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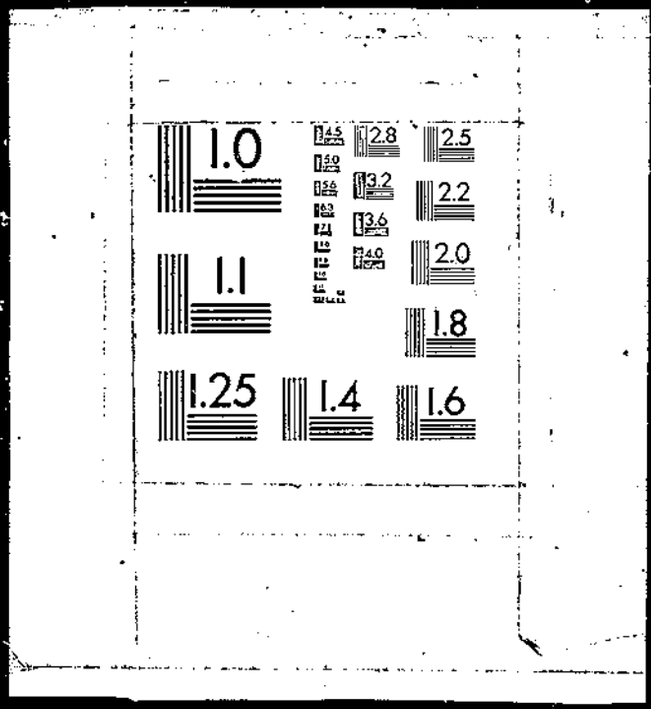

PB86-191707

Nigeria: An Export Market Profile

(U.S.) Economic Research Service, Washington, DC

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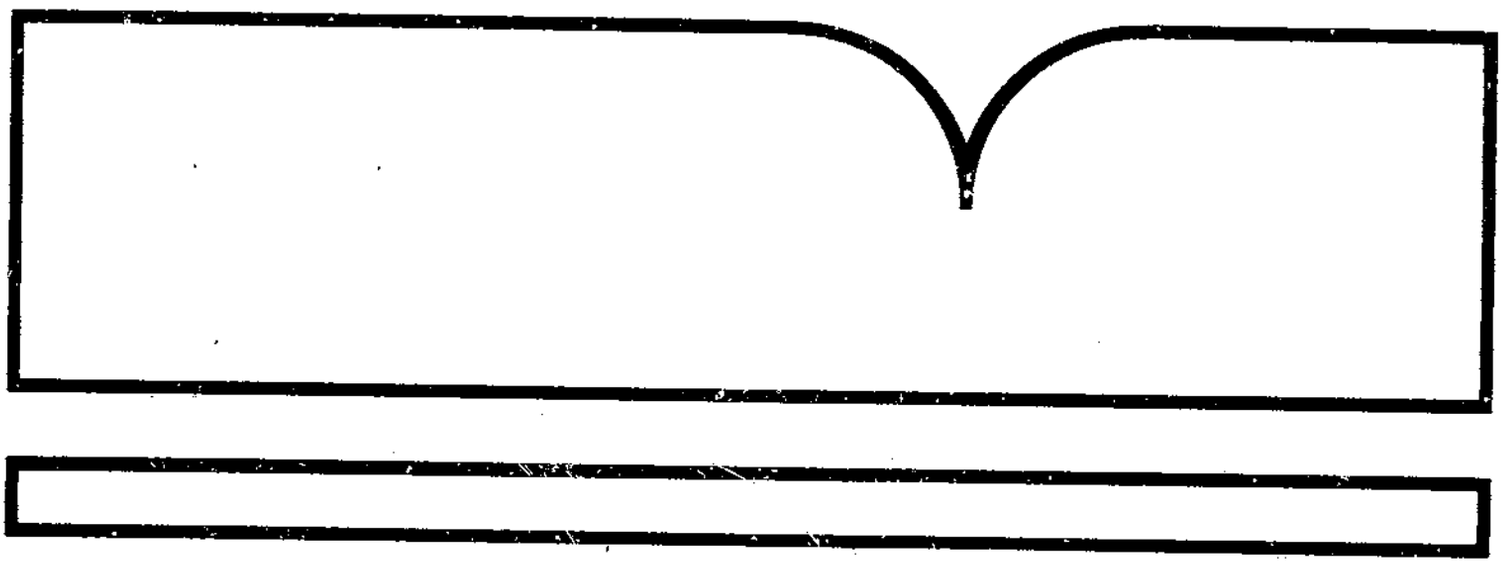

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United States Department of Agriculture

Economic Research Service

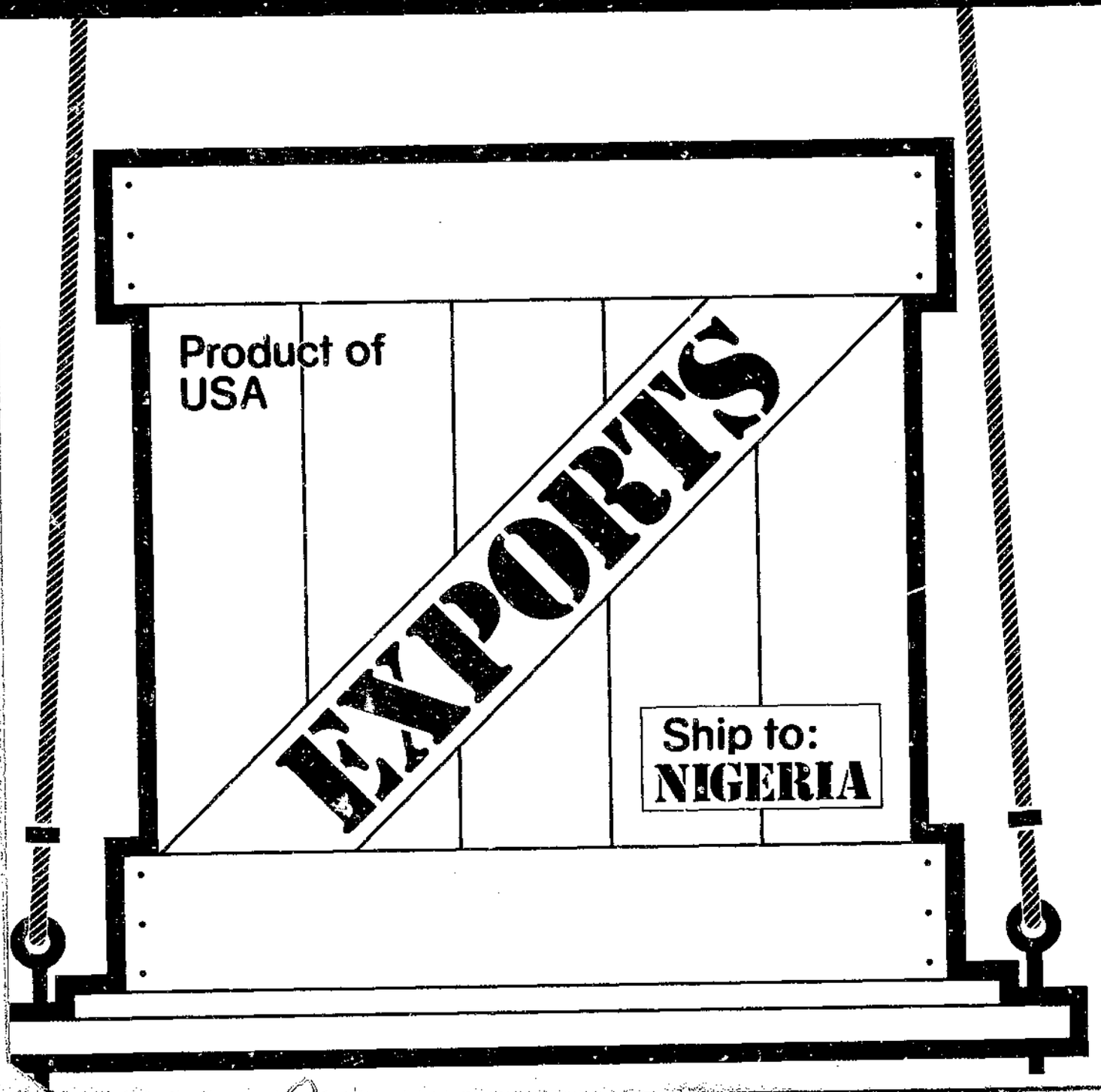
In cooperation with the Foreign Agricultural Service

Foreign Agricultural Economic Report Number 218

Nigeria

An Export Market Profile

Carl Mabbs-Zeno



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ABSTRACT

Nigeria's agricultural imports have grown more rapidly since 1974 than those of most other countries. About one-quarter of these imports have come from the United States, including almost all of Nigeria's imported grains, principally corn and wheat. By 1990, Nigeria may import almost 2.2 million tons of wheat annually, up from 1.5 million tons in 1983, and more than 750,000 tons of corn, up from just over 400,000 tons in 1983. Short-term debt repayment obligations limit immediate prospects for greater growth rates, but the large population (more than 90 million), established petroleum industry, and slowly developing agricultural sector assure substantial import demand for many years to come. New competitors for this market will challenge the U.S. market share, although the United States should remain a major supplier.

Keywords: Nigeria, agricultural imports, agricultural policies, import policies, import projections.

Washington, DC 20005-4788 April 1986

PREFACE

Expanding the market for U.S. agricultural exports is a major goal of the U.S. Department of Agriculture (USDA). The Economic Research Service in cooperation with the Foreign Agricultural Service is preparing export profiles for a number of high-potential markets for U.S. agricultural products. The Economic Research Service is USDA's major source of agricultural and trade information on foreign countries and regions, while the Foreign Agricultural Service has the key role in helping U.S. agriculture further increase exports in world markets.

This report presents information on the prospects for U.S. agricultural exports to Nigeria. The study surveys basic factors underlying agricultural supply and demand, presents long-run projections of food and agricultural trade, and suggests opportunities for export expansion. The report is intended for officials responsible for export market development programs, the agribusiness community, and the general public. The profile will also help identify information gaps and can serve as a basis for subsequent evaluations of the effects of market extension activities. Similar profiles will be prepared for selected markets in Africa and the Middle East, Asia, and Latin America.

CONVERSION CHART

This report uses metric units throughout:

1 kilogram (kg) = 2.2 pounds

1 metric ton (ton) = 2,205 pounds

1 hectare (ha) = 2.471 acres

1 kilometer (km) = 0.621 mile

1 naira = $1.004 (January 1986)

CONTENTS

SUMMARY

Nigeria's agricultural imports have grown more rapidly since 1974 than those of most other countries. About one-quarter of these imports have come from the United States, including almost all of Nigeria's imported grains, principally corn and wheat. By 1990, Nigeria may import almost 2.2 million tons of wheat annually, up from 1.5 million tons in 1983, and more than 750,000 tons of corn, up from just over 400,000 tons in 1983. Short-term debt repayment obligations limit immediate prospects for greater growth rates, but the large population (more than 90 million), established petroleum industry, and slowly developing agricultural sector assure substantial import demand for many years to come. New competitors for this market will challenge the U.S. market share, although the United States should remain a major supplier.

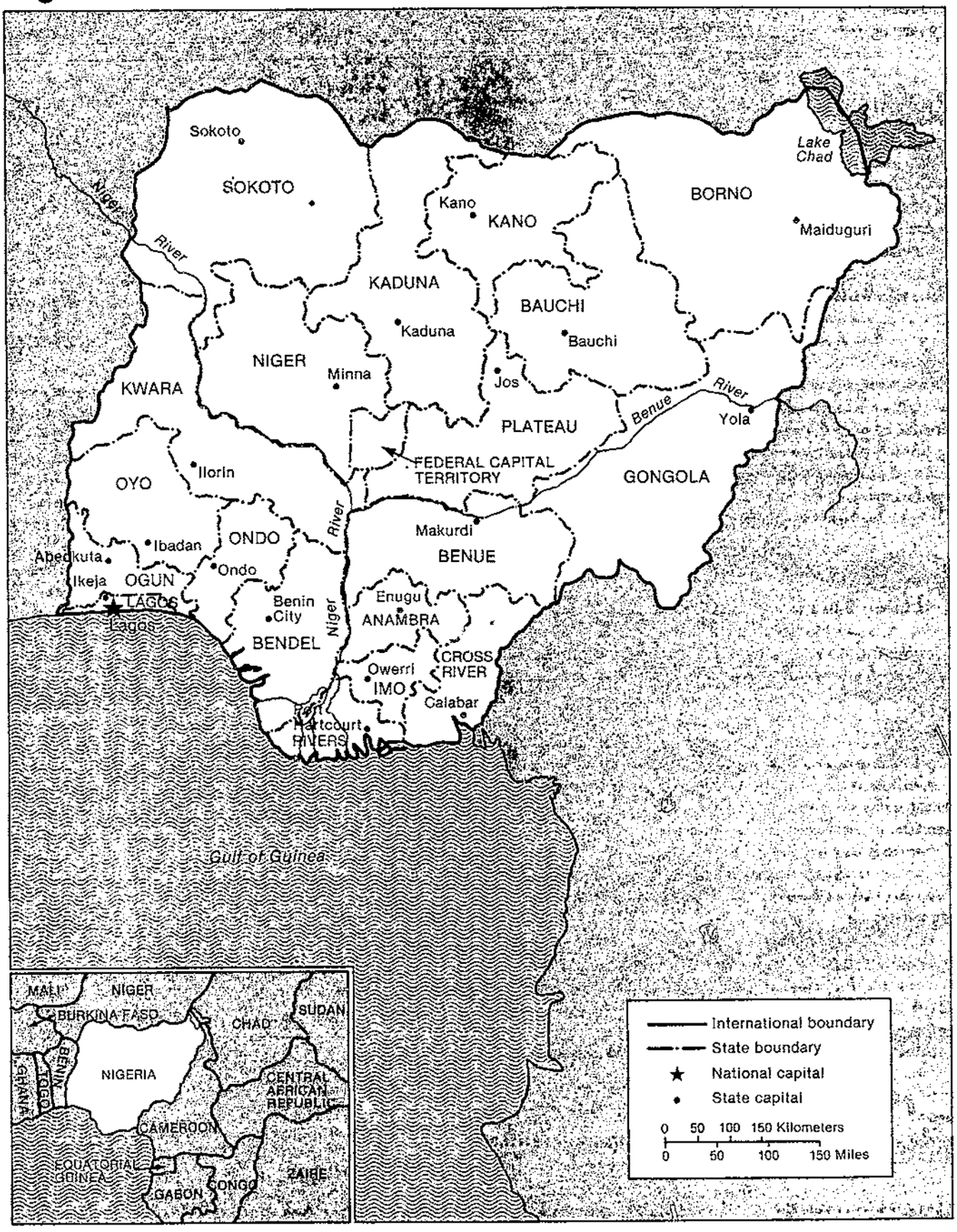
Immediate prospects are for limited foreign exchange caused by short-term debt repayment and relatively low petroleum prices restricting import growth. Government licensing requirements will determine the types and quantities of imports.

