl Liedholm, Growth and Development of the Nigerian Economy, Michigan State University Press, East Lansing 1970.

Ejiga, Nathaniel O. O., "Economic Analyses of Storage, Distribution and Consumption of Cowpeas in Northern Nigeria," Ph.D. dissertation, Cornell University, 1977.

Ekuerhare, B. U., "A Theoretical Framework for the Economic Appraisal of the Green Revolution in Nigeria," Paper, First National Seminar on the Green Revolution in Nigeria, Ahmadu Bello University, 1981.

Essang, S. M., "The Middlemen in the Domestic Marketing of Palm Oil: Asset or Liability," Bulletin of Rur. Econ. and Soc. Vol. 3., No. 1, 1968.

FAO, FAO Trade Yearbook, Vol. 33, (Rome: FAO), 1980.

Falusi, A. O. and L. B. Williams,"Nigerian Fertilizer Sector: Present Situation and Future Prospects,"(International Fertilizer Development Center, Muscle Shoals, 1981.)

Farruk, Muhammad Osman, "Structure and Performance of the Rice Marketing System in East Pakistan," Cornell International Development Bulletin 23, Cornell University, 1972.

French, Ben C., "Subsector Anslysis, An Appraisal," American Journal of Agricultural Economics, December, 1974.

Funtua Agricultural Development Project, Quarterly Report, Jan-March, 1980.

Gilbert, Elon H., "Marketing of Staple Foods in Northern Nigeria: A Study of the Staple Food Marketing Systems Serving Kano City," Ph.D. dissertation, Stanford University, 1969.

Giles, P. H., "The Storage of Cereals by Farmers in Northern Nigeria," Samaru Research Bulletin No. 42, Institute for Agricultural Research, Ahmadu Bello University, Zaria, Nigeria.

Gusten, Rolf, Studies in the Staple Food Economy of Western Nigeria, Nigerian Institute of Social and Economic Research, Ibadan and Ifo-Institut Fur Wirtschaftsforschung Munchen, 1968.

Hanushek, Eric A. and John E. Jackson, Statistical Methods for Social Scientists (New York: Academic Press, 1977).

Harrison, Kelly, Donald Henly, Harold Riley and James Shaffer, "Improving Food Marketing Systems in Developing Countries: Experiences from Latin America," Research Report No. 6, Latin American Studies Center, Michigan State University.

Harriss, Barbara, "There is Method in my Madness: or is it Vice Versa? Measuring Agricultural Market Performance," Food Research Institute Studies. Vol. XVII, No. 2, 1979.

Hays, Henry Marlin, Jr., "Organization of the Staple Food Grain Marketing System in Northern Nigeria: A Study of Efficiency of the Rural-Urban Link," Ph.D. dissertation, Kansas State University, 1973.

Hays, H. M., Jr., "The Marketing and Storage of Food Grains in Northern Nigeria," Samaru Miscellaneous Paper No. 50, Institute for Agricultural Research, Ahmadu Bello University, Zaria, 1975.

Helleiner, Gerald K., Peasant Agriculture, Government and Economic Growth in Nigeria, (Homework, Illinois: Richard D. Irwin, 1966).

Henderson, James M. and Richard E. Quandt, Microeconomic Theory: A Mathematical Approach 3rd Ed. (New York: McGraw-Hill Co., 1980).

Hill, Polly, Rural Hausa-A Village and a Setting, Cambridge University Press, 1972.

Hoque, Anwarul, "A Simulation Approach to Policy Planning and Evaluation in the Context of Integrated Rural Development in Bangladesh," Ph.D. dissertation, Michigan State University, 1977.

Idachaba, F. S., "Marketing Board Crop Taxation and Input Subsidies: A Second-Best Approach," Nigeria Journal Economic-Soc. Studies, Vol. 15, pp. 317-324.

Idachaba, F. S., "Concepts and Strategies of Integrated Rural Development: Lessons from Nigeria," Food Policy Technical Research Paper No. 1, University of Ibadan, December, 1980.

Ikpi, Anthony, "The Structure of the Nigerian Livestock Sector," Department of Agricultural Economics, University of Ibadan.

Jones, William O., "The structure of Staple Food Marketing in Nigeria as Revealed by Price Analysis," Food Research Institute Studies, Vol. 8, No. 2, 1968.

Jones, William O., "Regional Analysis and Agricultural Marketing Research in Tropical Africa: Concepts and Experience," Food Research Inst. Studies, Vol. 13, No. 1, 1972.

Kassam, A. H., J. M. Kowal, M. Dagg and M. N. Harrison, "Maize in West Africa and its Potential in the Savanna Areas," World Crops, March/April, 1975.

Kohls, Richard L. and Joseph N. Uhl, Marketing of Agricultural Products, 5th Ed., Macmillan Pub. Co., 1980.

Krishnaswamy, M. S.,"Agricultural Project Management in Kaduna State (1970-1979)," Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University, 1979.

Lele, Uma, The Design of Rural Development: Lessons From Africa, Johns Hopkins University Press for the World Bank, 1975.

Lele, Uma J., Food Grain Marketing in India, (Ithaca, New York: Cornell University Press, 1971).

Manyo, J. H., A. D. R. Ker and M. Campbell, (Eds.), Intercropping in Semi-Arid Areas, (Ottawa: International Development Research Center).

Matlon, Peter J., "Income Distribution Among Farmers in Northern Nigeria: Empirical Results and Policy Implications," African Rural Economy Paper No. 18, Michigan State University, East Lansing, 1982.

Mellor, J. W., The New Economics of Growth: Strategy for India and the Developing World, Cornell University Press, 1976.