Success of agricultural development programs and the changing food preferences of an increasingly urban population will play key roles in determining agricultural imports. Rapidly rising petroleum export revenues have increased urban employment opportunities, while Nigeria's agricultural sector has essentially stagnated. Stable, even declining, petroleum revenues in recent years, however, have increased pressure for economic diversification, including Government support of improved domestic agricultural production.

While the United States remains the sole supplier of wheat and corn, its predominant position as a rice supplier has been taken over by Thailand. The European Economic Community continues to be Nigeria's principal supplier of sugar and dairy products. Brazil has mounted strong competition to supply sugar and cotton.

Recent bilateral agreements with several countries have altered traditional trading patterns. However, the United States and Nigeria should remain major trading partners in agricultural goods despite considerable yearly variation in commodities and prices.

Nigeria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OYO
Makurdi
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Nigeria

An Export Market Profile

Carl Mabbs-Zeno*

INTRODUCTION

Tucked in the corner of Africa's Gulf of Guinea, Nigeria is far more important to the United States than its distant location and modest land area suggest. It is the most populous country in Africa by a large margin and ranks first or second among African nations in national income. It has consistently been among the 10 largest importers of U.S. grain and is among the largest suppliers of petroleum to the United States. Several other agricultural commodities are also important trade items. Nigeria receives no foreign aid from the United States, in part because its economy does too well to qualify. Nigeria's unique resource endowment places it in a position to lead Sub-Saharan Africa into broader participation in world markets.

This Export Market Profile presents data and other information to enable the reader to anticipate the quantity and type of Nigeria's future agricultural imports. Nigeria was chosen for this series because it has especially strong prospects for importing U.S. agricultural products.

This report delineates approximate values for future market developments, but its precision is hampered by uncertainty in the data used here. Even the most fundamental variables, such as population, have not in recent years been measured satisfactorily.

In order to treat problems consistently raised by the poor quality of the data, the report followed several principles. Data are generally reported here in the currency used by the data source, rather than converted through an exchange rate of questionable interpretation. Discussions of future values use real values to avoid estimating inflation. For trade quantities, the report used the amounts reported by trading partners. For agricultural production, it used U.S. Department of Agriculture (USDA) estimates (*109*). 1/ Most other data came from Nigerian Government sources as recorded in the International Monetary Fund's (IMF) *International Financial Statistics* (*61*) or by the Nigerian Federal Office of Statistics, the country's principal data-gathering organization (*40, 41, 42, 43, 44*).

OVERVIEW OF NIGERIA

Nigeria's 924,630 square kilometers (km) make it the seventh largest nation in Africa. Its 95 million citizens make it the largest national population on the continent and the 10th largest in the world. Nigeria's extensive petroleum reserves give it one of the strongest African economies.

Geography

Nigeria is located on the West African coast next to the Gulf of Guinea between 5 and 14 degrees north latitude. It has land borders with Benin, Niger, and Cameroon while bordering Chad in Lake Chad. Nigeria's land area extends 1,120 km north-south and 1,040 km east-west, covering an area approximately equal to Texas, Louisiana, and Mississippi combined.

The land is generally of low relief with a mountainous zone along the eastern border and

*The author is an agricultural economist in the International Economics Division, Economic Research Service, U.S. Department of Agriculture, Washington, DC.

1/ Italicized numbers in parentheses identify literature cited in the references at the end of this report.

two large river valleys, the Benue and the Niger, which meet in the south central part of the country.

Northern areas are drier, resulting in a series of agroecological zones extending in east–west bands across the country. On average, annual rainfall is progressively less by 130 millimeters (mm) for each degree of latitude north and the rainy season begins 13 days later and ends 5.7 days earlier (*69*). This pattern results in a continuous transition in growing conditions which may be categorized into four discrete belts: the forest zone along the southern coast, the guinea zone which extends two-thirds of the way north, the sudan zone which includes most of the remaining northern area, and the Sahel in the northeast.

History and Culture

The area which is today Nigeria has a long history of political and cultural organization, accounting for the recognition today of 300 ethnic groups speaking 350 to 400 languages. The largest of these groups are the Hausa, Yoruba, and Ibo, together constituting about 60 percent of the country's population.

Another important legacy of the precolonial period is the presence of regional economies based on large cities which had been capitals of earlier states. The relatively even distribution of city sizes and importance distinguishes Nigeria from all other countries in the region (*97*).

Europeans first influenced Nigeria as slave traders based along the eastern portion of the coast and, later, in Lagos on the western coast. In 1914, most of what is today Nigeria was consolidated into a single British colony. A chronology of modern Nigerian history is provided in table 1.

In 1960, Nigeria became independent with an elected Government heading a federation of three States. Since then, there has been a succession of elections and military coups redistributing power within the same economic class (*83*) and following essentially similar policies. The impetus for change of Government often came from regional or ethnic competition. The Government attempted to reduce regional tensions by redrawing State boundaries several times, but in 1967 Biafra attempted to leave the federation entirely, precipitating civil war. With the Federal Government victory and a dramatic increase in Federal Government revenue from petroleum sales, regional differences have been less dominant.

Table 1--Nigeria: Historical chronology since 1914

1914	Nigeria unified under British rule
1959	Election of parliament
1960	October 1--national independence with three States and Abubakar Balewa as prime minister
1961	Northern Cameroon voted to merge with Nigeria
1963	Formation of fourth State
1964	New elections led to new Government also under Balewa
1966	January--military coup places General Johnson Ironsi at head of Government
1966	July--countercoup places Lieutenant Colonel Yakubu Gowon at head of Government
1967	May--Eastern Region secedes from Nigeria, civil war begins, plan for 12-State federation announced
1970	January--ceasefire in civil war
1975	July--coup places Brigadier Murtala Muhammed at head of Government
1976	February--Muhammed assassinated in failed coup. Lieutenant General Olusegun Obasanjo is placed at head of previous Government.
1976	March--19 States announced
1979	Federal elections place Alhaji Shagari at head of Government
1983	August--elections again place Shagari at head of Government
1983	December 31--coup places General Muhammadu Buhari at head of Government
1985	August 27--coup places General Ibrahim Babangida at head of Government

The military returned to power on December 31, 1983, when Muhammadu Buhari deposed the elected head, Alhaji Shagari. The reasons usually offered for this coup include national economic crisis, personal corruption of Government officials, and election fraud (*84, 86*). The most recent coup, on August 27, 1985, was justified by the new head of Government, Ibrahim Babangida, on the issues

of greater freedom for the press and of reaching agreement with the IMF.

Politics

The basis on which power is gained and distributed in Nigeria has been seen differently by different researchers, although a consensus has formed on essential points. At the international level, Nigeria is able to claim a leadership role in Africa by virtue of its large population and income. The potential to become a major power on an even larger scale is also widely recognized although this would require development along lines unprecedented in Africa (*21*).

Evans writes that Nigeria is beginning "dependent development" on a course like Brazil's based on his observations of industrialization and on the function of the state and international capital (*30, 31*). Wallerstein similarly describes Nigeria's place as the "semi-periphery," a position more amenable to development both internally and externally in relation to other countries than that occupied by most other African countries (*110*).

The distribution of power within Nigeria also distinguishes it from the typical Third World or dependent nation. The integration of longstanding regional power centers within a strong federal structure is unique in West Africa and fundamentally alters the opportunities facing upwardly mobile rural residents (*12, 52, 73*). This internal structure presents relatively good potential for Nigeria to avoid overcentralization of urban activity (*11*) and to develop import substitution industries through regional specialization (*97*).

Even while recognizing the significance of urbanization in Nigeria, most authors find that location of residence is not the essential determinant of economic class (*118*). Various studies on the distribution of productive resources have found that moving to a city is not necessarily permanent, does not mean breaking existing rural ties, and does not imply a large change in income (*17, 24, 119*).

The importance of ethnicity and education in determining membership in the dominant class is fading. A bureaucratic elite which sees itself as a class with specific interests to protect was described shortly after independence by Sklar (*96*), and a compatible view of this group has been described by subsequent authors (*65, 118*).

Entry into the dominant class is today controlled by complex institutions which have yielded extreme imbalance in the distribution of wealth and which require considerable investment in personal prestige even though much of this investment is unproductive from the national perspective (*16*). In spite of many influences on the distribution of power, the state emerges as the predominant institution. Any economic analysis must consider political influences over major resource allocation decisions. Any program for change must accept this primacy, for

> successive political forms, both of state and of rural property and office, have been the determining influence restricting West Africa's development since it first came into contact with the Portuguese five hundred years ago (*54*).

Other, larger groups may begin to see themselves as a class with common interests. Uprisings based on the demands of farmers have become less common, but factory workers may begin organizing in pursuit of class interests (*90*). Most authors see no immediate prospect for radical change (*17*).

Macroeconomics

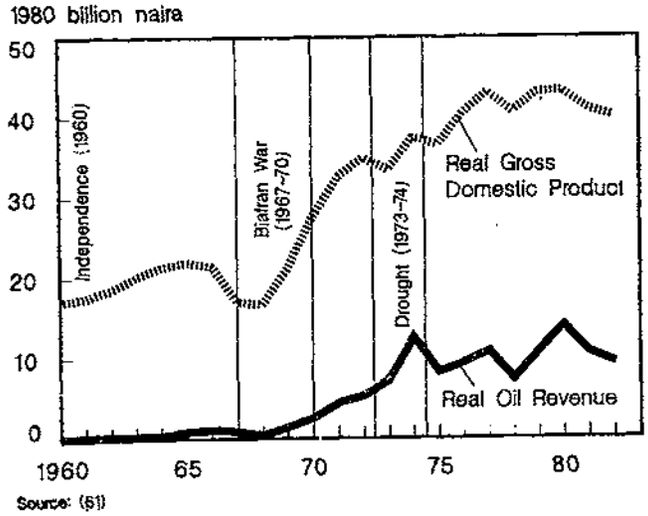
The gross domestic product (GDP) of Nigeria has grown at an average rate of 3.4 percent annually since independence, based on Nigerian Government figures on real GDP (fig. 1). This rate is approximately equal to, or slightly higher than, the growth rate of population, indicating that real GDP per capita is about equal today to 1960 levels. Major declines during the civil war and since 1980 have offset periods of relatively rapid growth. GDP in 1984 was down 0.6 percent in current naira from 1983 (*20*).

The composition of GDP has shifted in favor of mining, manufacturing, services, and utilities. Government statistics show agriculture as the slowest growing sector since 1960, but the statistics must be interpreted cautiously because they have been gathered by

institutions with very limited means. Estimates of GDP by international agencies, such as the IMF, differ from Nigerian Government figures in 1 year by as much as 15 percent, and estimates of production within particular sectors may diverge even more. Agriculture's contribution to GDP in particular is underestimated. The Nigerian Government uses production estimates which are generally well below U.S. Department of Agriculture (USDA) estimates (*109*). Independent estimates of agricultural value rely on prices offered by Government commodity boards which are well below average farmgate prices for food crops.

Table 2 shows Nigerian Government data on value of production in various sectors and U.S. Embassy estimates of percent production change since 1972 by sector. The data on sector contributions to GDP suggest the relative size of these sectors. The Nigerian Government has not yet released more recent data in this series. The production indices do not account for relative price change, but they suggest trends in productivity over the past 10 years. The largest sectors are agriculture, trade, and mining. Agriculture has grown relatively slowly, while mining has declined in quantity terms since 1972. Manufacturing grew rapidly until 1981 but has declined rapidly since then. The Nigerian Government reports that in 1984 agricultural value rose by 2 percent to 4 billion naira in current terms, partially offsetting an 8-percent decline during the drought year of 1983 (*19*).

Figure 1
Nigeria: Gross Domestic Product and Oil Revenues, 1960-83



Source: (61)

Although the contribution of growing petroleum revenues to real GDP is unclear, the rise in petroleum exports was important in restructuring and raising Federal revenue, thereby contributing to the strengthening of Federal institutions after the civil war. By 1980, collections from petroleum revenues were 82 percent of all Government income, but the proportion has declined since then to 60 percent in the 1985 budget. Government consumption rose in the national accounts at the same rate as GDP during the seventies.

The other major sources of Government revenue are taxes on domestic production and consumption, a company income tax, and import duties. Increases in excise taxes have contributed to steady growth in revenue from taxes on production and consumption. The wide variations in imports have produced wide variations in revenue from duties. The IMF regarded the Government revenue scheme on the whole as regressive based on the buoyancy of major revenue categories in relation to GDP. Generally, taxing policy is designed in part to create some incentive for locating

Table 2--Nigeria: Composition of gross domestic product

Item	Real value 1/		Production index 2/	
	1973	1981	1981	1984
	1977/78 million naira		Index (1972 = 100)	
Gross domestic product	24,850	30,470		
Agriculture	7,708	6,971	3/ 125	3/ 128
Trade	4,702	6,920	NA	NA
Mining	6,435	5,444	4/ 75	4/ 71
Building	1,921	3,204	NA	NA
Manufacturing	993	2,508	364	200
Government services	889	1,618	NA	NA
Transport and communication	920	1,458	NA	NA
Housing	858	1,195	NA	NA
Other services	346	1,056	NA	NA
Utilities	78	185	328	360
Cotton textiles	NA	NA	235	81
Vehicle assembly	NA	NA	1,139	850
Cement	NA	NA	170	140

NA = Not available.