Neter, J. and Wesserman, W., Applied Linear Statistical Models, Irwin, 1974.

Nicholas, M. S. O., Foreward to "The Private Marketing Entrepreneur and Rural Development," FAO Agricultural Services Bulletin No. 51, (Rome: FAO, 1982).

Nigeria, Federal Office of Statistics and Central Bank of Nigeria, "Economic and Financial Review." Various issues.

Nigeria, Federal Ministry of Economic Development, Third National Development Plan, 1975-80, Vols. 1 and 2, Central Planning Office, Lagos, 1975.

Njoku, J. E., "A Review of Agricultural Price Policy in the Context of the Green Revolution," Paper presented at the 1st. National Green Revolution Seminar, Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University, Zaria, 21st-24th September, 1981.

Norman, D. W., "An Economic Survey of Three Villages in Zaria Province: Vol I Text," Samaru Miscellaneous Paper No. 37, Institute for Agricultural Research, Ahmadu Bello University, Zaria, 1972.

Norman D. W., P. Beeden, W. J. Kroeker, D. H. Pryor, H. M. Hays and B. Huizinga, "The Feasibility of Improved Sole Crop Maize Production Technology for the Small-Scale Farmer in the Northern Guinea Savanna Zone of Nigeria," Samaru Miscellaneous Paper, No. 59, 1976.

Olayemi, J. K., "Food Marketing and Distribution in Nigeria: Problems and Prospects," Nigerian Institute for Social and Economic Research, Universiyt of Ibadan, 1974.

Olayide, S. O., Economic Survey of Nigeria; 1960-1975, Aromolaran Publishing Company Limited, Ibadan, 1976.

Olukosi, James O., "The Distribution of Personal Incomes Among African Farmers--A Two Period Analysis," Ph.D. dissertation, Michigan State University, East Lansing, 1979.

Poate, C. D. and P. F. Daplyn, "Farm Surveys and Project Evaluation, A Methodology Manual." APMEPU, 1982.

Pritchard, N. T., "A Framework for Analysis of Agricultural Marketing Systems in Developing Countries," Agric. Econ. Res., 21:78-85.

Purcell, Wayne D., Agricultural Marketing: Systems, Coordination, Cash And Futures Prices (Reston, Virginia: Reston Pub. Co., 1979).

Riley, Harold and John Staatz, "Food System Organization Problems in Developing Countries," Report No. 23, Agricultural Development Council, 1981.

Scherer, F. M., Industrial Market Structure and Economic Performance, Rand McNally, Chicago, 1970.

Shaffer, James D., "On the Concept of Subsector Studies," Am. Jour. Agr. Econ., Vol. 55, pp. 333-335, May, 1973.

Simmons, E. B., "Calorie and Protein Intakes in Three Villages of Northern Zaria Province, May 1970-July 1971," Samaru Miscellaneous Paper No. 55 Institute for Agricultural Reserach, Ahmadu Bello University, Zaria, Nigeria.

Slade, R. H., "The Monitoring and Evaluation of the Funtua, Gusau and Gombe Agricultural Development Projects," The World Bank, Washington, D. C., not dated.

Snedecor, George W. and W. G. Cochran, Statistical Methods, Iowa State University Press, 1967.

Southworth, Van Roy, "Food Crop Marketing in Atebubu District, Ghana," Ph.D. dissertation, Stanford University, 1981.

Spiegel, Murry R., Theory and Problems of Statistics (New York: McGraw-Hill Schaum's Outline Series).

Tatum, L. A., "Maize as a Grain Crop in Northern States of Nigeria," Samaru Agricultural Newsletter, Vol. 13, No. 4, August, 1971.

Thodey, Allen R., "Analysis of Staple Food Price Behavior in Western Nigeria," Ph.D. dissertation, University of Illinois, 1969.

Timmer, C. Peter, "A Model of Rice Marketing Margins in Indonesia," Food Res. Inst. Studies, 13 (No. 2, 1974):99-143.

Tomek, William G. and Kenneth L. Robinson, Agricultural Product Prices, Cornell Univ. Press, 1972.

USDA, Food Problems and Prospects in Sub-Sahara Africa: The Decade of the 1980's, USDA, Washington, D. C., 1980.

Webster, O. J., "The Maize Program at Samaru," Samaru Agricultural Newsletter, Vol. 12, No. 5, October, 1970.

Wells, Jerome C., Agricultural Policy and Economic Growth in Nigeria: 1962-1968, Oxford University Press, Ibadan, 1974.

Welsch, Delane E., "The Rice Industry in the Abakaliki Area of Eastern Nigeria," Ph.D. dissertation, Michigan State University, 1964.

Whitney, Anita, "Marketing of Staple Foods in Eastern Nigeria," Agricultural Economics Report No. 114, Department of Agricultural Economics, Michigan State University, East Lansing, 1968.

World Bank, World Development Report 1978, (The World Bank, Washington, D. C. 1978).

World Bank, World Development Report 1982, (New York: Oxford University Press for the World Bank, 1982).

World Bank, Accelerated Development in Sub-Saharan Africa: An Agenda for Action, The World Bank, Washington, D. C. 1981.

World Bank, Appraisal of Funtua Agricultural Development Project, Nigeria (Washington, D. C.: The World Bank, 1974).

Yudelman, Montague, "Agriculture in Integrated Rural Development: The Experience of the World Bank," Food Policy, November, 1976.

Zalla, T., R. B. Diamond, and M. S. Mudahar, "Economic and Technical Aspects of Fertilizer Production and Use in West Africa," African Rural Economy Working Paper No. 22, Michigan State University, East Lansing and International Fertilizer Development Center, Muscle Shoals, 1977.