1/ Source: (42)
2/ Source: (108)
3/ Source: (109)
4/ Source: (61)

private investment, but Government tax policy does not attempt to redistribute income (*17*).

Total federally collected revenue was 11.3 billion naira in 1984 and is expected by the Government to be about the same in 1985. Of this amount, the portion which is retained by the Federal Government rather than passed on to the States increased to 6.7 billion naira from 5.0 billion naira in 1983. The 1985 budget retains the 1984 proportions.

Net capital inflow from foreign sources has not been a major source of Government revenue for most of independent Nigeria's history. Generally conservative borrowing policy has been followed and, since 1977, vigorous policies for establishing local ownership of industry have been followed. Severe import limitations and large debt payments in 1984 followed 2 years of rapid debt accumulation. A short-term repayment problem remains on an external debt of 7.9 billion naira reported by the Government in October 1984. The IMF reported external debt for the end of 1984 at $18.3 billion (*62*).

Capital expenditures accounted for about half of Government spending in the 1985 budget, down substantially from 1984 levels in order to continue debt repayment, according to former Head of State Buhari (*48*). The focus of Government capital expenditure has shifted with political priorities but has included emphasis on roads, education, port facilities, petroleum mining and refining, irrigation, and factories for steel, fertilizer, and cement.

International Trade

The history of foreign trade in independent Nigeria must be interpreted in relation to the predominant commodity, petroleum. Even at independence in 1960, petroleum exports provided nearly 3 percent of all export value. By 1970, however, petroleum accounted for nearly two-thirds of exports and, thus, was already the dominant commodity of Nigerian trade. From 1973 to 1980, the volume of petroleum exported remained fairly constant, but price changes generally increased the value exported (table 3). Annual variation in value of petroleum exports or, probably, even the error in measuring that value exceeded the value of all other exports.

The quantity of petroleum exports declined by one-third in 1981 and further in 1982 to half the annual level of the 1973–80 period. By 1983 the value of petroleum exports was less than half the 1980 level measured in current dollars.

The value imported responded to this export pattern and other factors such as debt accumulation and population growth. Import values rose from 1970 to 1982, except for a decline in 1979 (table 3). Petroleum exports rose until 1980 except for a decline in 1978. Peak imports and peak exports were 20 times their respective 1970 levels.

Agricultural commodities constituted the bulk of Nigerian exports prior to the rise of petroleum. Their value rose until 1978 and since then have generally declined in real value terms. Various crops have been important exports since 1950: bananas, peanuts, palm oil, cotton, and cocoa. Peanuts, palm oil, and cotton are now imported. Only cocoa is an important export now, accounting for half or more of all agricultural export value each year since 1975.

Agricultural imports have remained at 8–10 percent of all imports, rising and falling with petroleum revenue. Nearly all agricultural imports are food, with relatively small amounts of tobacco, cotton, and other fibers. Grains have constituted an increasing proportion of agricultural imports, rising from 20 percent in 1975 to over 40 percent in 1985. Animal product imports, principally poultry and milk, rose more slowly than grain imports and have fallen more sharply since 1982. Those imports remained close to 20 percent of agricultural import value until 1982 when they dropped to 14 percent. Other agricultural imports are principally vegetable oil and sugar, their combined value generally exceeding that of grain imports, although their growth and decline pattern has been more erratic.

Terms of Trade

The net barter terms of trade compare prices of exports with prices of imports. A strong trend of decline in this ratio may indicate a substantial burden on an economy which depends heavily on foreign trade. Conversely, a rising ratio of export prices to import prices

may indicate a bounty flowing from international markets. Because a particular country is seldom able to influence world prices, changes in terms of trade are usually considered to be exogenous factors influencing an economy's performance.

For Nigeria, net barter terms of trade usefully measure an aspect of the opportunities offered by international trade. Nigeria is unable to control the price of any commodity although it participates in cartels for export of several commodities. Also, the production efficiency of its export commodities has not altered greatly since 1970, simplifying interpretation of the terms of trade ratio.

Table 4 shows prices derived from data on quantity and value traded. The price of major agricultural imports has been constant or, as for wheat and sugar, declining over the past decade as measured in current dollars. In real terms, prices declined for all of these commodities.

The prices of the major export commodities have been more variable although both cocoa and petroleum are well above 1970 levels. Cocoa prices peaked in 1978 at a level nearly five times the 1972 price. Petroleum prices rose most sharply in 1974 and in 1980, reaching a level in 1981 more than 20 times that of 1970.

Even though the prices of both exported commodities have been falling recently, it is clear that the terms of trade for agricultural imports since 1970 have strongly favored Nigeria. An analysis over the period 1970–78 found the terms of trade for petroleum

Table 3--Nigeria: Composition of international trade, 1960-84

Trade/commodity	1960	1970	1975	1976	1977	1978
	Million dollars					
Imports:						
Grains	10	24	101	165	306	541
Animal products (food)	10	24	101	115	176	229
Nonfood agriculture	3.3	2.7	15	5.1	5.2	7.6
Other agriculture	32	41	292	269	410	450
Total agriculture	56	91	508	555	896	1,227
Total imports	605	1,042	6,234	7,727	10,030	11,995
Exports:						
Cocoa	98	186	224	301	470	592
Total agriculture	391	450	446	532	741	819
Petroleum	12	781	7,513	8,935	9,853	9,020
Total exports	464	1,221	8,026	9,486	10,638	9,887

	1979	1980	1981	1982	1983	1984 1/
	Million dollars					
Imports:						
Grains	305	462	748	561	467	442
Animal products (food)	199	321	350	331	165	137
Nonfood agriculture	7.2	6.9	13	30	21	18
Other agriculture	429	852	1010	807	552	403
Total agriculture	940	1,642	2,122	1,728	1,205	1,000
Total imports	9,789	15,854	19,370	20,256	14,066	NA
Exports:						
Cocoa	456	403	247	198	271	431
Total agriculture	701	467	333	404	460	NA
Petroleum	16,131	23,877	18,103	14,812	11,359	11,269
Total exports	17,020	24,659	18,676	15,241	11,844	11,701

NA = Not available.
Note: Totals may not add due to rounding.
1/ 1984 imports from USDA/ERS estimates.

Sources: (61, 107)

exporting countries rose 395 percent for wheat imports and 350 percent for manufactures imports (*63*). Another study found the barter terms of trade for all imports rose 50 percent from 1972 to 1980 for middle-income oil exporting countries. Over the next 3 years, however, that figure fell by 7 percent (*93*). At a macroeconomic level, price changes have benefited Nigeria, but the agricultural sector within Nigeria has faced downward price pressure from international trade.

Sources of Imports

Since Nigeria was a British colony prior to 1960, Britain has been the major trading partner of Nigeria. The linkages established during the colonial period contributed to Britain's leading position among sources of imports ever since. Other leading sources in the eighties include Hong Kong, the Federal Republic of Germany, Japan, France, and the United States in declining order of value exported to Nigeria.

Agricultural imports have come almost entirely from Western Europe and the United States, which together account for 80-90 percent of agricultural imports each year since 1976 (table 5). The United States has provided between 21 and 27 percent of Nigerian agricultural imports during this period while ranking as the largest supplying nation. Most other agricultural imports consist of palm oil from Southeast Asia.

This pattern, stable during the past 10 years, may have changed in 1985 as a result of a new strategy for conserving foreign exchange. Countertrade agreements of $1 billion each were signed with France (*7, 76*), with Brazil (*3, 5*), and with several other countries. These

Table 4--Nigeria: Prices of commodities traded, 1970-83

Trade/ commodity	1970	1971	1972	1973	1974	1975	1976
				Dollars per ton			
Imports:							
Wheat	82	84	110	130	252	218	214
Rice	112	269	288	373	500	582	472
Sugar	160	173	283	321	542	1000	562
Palm oil	--	--	--	--	--	--	458
Poultry	--	--	--	--	--	--	750
Exports:							
Cocoa	949	743	675	799	1,279	1,508	1,565
				Index (1980=100)			
Petroleum 1/	5	7	8	11	32	34	36

Trade/ commodity	1977	1978	1979	1980	1981	1982	1983
				Dollars per ton			
Imports:							
Wheat	201	153	172	205	196	177	163
Rice	367	545	571	560	600	449	420
Sugar	416	446	377	598	498	368	341
Palm oil	625	694	808	760	696	601	580
Poultry	708	687	577	556	600	652	706
Exports:							
Cocoa	2,510	3,306	3,292	1,813	1,351	1,692	1,529
				Index (1980=100)			
Petroleum 1/	41	40	59	100	108	99	85

-- = No imports.
1/ From (61).

Source: Adapted from (47)

Table 5--Nigeria: Sources of agricultural imports, 1975-83

Region	1975	1976	1977	1978	1979	1980	1981	1982	1983
	Million dollars								
Africa	26	8	1	11	13	9	85	22	11
Asia	5	13	78	178	75	99	161	146	161
Latin America	6	11	36	47	23	30	55	39	12
Western Europe	289	351	546	675	591	1,122	1,249	1,029	670
United States	98	151	213	301	212	348	544	468	328
Others	84	20	22	14	27	34	28	25	23
Total 1/	508	555	896	1,227	940	1,642	2,122	1,728	1,205

1/ Totals may not add due to rounding.
Source: (107)

agreements exchanged Nigerian petroleum for various commodities at world prices by maintaining a bank account in foreign currency which is adjusted to reflect net trade each month. By this mechanism the velocity of foreign exchange is greatly increased, a benefit especially important to Nigeria, while assuring large sales from the specific partner countries involved. Precise allocation of the commodities to be imported by Nigeria was not announced although French sugar and Brazilian sugar and cotton were included. The Babangida regime suspended the use of countertrade in late 1985 although it indicates some form of countertrade may be used again later (*8*).

OVERVIEW OF THE AGRICULTURAL PRODUCTION SYSTEM

The agricultural sector includes several distinct subsectors which are distinguished by the type of product being grown but which also differ in their geographical location, the level of their technology, and their level of integration into markets. These differences, in turn, create different competition for inputs and for consumers within the subsectors. Each of these qualities is discussed for the five subsectors: root crops, grains, cash field crops, tree crops, and livestock.

Composition of Agricultural Production

The greatest volume of agricultural production in Nigeria is in root crops such as cassava, yams, and cocoyams (taro), averaging over 30 million tons produced annually during 1982-84 (fig. 2). Cassava and yams are grown throughout the southern half of the country while cocoyam is grown in the cocoa region of the southwest. The Food and Agriculture Organization of the United Nations (FAO) estimates these crops provide 30 percent of the calories consumed in Nigeria (*46*).

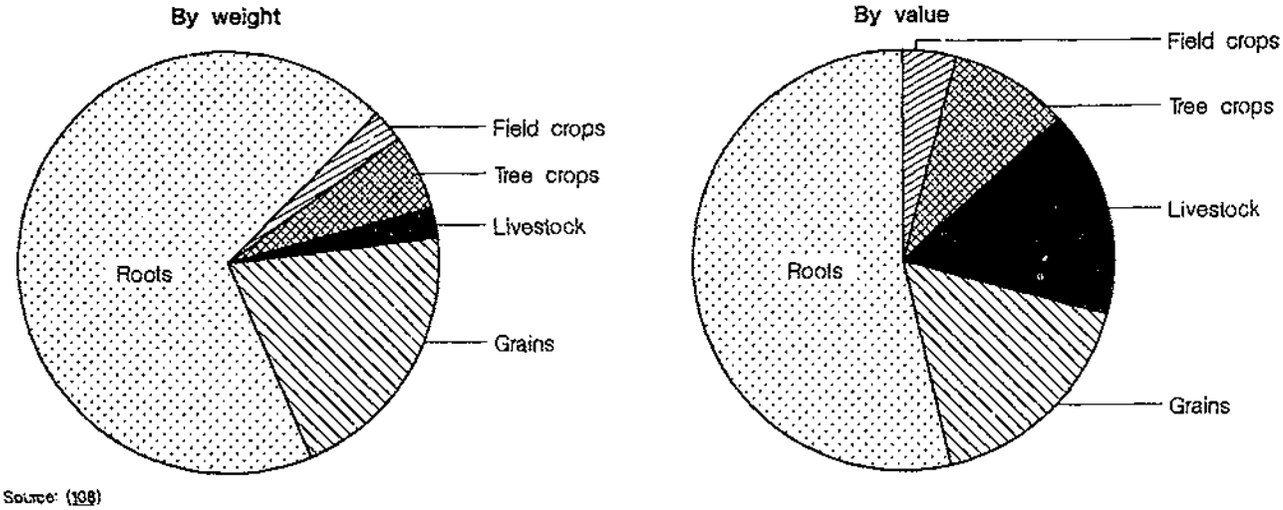
More than 40 percent of calories consumed are estimated to come from grains. Domestically, the bulk of this is provided by the sorghum and millet agriculture prevalent throughout the country's northern half. Corn, grown mainly in the south, accounts for 15 to 20 percent of grain production. Rice, grown in river valleys throughout the country, currently adds about 15 percent of grain output. The value of the rice crop, however, is approximately equal to that of millet or sorghum.

Livestock production yields more than 10 percent of the value of all agricultural production, with poultry exceeding values from beef, milk, mutton, and pork. Fish are also important along the coast, rivers, and lakes. Domestically produced fish are estimated to provide about 30 percent of the animal protein consumed nationally, but total animal protein is only 15 percent of all protein consumed.

Field cash crops include pulses, peanuts, cotton, sugar, tobacco, sorghum, and sesame. Pulses, peanuts, and cotton are grown in the north, although cotton is concentrated in river valleys. The total value of these crops currently constitutes about 4 percent of agricultural value.

Tree and bush crops have long been the major commercial crops. These are generally southern crops with cocoa in the southeast and

Figure 2
Nigeria: Distribution of Agricultural Output by Crop, 1981-83



Source: (108)

rubber and palm in the south-central and southwestern areas. Bananas, palm products, cocoa, and rubber are the most important. Kola nuts and coffee are also significant. Together, these crops account for about 7 percent of agricultural value.

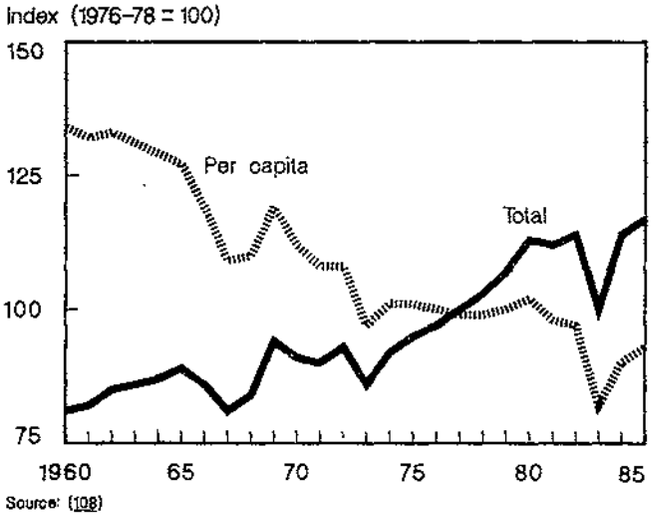
Changes in Composition of Agricultural Production

The data measuring performance of Nigerian agriculture reflect some major historical events and reveal certain long-term trends, even though details of agricultural performance are obscured by the poor quality of the data. The index of total value of agricultural production (fig. 3) rose at about 1 percent per year from independence until 1975. Substantial shortfalls occurred during the civil war and during the drought in the early seventies, but the index returned to the trend line quickly after these events. Since 1975, the index has grown at about 3 percent per year, except for a drop in the drought year of 1983.

The index of per capita agricultural production (fig. 3) would, in theory, better describe Nigeria's performance in meeting its needs. In practice, however, this index is calculated by mechanically adjusting the production value index under an assumed population growth. The result of these calculations indicates that the value of per capita production declined about 2 percent per year during the first 15 years of independence and stabilized thereafter. Again, substantial declines are indicated for the drought years and the war years.

Data on quantity produced of specific products must also be regarded as poor, but they are more reliable than value data because they do not include tenuous price measurements. In recent years, total production of palm products, cocoa, and cotton has declined. Production of bananas, peanuts, and sorghum has been stable recently, but at a level well below historical highs. Production of yams, corn, millet, pork, beef, and lamb has grown modestly and production of poultry and rice has grown rapidly.

Figure 3
Nigeria: Indices of Agricultural Production, 1960-85



Source: (108)

These shifts indicate that the composition of Nigerian agriculture in the past decade has tended away from cash crops toward food crops and has tended toward meat and rice (table 6). These findings are consistent with the view that export agriculture has been less emphasized since oil revenues became important and that urban tastes have affected the food market.

Table 6--Nigeria: Agricultural production quantity trends since 1972/73 drought

Trend	Product
Declining	Palm products, cocoa, cotton
Stable	Peanut, sorghum, rubber, kola nut, tobacco
Slowly growing	Corn, millet, yam, cocoyam, beef, mutton, pork
Rapidly growing	Rice, poultry

Source: (109)

Agricultural Production Techniques

In savannah areas where field crops are grown, several production systems have been developed. Rainfed agriculture on higher land is called *gona*. In depressions and along rivers where there is seasonal flooding, the agriculture is termed *fadama*. Finally, there are many areas where the land is irrigated. In all of these areas, except where large-scale irrigation predominates, intercropping and crop rotation are practiced, although the selection of crops varies widely.

National data describing the area of crops under each of these practices are unavailable, but their relative distribution is suggested by regional studies (*36, 67, 81, 82*). Millet, sorghum, cowpeas, and peanuts are grown on *gona* land, in various combinations and in various rotations. Up to eight crops may be grown on a single piece of land. Cowpeas and millet are apparently each grown only in combination with other crops, but occupy 10–50 percent of the land in the areas studied. Sole cropping predominates in *fadama* areas, apparently because the most extensive high-value crops grown in these areas (rice and sugarcane) are incompatible with other crops.

Although the yield of any particular crop is higher when grown as a sole crop (except, possibly, for cowpeas), mixed cropping appears to offer several advantages. The different growth cycles of crops grown on the same field allow fuller employment of land and labor throughout the year. Mixed cropping also provides some protection from erosion by maintaining mature plants on the field for a longer period, and it allows rotation of crops within a field from year to year. From an economic perspective, there is evidence that mixed cropping reduces variability in returns and even raises the average return to labor (*82, 85*).

Crop rotation is widely practiced, often including a legume in the cycle. Where crops are grown mixed, a ridge system may be used in which topsoil and organic matter are concentrated into ridges occupying only half the field area. These ridges aid drainage and weeding. As a new season begins, the ridge is split, effectively rotating soil use each year. In another common practice, termed "ring cultivation," food crops are grown closer to the home site and receive more organic matter and labor. Under this system, longer periods of fallow are typical in the rotation of more distant fields. Fallowing is an effective way to restore soil productivity, but farmers are often limited in their ability to use this tool. Increasing population pressure in many areas places immediate food needs as a higher priority and reduces fallow periods while, in other areas, labor shortage or excessive seasonal moisture cause fallowing of productive *fadama* land.

Overall productivity in the savannah has been estimated according to tool use. Given the production methods described above, case studies indicate that indigenous practices, defined as hand hoe cultivation, achieve yields per land area of half or less than would be achieved by improved practices, meaning cultivation with animal traction. The yields under improved practices are, in turn, about half of the level achieved at experiment stations (*82*).

Large-scale, mechanized farming does not contribute a large portion of field crop production, although the Government continues major investment in such technology. The World Bank has reported that

yields on large-scale Government farms are below the national average and that economic returns on these operations are, at best, marginal.

Tree crops are grown mainly by smallholders in Nigeria. Bananas and plantains are produced for domestic food supply throughout the south. These fruits were typically planted as the first crop after clearing fallow land, but as less land is fallowed they are more often grown on the margin of fields.

Palm products originally became a major export crop based on collection of fruit from wild trees. Recently, however, the Government has supported planting of oil palms to the extent that 28,000 hectares (ha) were planted between 1976 and 1980 (*39*).

About 20 percent of rubber production comes from plantations, but 98 percent of the area in rubber trees is owned in holdings of less than 4 ha. Rubber production is declining: only 6,000 ha were planted between 1976 and 1980 (*39*).

Forest products are derived principally from unmanaged woodland areas. Forest reserves, constituting about 9.5 million ha, have been established for protection from clearing. Some 115,000 ha since 1960 in high forest areas have been planted for lumber use, but most woodland, which is used for firewood, suffers from overuse (*39*).

Cattle production is strongly concentrated in the north because of tsetse fly infestation in more humid areas. The Fulani people own about 90 percent of the nation's stock, raising them in an annual migration which follows the edge of the fly area as it shifts with the seasons. Malnutrition and sale of milk in competition with calves severely limit productivity, resulting in an annual harvest of less than 13 percent (*91*). The roaming herds, especially during the trek to southern markets, are meeting increased competition for land use from irrigation and other cropping, although marketing in this sector is making greater use of road and rail transportation.

Alternatives to the Fulani cattle culture exist. About 4 percent of cattle in Nigeria are breeds which tolerate the trypanosome parasite. These breeds are generally small but can prosper in the humid pasture areas. Also, several exotic breeds of relatively high-yielding dairy cattle have been introduced, but have apparently failed to make profits thus far.

Sheep and goats are also more common in the north although 30–40 percent of the national herd are reported in the south. A study of small ruminants in the southwest found they are relatively productive, allowing an annual harvest rate over 40 percent for both sheep and goats (*77*). Traditional husbandry consists of scavenging near the village compound during the day. More intensive production efforts have suffered from disease associated with higher population density.

Poultry has traditionally been raised as scavengers in village compounds, with low annual harvest and almost no production of eggs for consumption. Recently, however, commercial operations designed to serve urban areas with both eggs and broiler meat have attempted to exploit improved breeds through private enterprise. These efforts have significantly raised poultry production, especially of eggs, but their reliance on commercial feeds has left them vulnerable to input shortages. When grain imports were restricted in 1984, commercial poultry production declined abruptly (*9*).

Most fishing is done in small canoes along the coast. Under the Third National Development Plan, about 1,000 outboard motors were supplied to such fishermen (*38*). A modern commercial fleet of about 300 ships also exploits coastal and inshore areas. A large off-shore fishing industry is pursued by foreign trawlers, although Nigeria claims an exclusive economic zone extending 200 nautical miles from shore. There is also potential for expanding freshwater fishing in both lakes and rivers.

Sector Characteristics

Nigerian agricultural production results from the combination of land, labor, and capital. The quality and distribution of these factors help determine success of agriculture but research, extension, and marketing contribute as well.

Agricultural Research

State institutions (research institutes, universities, and regional development authorities) pursue formal agricultural research programs in Nigeria.

The first agricultural research institute began in Lagos in 1893. The early research efforts were strongly oriented toward export crops with a model farm for rubber propagation in 1899 and a cotton research farm in 1905. By 1960, institutes specialized in research on root crops and livestock. Also by 1960, Nigerian research stations concerned with cocoa, oil palms, and trypanosomiasis were serving other West African countries. Today, 18 agricultural research institutes are functioning, including several each in fisheries and forestry. Ibadan, Nigeria, is the headquarters of the International Institute of Tropical Agriculture (IITA).

The constitutions of 1954 and 1963 called for research by both State and Federal Governments, but a clear, if unwritten, hierarchy became established in 1973 with a decree which empowered the Federal Government to take over State research stations. Some States encouraged Federal takeover as a cost-saving measure. Since 1973, Federal institutions have conducted mostly basic research, and State institutions have focused on applications of that research.

The Agricultural Research Council, established in 1971, previously coordinated all agricultural research. The National Science and Technology Development Agency now has responsibility for all areas of research, including coordination.

The budget allocated to agricultural research institutes has declined since independence as a proportion of all Government expenditures, although it has risen with each plan in absolute terms. In the First National Development Plan, agricultural research institutes received 3.3 percent of public sector expenditures. In the Fourth National Development Plan, only 0.55 percent of the budget went to these institutions (*39*). Part of this decline may be attributed to reduced emphasis on agriculture in the budget, but research as a proportion of agricultural allocations is also steadily declining. From the First to the Fourth Plans, research as a share of agricultural spending fell from 23 percent to 4.2 percent. This image of low investment in agricultural research, however, is countered by data on human capital usage. The World Bank reported in 1979 that more than a third of all high- or middle-level scientists in Nigeria worked in research institutions (*121*). Even so, vacancy rates exceeding 50 percent were common at agricultural research institutes (*58*) even before the retrenchments of the eighties.

Money for agricultural research is allocated to institutions, and each institution specializes in one or more commodities. The distribution of funds does not reflect relative contribution of commodities to the economy, but the allocations do reflect national goals for balancing agricultural production. Livestock and fisheries research received relatively large allotments in the early fifties when policymakers were especially concerned with protein intake. Before 1960, export crops were heavily favored in research allocation. Food crops have been separated from export crops and have received greater emphasis since 1970, although research allocation in this area remains below 50 percent while food crops provide over 90 percent of calories consumed.

The identification of research institutes with particular commodities has strongly emphasized agricultural production. The lack of clear national objectives in research has focused little attention on marketing, soils, water management, mechanization, or other aspects of agriculture. The primary exception to this pattern is the Institute for Agricultural Research which allocated over 20 percent of its budget to socioeconomic research and 13 percent to soil fertility and nutrition studies during the late seventies.

In addition to the 18 agricultural research institutes, the Federal Government operates 9 institutes specializing in other areas of research. Some of these, however, research agricultural topics. For example, the Fourth National Development Plan lists among the recent achievements of the Project Development Institute a new design for egg incubators, grain dryers, and a palm kernel cracking plant. The Federal Institute of Industrial Research was cited in the Fourth

Plan for developing new uses for or improving processing of several agricultural commodities. This institute is responsible for concentrating on "research and development of post-harvest technologies for industrial processing of local foodstuff" (*39*). Thus, the tight focus on production technology found at the agricultural research institutes is complemented by research on other aspects of the production process at other institutes.

Further agricultural research is undertaken with less centralized control by universities, development projects, and private sector firms. Universities have maintained close contact with the research institutes. Several institutes were formed from university programs and, in the case of Ahmadu Bello University and the National Animal Production Research Institute, a university controls an institute. In 1977, universities and Federal institutes agreed to several areas of cooperation. Further formal links, particularly for tree crops, are still being considered (*60*). Private sector research has been important in a few crop areas, notably the program run by the Empire Cotton Growing Corporation, but private sector contributions declined as the state accepted a larger role in research.

Extension Services

The task of extending research results and other information to farmers is generally considered to be a function of State Governments. Formal contact among the appropriate Federal and State Government agencies is maintained through the National Accelerated Food Production Programme. The World Bank cites this program for its major effort to make research institutes aware of the farm-level problems of technology adoption. Extension efforts, however, are generally considered inadequate, even by the Nigerian Government. In some cases, research has provided recommendations which were subsequently found to be faulty. The Ministry of Agriculture recommended inappropriate, "improved" sorghum varieties for the Funtua Project because their research failed to account for socioeconomic variables (*26*). More commonly, the extension services have failed because of insufficient staffing. In 1980, the Government of Nigeria reported a 1:2,500 ratio of extension workers to farmers, compared with a 1:250 ratio in Kenya. The Fourth National Development Plan set a goal of raising Nigeria's ratio to 1:800 by 1985 (*39*).

The National Accelerated Food Production Programme also provides some extension services through its Agro-Service Centers. These centers are patterned after U.S. farm cooperatives principally for dissemination of chemical inputs, but they also emphasize technical information. Although their services are limited, the Agro-Service Centers provide a way to spread technical knowledge beyond the reach of conventional extension workers.

Specific development projects also provide extension service. Operation Feed the Nation, for example, was largely a publicity campaign to raise the status of farming, but its educational efforts also served an extension function. The Integrated Agricultural Development Programme uses extension work heavily to promote packages of crop and mechanical technology within specified agricultural development projects (ADP's). In a 1980 evaluation of the Funtua project, D'Silva and Raza found the ratio of extension workers to farmers had risen to 1:277, improving agricultural productivity. They criticized the project, however, for its high cost and for its impact on distribution of farm income. In contrast, extension information not only succeeded in promoting adoption of new technology packages in a northern Nigeria project, but also led to enthusiastic recommendation for similar efforts elsewhere (*82*). The other major rural development effort in Nigeria, the Accelerated Development Areas Programme, lists extension work, along with input distribution and road building, as its focus. This program is designed to spend less per farmer and to reach a larger area than the ADP program. This program is too new to have been evaluated yet.

Farmer Training Institutes and primary schools also provide agricultural education. The major expansion of public primary schools, begun in 1976, has emphasized in rural areas the teaching of skills which will promote farm employment and thereby reduce urban migration.

Distribution of Agricultural Inputs

The distribution of agricultural inputs is an important measure of development and reveals much about the direction and pace of future development. The subsectors with better access to resources will probably grow better.

Land--Land quality is defined here in terms of its ability to serve production; thus, the natural endowment of land favors various land uses differently. Similarly the distribution of land quality inevitably favors certain regions.

Across Nigeria neither temperature nor slope varies widely enough to be an important regional parameter of land quality, but several other natural characteristics are important. The dominant natural constraint on returns to land is water shortage, so land quality is principally a result of proximity to water, whether rain, rivers, lakes, or marsh. Some areas, also, are affected by forests, fish, oil palm, trypanosomiasis, and natural transportation channels. These factors have contributed to the present distribution of land uses in obvious ways, although some modifications of their efforts are possible (table 7). For example, tillage practices, irrigation, and crop selection can mitigate water shortage.

Within a given natural environment, the distribution of rights to land use is determined by land tenure arrangements. Traditional tenure throughout Nigeria allocated use rights without establishing institutions for land sale or rent. Allocations under this system were administered by village chiefs on the basis of the farmers' community membership and ability to use the land. Grazing land, wild trees and fish, and fallow were common property. Planted trees belonged to the planter. Inheritance of use rights was patriarchal and was limited to one son or brother of the deceased.

This traditional system was changed in most of the area north of the Niger and Benue rivers as a result of the Fulani conquest completed about 1810. The Fulani organized land use into feudal emirates. Inheritance followed Islamic laws in which all offspring share the inheritance.

With the subsequent British conquest, some Western tenure concepts were introduced, but their effects were limited to urban areas. In spite of colonial legislation directed at rural land tenure, the traditional and the Fulani-imposed patterns remained typical. Even today some fief holders in the north collect rent in the form of tithes, called *zakka*. The actual payments reported by researchers during the seventies are closer to 5 percent than to 10 percent of farm income, and they are generally insufficient to provide very large incomes to landowners (*2, 68*).

After 1960, the Federal Government followed the colonial administration in attributing numerous development problems to land tenure institutions. Among the problems they cited were fragmented holdings, insecure tenure, and overuse of common grazing lands. Fragmented holdings, especially in the north,

Table 7--Nigeria: Estimates of land use, 1958-82

Item	1958 1/	1961 2/	1968 1/	1971 1/	1975 2/	1978 1/	1980 3/	1982 2/
	1,000 ha							
Formal irrigation	NA	7	10	14	NA	NA	NA	NA
Informal irrigation	120	NA	NA	NA	NA	800	NA	NA
Crop	NA	NA	NA	NA	2,497	NA	NA	2,535
Pasture	NA	25,800	NA	NA	20,757	NA	NA	20,920
Forest	NA	31,592	NA	NA	16,357	NA	NA	14,600
Cultivable	NA	21,795	NA	NA	30,000	NA	71,200	30,435
Total land area	NA	92,377	NA	NA	92,377	NA	98,300	92,377

NA = Not available.

1/ Source: (121)
2/ Source: (47)
3/ Source: (39)

were said to inhibit improved technology and to waste effort in moving among fields. Insecure tenure was said to inhibit long-term investment and to prohibit the use of land as collateral in loans. Shared property tends to be overused.

Offsetting these problems are several advantages of traditional tenure. Fragmentation of holdings allows sharing of land quality and promotes diversification of output. Access to means of production is relatively secure for family groups. The traditional system is compatible with bush fallow technology because it can shift use rights from year to year as the land in cultivation shifts. Furthermore, because such an arrangement is unwritten, the traditional system can be flexible in response to changing conditions of production. Flexibility has extended even to a form of sharecropping, called *abusa*, by which northerners have moved to the cocoa region to work as sharecroppers. Their role as outsiders allows local people to claim a share of their output, but even the outsiders' rights to land use are heritable.

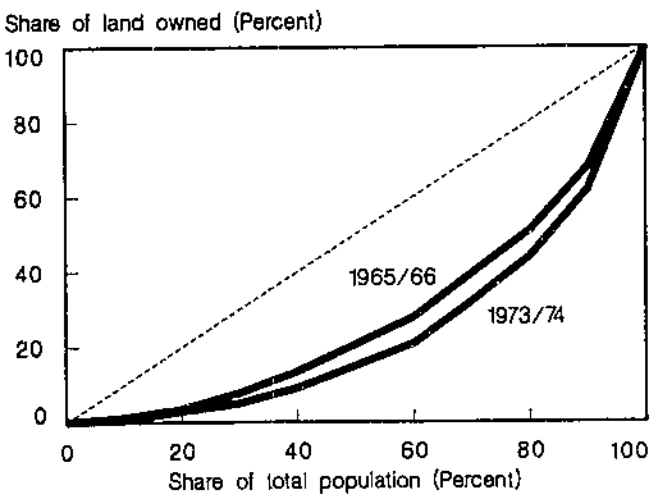
The Land Decree of 1978 represented a major change in land tenure arrangements. The Decree, which was included in the 1979 constitution, requires a certificate of occupation for traditional holdings and payments of "rent" to the Government. It attempts to establish a Western concept of tenure including selling and leasing of rights even though ownership is formally held by the state. Inheritance is limited to one heir. Certain provisions of the Decree limit the total size of holdings by one person. In urban areas, no single person may own more than one-half hectare (ha) in any State. No one may own more than 500 ha of cropland nor more than 5,000 ha of grazing land.

The land reform has not been successful in alleviating the problem for which it was presumably prepared. In most areas it has not been implemented. An important reason for this failure has been the resistance of traditional leaders in the south. Their influence on land allocation is a major vehicle for their power; thus the land reform may be viewed as an attempt to shift power from traditional leaders to the state. The issue of land reform is not presented as a high priority of the Government today. It is not mentioned specifically either in the Fourth National Development Plan of the last civilian Government (*39*) nor in the plan revisions of the military Government of former Head of State Buhari (*19*).

Regional studies vary widely in findings of typical farm size with a range among studies of from 3 to 15 ha found in the savannah (*81*). The Federal Government determined that the national average area farmed per household was 2.5 ha in 1966 and 2.7 ha in 1974 (*37*). Based on these figures, the restrictions on farm size contained in the 1978 Land Decree are much larger than typical holdings. Observers agree that increasing population has contributed to an overall decline in farm size as well as a decline in soil husbandry. National surveys in 1966 and 1974 showed a concentration of land ownership with the Gini coefficient, a measure of inequality, rising from 0.435 to 0.520 (fig. 4). Although urbanization tends to relieve the pressure on land area, recent high unemployment has seen many people return to farming (*102*).

Declining farm size will probably reduce per capita farm income even though aggregate production may rise. Cross-sectional studies in Nigeria have found that smaller farms have higher yields per unit of land area even though returns to labor are less (*23, 88*). The relationship between farm size and family income is complicated by the effects of land quality and off-farm income. Off-farm income opportunities for rural residents,

Figure 4
Nigeria: Distribution of Farmland



Source: (4042)

particularly from trading, tend to benefit farmers with large holdings. Williams concludes that the correlation between farm size and family income is weak for medium-size farms and relatively strong for large and small farms (*118*).

Although tenure arrangements allow a concentration of wealth with traditional leaders and distribution is apparently becoming less even in some areas (*81*), the consensus among researchers is that land distribution is not a major source of inequity in Nigeria (*17*). The failures of both capitalist farming and cooperative farming along with the protection against landlessness afforded by the functioning tenure system have left Nigeria dominated by subsistence agriculture which is not polarizing into owner and worker classes (*118*).

Labor—The agricultural labor force provided about 30 million jobs, about 60 percent of all employment, in 1980 (*39*). The sector's growth rate will probably accelerate from 3.2 percent annually now to 3.7 percent in the . ties, according to the World Bank (*121*). This figure compares with a growth rate of formal urban employment estimated at 8 percent annually in 1980.

Agriculture contributed just over 20 percent of GDP in 1979–80, but rural people do not depend entirely on farm income. Processing of agricultural products, arts and crafts, and trading are also important sources of income for rural people, particularly women. Although data are especially sparse, the World Bank estimates that rural nonfarm employment contributes 20–25 percent of rural income. Government surveys in the late seventies found that about 25 percent of rural men have off-farm income (*43*).

Some evidence indicates that rural labor is not strongly differentiated from urban labor. The World Bank found that remittances from urban workers to rural families are an important supplement to agricultural incomes (*121*). Sociological studies also show that urban people maintain close ties with the village from which they migrated (*16*). An important discontinuity in the national labor force is recognized by Bienen (*17*) in his study of income distribution in Nigeria, but it occurs between the formal and informal urban sectors rather than between rural and urban residents. The IMF has found that rural wages have kept pace with urban wages, indicating some unity in the labor market. The World Bank determined that 10–15 percent of rural males perform rural wage labor (*121*).

Even the rapid pace of urbanization suggests that urban migration is not an extremely difficult task (*17*). In 1978, Theophilus Fadayomi, a demographer, concluded that "the excessive growth of large towns in comparison with rural and relatively small settlements... supports the current hypothesis of massive population redistribution in favor of urban areas" (cited in *65*). Recent estimates show urban areas are growing at twice the national population growth rate or faster (*65, 106*). These sources find that the pace of urban migration became unusually high in the sixties and seventies. The World Bank reported an annual rate of urban migration of 0.5 percent of the rural population each year until the early seventies when it rose to 1 percent per year. This growth rate resulted in at least one-fifth of the population living in urban areas by 1981 (*105*).

Surveys of the labor force in 1967 and 1974, however, show a pattern of increasing numbers of children, declining employment, and declining working-age population as a proportion of urban residents, all characteristics typical of areas with low immigration (*79*). Recently, urban unemployment reportedly influenced substantial numbers of people to move out of urban areas (*102*). More people have moved into Kano than have moved out, but the rate has been too slow to relieve demand pressure for land (*118*). Although data on urbanization is poor, rural-urban migration has been heavy in some periods and the migration rates have changed rapidly at times.

Researchers generally explain the motivation for these migrations in terms of changes in perceived urban opportunities rather than as attempts to escape rural pressures. Nonetheless, farming has lost prestige as an occupation since oil revenue became important in Nigeria. For example, the World Bank refers to the view that physical work and low return associated with farming are unacceptable in a period of accelerating public expenditures financed by oil sales. The spread

of primary-level education has compounded this attitude both by removing young people from the work force and by raising their expectations about future earnings. These problems exist despite Government promotion of agricultural work by including agricultural training in the schools and through the publicity of Operation Feed the Nation.

Farmers have identified labor shortage as a major constraint on production (*87*). Several researchers have noted that the reduced participation of youth and the seclusion of women in Muslim areas is an important loss of labor (*70, 81*) and contributed significantly to the 1972-74 food shortage (*118*).

Labor shortage is difficult to reconcile theoretically with claims of land shortage. Part of this conflict may be explained by varying crop requirements. Land is a constraint principally for livestock and tree crops, and labor is a seasonal constraint for annual crops.

The revised Federal budget released in May 1984 regarded unemployment as an important problem, calling for labor-intensive enterprises and "a conscious movement back to the land." Thus, the Government apparently viewed unemployment then as an urban phenomenon. The budget attempted to encourage State Governments "to set up farm settlements to absorb surplus labor and increase food production" (*19*). This initiative, however, was abandoned in the 1985 budget. Unemployment figures for 1983, released in 1985, set urban unemployment at 7 percent, rural at 2.4 percent (*112*).

Labor productivity has remained constant over many years while traditional technology continues to dominate agriculture (*54*). Benchmark surveys in northern Nigeria found labor yields for wheat averaging 196 kg per worker-day over the year (*67*). Millet and sorghum were much less labor intensive with yields of 49 kg and 26 kg per worker-day, respectively. Multiplication by typical prices for the year of the survey, 1975, gives gross daily return to labor of 1.7 naira on wheat, 4.9 naira on millet, and 2.5 naira on sorghum. 2/

2/ Note that gross return to labor does not consider production costs or other constraints on work available per farmer.

From the perspective of agricultural workers, the return to labor is the wage rate. Although capitalist farming, in the sense of production based on the labor of wage earners for landowners, is not common, wage work is common. Family members are sometimes paid for farm work, complicating the designation of hired workers, but the benchmark survey which gave the above labor productivity figures attributed approximately half of the labor hours in the study area to hired workers. There is evidence that farm wages have closely matched minimum wages in urban employment although that point remains controversial (*57*).

The minimum wage has been periodically readjusted within a political environment more or less responsive since national independence to actions of various urban worker movements (*90, 119*). Since 1976, the Federal Government has issued wage guidelines regularly. The minimum wage of 125 naira per month was approved by Parliament in 1981, but it does not have legal standing for firms with fewer than 50 employees.

Fixed capital—Building fixed capital in support of agriculture includes both onfarm investment and investment in regional or national infrastructure. In Nigeria, onfarm investments include irrigation, mechanization, and storage. Other fixed capital investments affecting agricultural output include storage, transportation, education, and processing facilities. The emphasis among these types of investment has not varied widely since Nigerian independence even though the relative performance of investments has shown consistent differences. The annual expenditure on fixed capital, however, rose by 400 percent during the seventies, reflecting the rise in national income derived from oil sales.

Irrigation—Formal irrigation programs have received high priority among Government capital expenditures on agriculture since 1970. In that year, there were 14,000 ha of irrigated land in the country, one third of which was in a single project. Under the Second and Third Plans, numerous projects were undertaken to increase production of rice, sugarcane, wheat, corn, legumes, and vegetables (*38*). These efforts were consolidated under the control of nine River

Basin Development Authorities by 1976. In 1984, these institutions were restructured into River Basin and Rural Development Authorities and their number was increased to one for each State, except Lagos. The Fourth National Development Plan allocated 924 million naira to the Authorities and charged them with bringing the total irrigated area up to 1.4 million hectares. In addition, 257 million naira was allocated to State water programs aimed at small-scale projects including water for household consumption, livestock, and irrigation.

The capital cost on large-scale projects has been about 6,000-12,000 naira per ha and the annual operation cost has averaged 90-100 naira per ha. Because farmers typically pay only 25 naira per ha, even the operating cost exceeds the direct returns to the State. According to the World Bank, returns to farmers, after paying the users' fee, are zero or less (*121*). Thus, there is no potential to regain any portion of the capital investment.

In contrast, informal irrigation schemes seem to have been profitable during this period even though they have received minimal Government support. The estimated area of informal irrigation increased from 120,000 ha in 1958 to 800,000 ha in 1978, including 510,000 ha of riverine swampland and 120,000 ha of seasonally flooded land. The technology applied on this land consists of water control by labor-intensive pumping (*shadouf*), ditching, contour ridging, and small dams (*bunding*). The cost of such projects is set by the World Bank at 1,000 to 2,500 naira per ha (*121*). Approximately 2 million ha of land is physically situated favorably for informal irrigation.

Mechanization---Most efforts at mechanizing agriculture have been directed at increasing the use of tractors. The experience on experimental farms has been that increased tractor use reduces or, at best, equals the output per unit of land area achieved with traditional practices. Some advantage in productivity is possible, however, when tractors are used for clearing land.

Renting tractors from the Government began in 1948 and has grown today with Tractor Hire Units in every State. The total area covered by this effort, however, is extremely small compared with the area cropped. The FAO reported fewer than 9,000 tractors in Nigeria in 1981 (*47*). The coverage for an operable tractor is only 50 to 120 ha, and nearly half the tractors are inoperable. Hire rates are 50-75 percent of operating costs. Private tractor purchases are subsidized about 50 percent. Most private owners do custom work on a part-time basis, so that they use their tractors about twice as much as farmers who rent from Tractor Hire Units, according to the World Bank (*121*).

Tractor use has also been encouraged on large-scale, State-run farms. Nearly all States have established such farms, but none has been profitable. A World Bank study indicates the failure of these efforts lies in mismanagement rather than in the potential of the technology. In the revised budget of 1984, the Government continued to call upon State farms as a major source of production. More recently, the Government announced a wide range of incentives designed to attract foreign capital into large farms in Nigeria (*74, 99, 106*).

The use of oxen power has been successful in achieving positive returns, according to the World Bank. Government support for this technology has been limited to certain Agricultural Development Projects and data on its use are poor, but the World Bank finds that the number of oxen in use has increased steadily from 36,000 farms in 1965. A 1974 study of three northeastern States found 44,000 farms using oxen (*14*). Although oxen have already proven to be profitable and further improvements in the technology seem likely, the spread of their use is limited by the tsetse fly which potentially infests as much as 95 percent of the land mass of Nigeria (*25*). Control programs reduced the area unavailable to oxen to 60 percent by 1980 (*39*).

Storage---Most storage facilities are on northern farms for millet or sorghum. They are easily built and serve the region well without large losses, although increased use of insecticides has been recommended. The greater bulk of unshelled maize, which is more common in the south, and the higher humidity greatly reduce the usefulness of informal, onfarm storage systems in that area. Reserves in the north may be as large as the equivalent of 3 years' household consumption,

while southern stores are usually of only seasonal importance. Average capacity in the north was 25–32 tons in a 1975 study, slightly more than average annual needs. More than 80 percent of households in that study had granaries (*55*).

Large-scale, Government-built storage systems are almost entirely for strategic reserves. Both Federal and State Governments have built storage facilities, mostly during the period covered by the Third National Development Plan (1975–80) when capacity was increased by 600,000 tons (*38*).

Transportation—The road system in Nigeria was the largest investment planned by Government through 1980. The length of roadways stabilized around 1976 as the road building effort focused on upgrading existing roads. Since that time, the Federal Government has reported about 115,000 km of new road, of which one-fourth is paved.

The rail system is much less developed. Poor maintenance limits the usefulness of existing railways, so that their primary use is for relatively short-distance human travel. The Fourth National Development Plan reported 3,500 km of rail in 1980 and called for modernizing these lines (*39*).

Education—Higher levels of agricultural education are provided by seven universities with agricultural facilities. Many Nigerians also attend foreign schools. Most of the graduates of these programs go into Government employment, especially in the research institutes. More than 30 schools offer certificates or diplomas in agriculture, and there are about 50 vocational agriculture schools.

A 1979 World Bank study concluded that the output of the formal school system does not constrain agriculture and that higher education facilities may actually be overexpanded. The study also recommended increased training in irrigation and agricultural engineering. The capacity of intermediate schools was adequate, although they would need to expand, especially in marketing and agricultural education. The vocational school system was minimal, requiring substantially increased programs in agricultural mechanization, tractor driving, animal husbandry, and various crafts (*121*).

Processing—Food processing continues to be based largely in very small-scale village operations. A 1975 study found that as many as 90 percent of women in northern villages were thus employed, reflecting their limited employment opportunities. Their income from this work was estimated at 3–9 U.S. cents per hour (*94*).

The manufacturing sector has grown rapidly since independence, reportedly at rates of 11–16 percent annually in the Fourth National Development Plan. Until the recent turn toward petroleum-based products, most of the manufacturing growth was in processing agricultural goods. Substantial industries serve domestic consumption with textiles, beer, tobacco, soap, soft drinks, vegetable oil, confections, lumber, and rubber products. Domestic industries export newsprint and manufacture about half of the tractors in use. In the past 5 years, the National Root Crops Production Company has established numerous small factories for processing cassava. The product of these factories, called *gari*, has a shelf life up to 1 year, greatly increasing demand for the crop. In 1979, the quantity of *gari* going into Lagos each day was estimated at 420 tons, nearly all of which originates with individual processors having a capacity of less than 1 ton per year.

The Federal Government has a large ownership interest in agricultural processing industries. The Federal Government has large tanneries at Oji River and Zaria. Nearly all cotton gins belong to one company, Cotton and Agricultural Processors, Ltd., which is 60-percent owned by the Federal Government. The Fourth National Development Plan also calls for two dairy processing plants with a combined capacity of 40,000 liters per year. Peanut and palm oil processing facilities are currently underused.

Purchased variable inputs—Purchased variable inputs for agricultural production are provided principally through the Government's network of 250 Agro-Service Centers established under the National Accelerated Food Production Programme. The centers are designed to supply seed, fertilizer, chemicals, agricultural implements, storage, credit, and extension

advice. The prices of seed, fertilizer, and chemicals are substantially subsidized.

Prior to the establishment of Agro-Service Centers, which began with the Third National Development Plan (1975–80), fertilizer use was primarily constrained by availability rather than price (*32*). Even now, the poor marketing network may still be the limiting factor in fertilizer use. The fertilizer subsidy has varied from 15–85 percent during the past decade, but there is virtually no evidence that use levels respond to price. Resale of fertilizer before it reaches farmers may reduce the subsidy they receive, but the activity remains significant. The ready availability of fertilizer at Agricultural Development Projects has dramatically increased use. For example, the percentage of farmers at Gusau using purchased fertilizer increased from 5 percent to 64 percent in 3 years.

The aggregate level of fertilizer use is very low compared with the level recommended by the Government or the average level in Africa (table 8). The Government recommends about 90 kg per ha for major crops (*37*), but estimates of actual use varied from 7–25 kg per ha in 1980. Nigerian per capita use of fertilizer is about one-sixth the average for all of Africa. Even this level, however, constitutes a large increase over previous years; use increased twentyfold during the 1970s in Nigeria, while levels in Africa overall merely doubled (*45*). The Nigerian Government reported fertilizer use at more than double the FAO reported rate, but growth in use is similar for both sets of data. Beginning in 1985, a large portion of fertilizer imports come from Senegal, where the major chemical company is partly owned by the Nigerian Government (*1*).

Insecticides are generally limited to use on cotton and seed dressings. A 1975 benchmark survey found nearly half of grain farmers used pesticide on seeds, and about a third used it on grain in storage. Pesticide use in the fields, however, was uncommon (*67*). The importance of pesticides was brought out by an estimate of grain losses to pests in 1980 (*121*). Other researchers claimed between one-third and three-quarters of the national grain crop would be lost if no pesticides were used (*59*).

Seeds for the major food crops, including rice, maize, sorghum, millet, cowpeas, wheat, and vegetables, are provided to some farmers by the National Seed Service. Improved seed for Nigerian conditions is available only for cotton and peanuts, although considerable potential for improvement has been identified for millet and yams. Recent data on the use of purchased seed has not been published, but the National Seed Service reported production of

Table 8—Nigeria: Fertilizer use, 1969–82

Item	1969/71	1977	1978/79	1979/80	1980/81	1981/82
			Dollars per ton			
Fertilizer	NA	NA	208	290	232	253
Farmer price	NA	NA	69	98	77	84
			Kilograms			
Consumption:						
Per capita	NA	NA	1.5	NA	2.7	NA
Per arable ha	NA	NA	3.6	NA	7.0	NA
Per arable ha 1/	NA	NA	.3	NA	12	8.5
			1,000 tons			
Total consumption	9	NA	71	108	174	213
Total consumption 2/	NA	174	NA	549	NA	NA

NA = Not available.

Source: (45) for all data except as noted:
1/ Source: (121)
2/ Source: (39)

1,400 tons of seed in 1977. The baseline survey in 1975 (*67*) found that northern farmers knew the variety for one–third of the wheat and sorghum they planted but for none of the millet. One goal of the National Seed Service is to provide seed every fourth year, while farmers save seed from their crop during the interim.

Both Federal and State Governments provide inputs to livestock production. Under the Fourth National Development Plan (1981–85), the Federal Government reported plans to provide 335,000 tons of supplementary feed while State Governments were to provide 720,000 tons annually. Funds were also allocated for expanding State farms providing young cattle, rabbits, sheep, and poultry. Poultry capacity is planned to reach 5 million chicks per year from two Federal hatcheries and 70 million chicks per year from State farms.

Credit—Informal credit arrangements from friends and family are important in easing the seasonal demand for cash throughout Nigeria's smallholder agriculture (*66*). Various studies (such as *67*) have found that 30 percent or more of farmers use informal credit in a particular year, and most farmers use some form of credit occasionally. The prevalence of credit use and the amounts borrowed tend to be higher in the south, with typical informal loans averaging 30–70 naira.

Formal credit has not been effective in serving smallholders, although several programs have professed that goal (*71*). The IMF estimated that less than 5 percent of credit to smallholders comes through institutions. Most of the loans from Government programs to smallholders have gone into consumption, particularly payment of school fees, rather than into purchase of agricultural inputs (*89*). A study of noninstitutional loans in northern Nigeria found most had been used for inputs (*66*).

The Agricultural Credit Scheme was begun in 1977 for the espoused purpose of extending credit to farmers who represented acceptable lending risk but who were unable to get credit through private channels. The program has not reached smallholders, but it has alleviated the problem that land cannot be used as loan collateral. Several local cooperatives have also attempted to establish credit institutions with limited success although data on these attempts is especially sparse.

The Federal Government recognized that its credit programs served only large farms (*39*) and has recently attempted to increase the amount of credit available by allocating a larger proportion of lending to the agricultural sector and by expanding the number of bank branches. In 1980, 51 percent of all formal private loans went to 0.6 percent of all borrowers. Almost 80 percent of these loans were in amounts exceeding 100,000 naira. The percent of loans legislatively allotted to agriculture rose from 5 percent in the early seventies to 10 percent in 1980. Actual amounts lent rose from 2.5 percent to 8 percent over the same period, according to data from the Central Bank (*20*). Even these loans, however, often went to agribusiness companies rather than to farmers.

The number of branch banks has grown steadily from 490 branches in 1977 to 1,160 in 1984 (*116*). This rapid growth of private banks, forced by Government regulations, is reportedly limited by declining profitability, but some sources still regard the three major Nigerian banks as relatively profitable in the world banking industry (*98*). The lack of formal credit for farmers does not constrain agriculture because other factors are more important in limiting purchases of inputs.

Marketing Food Crops

Most food produced in Nigeria never reaches formal marketing structures, although small quantities of food crops are grown for cash. Surveys of major food crops in 1975 found over 90 percent of both millet and sorghum were consumed by the producer (*67*). These two crops made up 75 percent of grain production nationally in that year. The remaining crop in the survey was wheat, of which 80 percent was sold. More complete data on proportion of food crop marketed are unavailable, but these figures are consistent with the impressions of recent observers.

Village sales are made by farmers from their homes, by small traders selling along the roadside, and by mobile traders (*talla*) moving among villages. The next level of market is the weekly or biweekly rural market. These

markets typically draw from a 10–km radius or less because participants rely on foot, bicycle, or donkey transportation (*81*). Despite the informality of these markets, they attract participation from a high proportion of farmers and are critical institutions in the exchange network (*92*).

Several intermediaries may handle a product as it passes from farmer to urban consumer. During this process, the produce must be assembled, packaged, moved, and stored. Most intermediaries perform a combination of these services because their volume is too low to specialize (*55*). The trading role supplements employment for farmers who are often constrained from economic growth by shortage of agricultural inputs (*118*).

Most observers agree that poor information on price and production in alternative markets hinders market functions (for example, *53, 82*), but the Government does not provide such information nor has any proposal to improve the flow of market information received national attention. No available data directly reflect the loss of efficiency from this source.

More attention has been given to the issue of competitiveness, possibly because high margins by traders suggest exploitation of farmers and reduced incentive to produce. A 1975 study measured marketing margins of about 70 percent on millet and sorghum. Most of this, except for trucking, was explained by value added, however. The study suggested that a shortage of capital had raised returns to truck owners but that returns to other intermediaries were "not excessive" (*55*). Market studies prior to 1970 found evidence of monopoly power among kola growers (*72*), livestock growers (*22*), peanut buyers (*15*), and yam retailers (*13*). More recent reviews, however, tend to conclude that private cartels are no longer a force in Nigerian markets. Rather, the observed problems are described as poor regional integration of markets due to high transportation costs and poor information (*64, 78*).

Some researchers who reject imperfect competition as an important market imperfection focus instead on large profits made from seasonal price variation (*56*). Some large traders have offered credit and thus gained control over the price of grain paid later in the year to borrowers. Because most storage is on farms, some analysts conclude that farmers usually benefit from seasonal price change. Case studies of removals from storage, however, indicate that farmers do not respond to price change but merely sell grain when cash is needed (*82*). Similarly, livestock slaughter during periods of famine tended to be more responsive to timely consumption needs than to price (*111*). Because local and urban intermediaries seldom store produce, the benefits of seasonal price rises are probably passed back to producers, at least to the extent that marketing channels are competitive. Marketing channels remain inefficient because of poor response from storage to price change. This unresponsiveness apparently stems from the priority farmers place on food security. Relative luxuries, such as cowpeas and rice, are often released from storage when prices rise to an attractive level (*82*).

Marketing Export Crops

In contrast to its activity in food crops, the Government has been active in marketing export crops for many years. In 1973, most Government intervention was shifted from the States to the Nigerian Produce Marketing Company. This Federal Government institution has wide powers over exchange and production of export crops. This company was split into seven Federal boards in 1977, each with responsibility for several commodities. The roots and tubers board was abolished in 1979, leaving the present array of six boards: grains, cocoa, peanuts, cotton, palm, and rubber.

The boards function through the Head of State who sets price floors on commodities consumed domestically and sets prices for export commodities based on recommendations by the Technical Committee for Producer Prices. In practice, price floors have typically been below market prices so actual Government purchases have been only for export (table 9). The World Bank, while recommending higher prices, has noted that internal prices do not constrain agricultural growth in Nigeria (*121*). The effectiveness of board prices at the farmgate is limited, even for exported produce, because licensed buying agents have shown considerable power to affect price. Also, an apparently increasing

number of producers are marketing outside official channels.

The historical role of these boards was to market surplus agricultural produce (*119*). Government monopsony was used to provide Government revenue rather than to support producer prices (*118*). The record of beneficiaries is mixed--net subsidies for seed cotton, palm kernels, rubber, and peanuts, and net taxes on cocoa in 1980. The IMF attributed this inconsistency to poor information and technical analysis by the boards (*62*). The quantity purchased (table 10) and export prices are generally declining, except for rubber, but prices paid to producers have been rising, creating a trend toward greater subsidies for producers (table 11).

GOVERNMENT POLICY

Policies of the Nigerian Government which affect agriculture are summarized below in three historical periods. The most recent period, beginning with 1982, is discussed in greatest detail with emphasis on trade and on activities under the Ministry of Agriculture.

Table 9--Nigeria: Domestic agricultural prices, 1982-84

Crop	Scheduled prices 1982/83	Scheduled prices 1983/84	Retail, 1982/83	Farmgate, 1982/83
	Naira per ton			
Beans	362	362	1,156	810
Corn	210	210	570	580
Millet	231	231	444	330
Sorghum	220	220	362	340

Source: (20, 44)

Table 10—Nigeria: Commodity board purchases, 1978-83

Crop	1978	1979	1980	1981	1982	1983 1/
	1,000 tons					
Cocoa	161	144	107	184	149	115
Cotton seed	117	117	81	78	63	59
Peanuts	.4	18	0	1.7	2.5	0
Palm kernels	240	231	189	194	179	154
Rubber	22	21	21	20	23	27

1/ Preliminary.

Source: (20)

Table 11--Nigeria: Ratio of producer price to export price, 1979-83

Crop	1979	1980	1981	1982	1983
	Ratio				
Cocoa	0.49	0.61	0.91	1.03	1.11
Cotton seed	.31	.30	.31	.40	.49
Peanuts	.81	1.09	1.68	1.23	1.68
Palm kernels	.69	.63	1.19	1.32	1.47
Rubber	.85	.76	.69	.77	NA

NA = Not available.

Source: (20)

Past Policy

Until the end of the Second National Plan, which officially extended to 1974, the policy of Nigerian Governments was to encourage agricultural surpluses in the belief that food production activities would "take care of themselves" (*111*). The surplus went first to colonial merchants, and later to Government elites and urban consumers. This neglect of agricultural development was supported by FAO projections in the midsixties which anticipated food surpluses within 10 years even without substantial new investment by the state (*111*). Similarly, a 1970 "green revolution" study optimistically targeted 1985 for self-sufficiency (*29*). During this period, development was pursued primarily through an import substitution strategy. Trade policy was directed toward controlling inflation with the effect of diverting labor and capital from commodity production toward services, construction, and trade.

The drought and oil price rise in 1973, however, led to major policy changes. From 1973 to 1981, increased oil revenue dominated Government activity (table 12). The revenue was to be distributed through fiscal policy, leaving exchange policy to treat inflation. The naira was increasingly overvalued in relation to the dollar until 1979 when it stabilized in a strongly overvalued position (table 13). Tariffs were generally low at less than 10 percent for intermediate goods and around 50 percent for consumer goods other than food. In 1981, the average tariff, weighted according to value imported, was

Table 12--Nigeria: Foreign exchange, 1970-83

Item	Units	1970	1971	1972	1973	1974	1975	1976
Exchange reserves	Million dollars	174	362	292	464	5,503	5,270	4,721
Debt outstanding	Million naira	489	214	263	277	322	350	375
Repayment schedule	Million dollars	31	30	26	31	29	32	30
Agricultural exports	do.	438	392	315	462	544	446	532
Oil exports	Million naira	510	964	1,175	1,935	5,675	4,592	5,895

		1977	1978	1979	1980	1981	1982	1983
Exchange reserves	Million dollars	3,739	1,323	5,017	9,593	3,098	1,568	963
Debt outstanding	Million naira	497	1,252	1,611	1,867	2,331	9,051	12,237
Repayment schedule	Million dollars	33	161	183	110	519	775	1,335
Agricultural exports	do.	741	819	701	467	333	404	460
Oil exports	Million naira	7,046	6,033	10,035	13,999	11,250	10,503	7,786

Source: (61)

Table 13--Nigeria: Overvaluation of naira implied by inflation, 1970-83

Item	Unit	1970	1971	1972	1973	1974	1975	1976
Nigerian CPI	1980 = 100	24.2	28.1	28.9	30.5	34.3	45.9	57.0
Change	Percent	na	16.1	2.8	5.5	12.5	33.8	24.2
U.S. CPI	1980 = 100	47.1	49.1	50.7	53.9	59.8	65.3	69.1
Change	Percent		4.2	3.3	6.3	10.9	9.2	5.8
Exchange rate	Dollars/naira	1.40	1.52	1.52	1.52	1.62	1.60	1.60
Change	Percent	na	8.6	0	0	6.6	-1.2	-.6
Change in exchange value implied by CPI	Dollars	na	-11.9	.4	.8	-1.5	-24.6	18.4
Overvaluation since 1970	Percent	0	18.8	18.5	17.9	24.1	42.1	52.4

		1977	1978	1979	1980	1981	1982	1983
Nigerian CPI	1980 = 100	68.1	80.8	89.8	100.0	120.9	130.0	156.0
Change	Percent	19.5	18.6	11.1	11.4	20.9	7.5	20.0
U.S. CPI	1980 = 100	73.6	79.2	88.1	100.0	110.4	117.1	120.9
Change	Percent	6.5	7.6	11.2	13.5	10.4	6.1	3.2
Exchange rate	Dollars/naira	1.54	1.54	1.78	1.84	1.57	1.49	1.34
Change	Percent	-3.1	0	15.6	3.4	-14.7	-5.1	-10.1
Change in exchange value implied by CPI	Dollars	-13.0	-11.0	1	2.1	-10.5	-1.5	-16.8
Overvaluation since 1970	Percent	57.2	62.0	67.1	67.4	65.8	64.5	67.2

na = Not applicable.

Source: (61)

13.5 percent. The policy change during this period is revealed by World Bank figures which show that the index of food prices rose 275 percent compared with a rise of 60 percent in the price index of export crops. Although production of food crops grew more rapidly than production of export crops, food imports met most of the increased consumption. Cereal imports, for example, rose from 356,000 tons in 1972 to 2.4 million tons in 1981.

A 33-percent fall in oil production in 1981 and a 40-percent fall in received oil prices in 1983 fed large Federal deficits and left States with little revenue. Official policies were directed toward protecting the balance of trade, but smuggling and large trade arrears exacerbated the foreign exchange shortage.

Tariffs were increased on rice, cereal flour, sugar, cotton linters, and coffee in April 1982, while imports of frozen poultry were prohibited and licensing restrictions were placed on sugar, cotton yarn, cereal flours, vegetable fibers, bulk tea, and vegetable oil not in bulk units. In August 1982, the tariffs on tea and corn were increased. A 10-percent surcharge was added to all imports. In January 1983, licensing restrictions were imposed on corn, tallow, baby foods, day-old chicks, peanut oil, margarine, milk powder, and certain other food preparations.

Government capital expenditures were cut 10 percent in April 1982 and another 30 percent in the following year. Agriculture's share of the budget rose from 7 percent in the Third Plan to 13 percent in the Fourth Plan. This rise came in place of spending allocated to transportation. Finally, border closures, currency change, foreign debt payments and cessation of new external borrowing during 1984 led to reduced consumption.

Current Policy

After releasing the budget for 1985, Nigeria's Finance Minister, Dr. Omaolapo Soleye, outlined five immediate objectives of the Government: increase agricultural production, stimulate industrial production, reduce inflation, achieve a healthy balance of payments, and increase domestic and external capital formation (*115*).

The 1985 budget contained significant increases in Government spending on rural development, crops, manufacturing, air transportation, telecommunications, national defense, and police. Spending on science and technology was reduced from 14.4 million naira in 1984 to 3.7 million naira. Smaller percentage reductions are also allocated to housing, land transportation, and education. Associated with the new budget priorities is a review of all existing capital projects resulting in rescheduling (such as the Ajaokuta steel plant), modification (such as the new Federal capital at Abuja), or cancellation (such as the Lagos metroline). The project reviews, headed by Gamaliel Omosode, considered 615 projects, each of which required more than 30 million naira to complete (*100*).

Government revenue continues to depend heavily on petroleum revenue, but several revenue-generating measures were introduced at the beginning of 1985. Income tax withholding was raised from 12.5 percent to 15 percent, and it was expanded to apply to more categories of income. A levy of 100 naira was placed on all airline passengers leaving Africa, and a levy of 500 naira was placed on dormant companies. By the end of March, these new levies had yielded 5.3 million naira and 360,000 naira, respectively (*50*).

In sum, the budget shows a deficit of 4.5 billion naira, to be financed without new external borrowing by relying on 2.3 billion naira from internal borrowing and 2.2 billion naira from undisbursed existing external loans.

In his speech announcing the 1985 budget, then Head of State, Major General Muhammadu Buhari, continued the War Against Indiscipline campaign to motivate Nigerians. The campaign later moved into a new phase, the War Against Corruption and Economic Sabotage. Prosecution of former Government officials by military tribunals continued under this phase. Among other points, the program held wages constant for 1985. The Babangida regime lowered wages substantially at the end of 1985.

Monetary and Foreign Exchange Policy

The Central Bank of Nigeria holds wide-ranging powers to affect the economy, and it continues to actively exercise those powers

although ex post facto analyses show its policy decisions have not generally been fully implemented. The tools it uses include specifying credit allocations, interest rate limitations, foreign exchange outflow, liquidity reserves, and maturity structure of bank lending.

Aggregate credit expansion is set annually and allocated to commercial and merchant banks according to product type (for example, petroleum versus food processing), location (rural versus urban), size of bank, and share of Nigerian ownership of borrower. Loans which are exempt from these controls include those for buying shares in expatriate firms, for cars, and for certain agricultural and residential uses. The allocation for agriculture is now 12 percent of loans from commercial banks and 6 percent of loans from merchant banks, up from 10 percent and 5 percent, respectively, in 1984.

Interest rates have generally been below the inflation rate, resulting in negative real interest. The interest rate for borrowing by less preferred sectors may now vary between 10 percent and 13 percent. Agricultural projects may borrow at rates between 6 percent and 7 percent. Deposits may earn between 8.5 percent and 10 percent. These rates incorporate modest rises in a recent effort to increase investment. They compare with inflation in 1984 of 40 percent and the Government's goal for inflation of 30 percent in 1985 (*115*). Raising interest rates on loans is one of the recommendations offered by the IMF which was resisted by the Buhari government in its negotiations.

For 1985 the total allocation of foreign exchange to banks was limited to $4.8 billion, only 30 percent of the amount needed for the private economy to trade at 1983 levels (*108*). The Central Bank has allocated this exchange into four sectors: 58 percent for industrial raw materials, spare parts, and machinery; 18 percent for food; 12 percent for general merchandise; and 12 percent for invisibles, such as education overseas.

Liquidity constraints currently require that at least 25 percent of total deposit liability be held in liquid assets and that cash holdings be at least 2–5 percent, depending on the size of the bank. The maturity structure specified by the Central Bank prohibits more than 20 percent of loan value maturing in 1 year or less and requires 40 percent of loan value maturing in 3 years or more.

In 1985, the Government also announced that Nigerians will be allowed to hold foreign currency accounts in Nigeria. This change is an effort to reduce the holdings of Nigerians in foreign banks. To qualify, a Nigerian must bring at least half of the money invested in foreign currency from outside Nigeria.

Agriculture Policy

Agriculture-related funding increased in the 1985 budget with spending on rural development doubling in nominal terms and spending on crop production up 25 percent over 1984 levels. The direct allocation of 1.0 billion naira to agriculture is less than one-fifth of the capital budget and less than one-tenth of the 11.3 billion naira total 1985 budget.

Among existing agricultural programs which are continuing as scheduled is the World Bank-sponsored agricultural development project (ADP) in Kaduna State. This project, costing $194 million, is funded primarily by the World Bank although $39 million is being provided by the Federal Government, $24 million by the State Government, and $9 million by participating farmers. This project plans to expand the infrastructural services currently provided in the Funtua project over a larger area, including various inputs, and 1,400 km of feeder roads.

The marketing boards also continue to follow the pattern of the recent past. No grain was purchased in 1984 by the Government due to low offer prices in relation to the prices available from private traders. Higher prices have been announced by the marketing boards, but the change is insufficient to make the marketing boards competitive buyers of food.

The River Basin Development Authorities remain important policy instruments, but they have been redefined and restructured. They are now termed River Basin and Rural Development Authorities (RBRDA's), and their number and jurisdictions have been changed so that there is one for each State, except Lagos, which shares one with Ogun. Their new

mandate specifically excludes direct production and increases emphasis on extension services.

Various input subsidies were retained for 1985. Large fertilizer imports will again be distributed at low prices. Planned imports for 1985 were reduced in November 1984 to 1.1 million tons which is still 20 percent over 1984 imports. The pesticide subsidy for use on cocoa and coffee was doubled in January 1985. At that time 3.6 million naira was released to support purchase of spraying pumps, drying ovens, and coffee huliers. Supplementary feed for livestock and repair of agricultural machinery are also subsidized. New agricultural equipment may be imported without duty although the availability of foreign exchange will limit such purchases. Loans will be offered at low rates and a long moratorium (5 years) on repayment is planned for loans used to plant tree crops. The Government has announced plans to provide crop insurance, and 200 million naira has been allocated for improving emergency water supplies.

At the center of the Government's plan for agricultural growth is a major increased effort to attract foreign investment to agricultural production. To encourage such capital, several tax changes have been made, including tax relief for at least 5 years on agricultural projects which use local raw materials. The maximum proportion of foreign ownership allowed in farming enterprises was raised from 60 percent to 80 percent, although only 60 percent of profits may be repatriated. The State Governments and the RBRDA's have already formed large plantations under one ownership, and these are now available to private entrepreneurs (*9*).

Several major projects are already taking advantage of the new incentives. A $12-million private irrigation project in Kwara and a $7-million piggery in Ondo are expected to begin operation soon. Less specific plans for poultry production and tractor assembly appear to be underway (*106*). The United Africa Company, a branch of Unilever, has announced investment plans of $8 million in forestry and further investment in palm oil production (*101*). When added to the modest amount of similar existing projects, the production of private, large farms in Nigeria is still insignificant compared with the production of peasant farms, yet the present policy depends on rapid growth in this sector to increase total agricultural output.

Trade Policy

Nigeria is a member of several international organizations designed to control or facilitate trade (table 14). The crop-specific organizations are concerned with Nigerian exports.

Longstanding agreements between Nigeria and the United States exist in areas of aviation, consular matters, economic and technical cooperation, extradition, mutual security, taxation, and trademarks. Treaties have more recently been signed on investment guarantees and other tax issues.

The General Agreement on Tariffs and Trade (GATT) seeks to reduce tariffs and other trade barriers. In spite of membership in GATT, Nigeria has numerous formal import barriers.

Table 14—Nigeria: International organization memberships

Predominantly Trade Organizations
General Agreement on Tariffs and Trade (GATT)
Lome Convention
Economic Community of West African States (ECOWAS)
African Timber Producers
International Cocoa Organization
International Coffee Organization
International Cotton Advisory Commission
International Institute for Cotton
International Rubber Organization
International Tin Council
Organization of Petroleum Exporting Countries (OPEC)
West African Groundnuts Council
West African Rice Development Association
Other Organizations
African Development Bank (ADB)
British Commonwealth
International Monetary Fund (IMF)
Lake Chad Basin Commission
Niger River Commission
Non-Aligned Movement
Organization for African Unity (OAU)
United Nations (UN) and affiliated organizations: Economic Commission for Africa (ECA), Food and Agriculture Organization of the United Nations (FAO), United Nations Conference on Trade and Development (UNCTAD), United Nations Industrial Development Organization (UNIDO)
World Bank (IBRD)

The Economic Community of West African States (ECOWAS), headquartered in Nigeria, was formed in 1975 to promote trade and development in West Africa. While several agreements have been reached, ECOWAS has not yet substantially reduced regional trade barriers. The United States has supported ECOWAS in recent years with partial funding for its administrative costs. In 1984, the United States provided 220 million CFA francs, bringing the total since 1981 to 470 million.

The Lome Convention, originally signed in 1975 and subsequently renewed, is an agreement between the European Economic Community (EEC) and numerous developing countries in Africa, the Caribbean, and the Pacific. This agreement provides duty-free access to EEC markets for manufactured goods and tropical agricultural produce. Several measures to aid technology transfer and investment are also included.

Imports of several agricultural goods have been prohibited since 1982. These include rice in bags weighing less than 50 kg, pulses, eggs in shell, live poultry (except chicks), nuts, fruits, roots, beer, bread, milk, and numerous food preparations. The Federal Government has imported milk and now constrains rice imports to government-to-government agreements.

Duties on agricultural imports announced in May 1984 are shown in table 15. In early 1984, several other trade restrictions were imposed. All imports now require specific licenses. Food imports are now limited to 18 percent of private foreign exchange expenditure.

In April 1984, all borders of Nigeria were closed and a new currency introduced. All land borders were reopened with restrictions in March 1986. The currency change appears to have damaged some holders of illegal naira, but the initial 40-percent reduction in quantity of currency has now been made up through further printing so there has been little impact on inflation. The Government eased imports in May 1984 by eliminating the requirement of an advance deposit on imports and by prepayment of import duties, which reduces the delay of goods at the docks.

By the end of 1984, Government plans for issuing import licenses were being clarified. The chief-of-staff, Major General Tunde Idiagbon, stressed imports for agricultural development over consumable food. Implied criteria for import licensing include that companies should be major employers of labor and major contributors to Government revenue. Their goods should have a high value added in Nigeria, use local raw materials, and be beneficial to Nigerians. 3/

Speculation on the future path of trade policy is beyond the scope of this report, but the Government has suggested the direction of its thinking during preparation of the next Five-Year Development Plan, now due for release. A 1984 food production study commissioned by the Government recommended immediate cessation of rice and corn imports. The report also called for ending fertilizer subsidies in 3 years and for expanding grain storage facilities to a capacity of 5 million tons by 1987 (*49*).

3/ Changes in trade policy and tariffs usually appear annually in the March or April edition of the *Federal Republic of Nigeria Official Gazette*.

Table 15—Nigeria: Duties on agricultural imports, May 1984

Import	Duty
	Percent
Cereal flour, groats, and meal	40
Fats of brine cattle	25
Fats and oils of fish	25
Fruit juices	60
Edible pigfat	35
Butter	40
Cheese and curd	40
Lard	30
Brine fats	25
Other animal oils in bulk	20
Other animal oils	30
Other fixed vegetable oils (solid)	30
Margarine and other prepared edible fats	35
Beet sugar and cane sugar in solid form	30
Cocoa	30-40

No duty on:

Foodstuffs of the type ordinarily consumed by Africans produced in a territory adjoining Nigeria and machinery and equipment imported overland for exclusive use in agriculture.

On October 1, 1985, the new Head of State announced an end to rice and corn imports for an indefinite period. In December 1984, Chief of Staff Idiagbon stated that the Government would use import licensing to minimize or completely stop importing food items with low quality food value. The exceptions to this prohibition are salt, sugar, milk, baby food, and edible oil (*51*).

Political circumstances also influence trade policy. Nigerian perceptions of U. S. links with South Africa negatively affect U.S. trade, according to former U.S. Ambassador to Nigeria Donald Easum (*117*).

AGRICULTURAL TRADE PROFILE

Nigeria's agricultural trade mainly consists of food imports, especially grains and sugar. Several export commodities have been important in the past, demonstrating potential for foreign exchange earnings.

Grain Imports

Table 16 summarizes grain imports over the past 10 years. Grain, principally wheat, is the major item of U.S. agricultural trade with Nigeria and an important, but not dominant, import from the Nigerian perspective. In 1981, grain imports constituted over 90 percent of the value of agricultural products imported from the United States and, since then, this proportion has remained above 80 percent. U.S. grain has been nearly 20 percent of all Nigerian agricultural imports.

U.S. wheat sales fell in 1983 in both quantity and value measures, but a pattern of increasing trade is evident over the decade. Since 1977, the Nigerian trade has been near 3 percent of total U.S. wheat exports. No country other than the United States has sent large quantities of wheat to Nigeria. Most of the wheat which is not of U.S. origin comes from the European Economic Community (EEC), and it has been almost entirely as flour, while most U.S. wheat has been unmilled. Domestic wheat production is less than 5 percent of consumption (table 16) and is unlikely to rise greatly because the climate is generally too warm for wheat.

Wheat import prospects are strong. Wheat import levels rose as national income rose because urban consumers preferred bread to most other foods. Wheat bread has recently displaced rice as the food of choice among many consumers. The political power of these urban residents is one of the important factors behind the Nigerian Government policy of keeping the naira overvalued and, thus, of subsidizing food imports. The Government explicitly placed future wheat imports at the head of the priorities for foreign exchange expenditure in 1985.

Rice consumption also grew rapidly during the past decade in response to rising urban incomes, but the pattern of U.S. exports has been more erratic. For several years, 15 percent of U.S. rice exports went to Nigeria, representing 65 percent or more of Nigeria's rice imports, but in the last 2 years Thailand has become the major supplier. Thai rice has long been cheaper than U.S. rice, but preference for U.S. varieties contributed to continued U.S. sales. U.S. prices fell from $540 per ton in 1978 to $440 in 1982 while Thai prices fell from $360 to $260. When only the Federal Government was allowed to import rice, price was the key determinant in choosing among rice sellers. Although figures for 1984 imports are unavailable, purchases of Thai rice totaling 400,000 tons at a cost of $107 million were announced in April 1984. Also, 180,000 tons of rice from Pakistan were purchased for $32 million. U.S. sales for 1984 were probably less than 5 percent of rice imports.

Domestic production of rice has been encouraged by several Government programs. Production in Nigeria now provides about 70 percent of what is consumed although no increase was obtained in the last 2 years due, in part, to poor weather (table 17). The present price offered by the Nigerian Grains Board for rice is 500 naira per ton. This price is near the market clearing price, but there has been conflict between the Nigerian Grains Board and the River Basin Development Authorities which affects farmers' selling decisions beyond price incentive (*80*).

Prior to passage of the U.S. Food Security Act of 1985, import prospects for U.S. rice were poor, primarily because of the much lower prices offered by Thailand. The 1985 Act allows U.S. rice to be sold at world prices,

Table 16--Nigeria: Grain imports, 1975-84

Item	Unit	1975	1976	1977	1978	1979
Wheat:						
United States--						
Quantity	1,000 tons	378.3	598.6	679.3	918.0	927.6
Value	Million dollars	61.8	91.9	84.5	116.6	145.6
Share of U.S. trade	Percent	1.2	2.3	2.9	2.6	2.7
Share of Nigeria trade	do.	94.6	96.6	90.7	81.2	88.9
EEC--						
Value	Million dollars	.1	.5	5.7	26.6	8.7
Rice:						
United States--						
Quantity	1,000 tons	5.6	46.3	158.0	256.3	42.7
Value	Million dollars	3.7	25.6	82.8	137.7	20.0
Share of U.S. trade	Percent	.4	4.1	11.3	14.8	2.3
Share of Nigeria trade	do.	99.7	65.8	50.4	42.1	24.6
Thailand--						
Value	Million dollars	0	12.6	77.4	173.5	61.0
Corn:						
United States--						
Quantity	1,000 tons	.8	17.5	53.4	81.5	57.5
Value	Million dollars	.2	2.3	6.1	9.2	9.1
Share of U.S. trade	Percent	.01	.04	.15	.17	.13
Share of Nigeria trade	do.	98.3	99.7	91.2	89.8	52.8
Brazil--						
Value	Million dollars	0	0	.6	.2	3.5
Thailand--						
Value	Million dollars	0	0	0	.8	4.5

Item	Unit	1980	1981	1982	1983	1984
Wheat:						
United States--						
Quantity	1,000 tons	1,001.8	1,203.0	1,423.8	1,316.5	1,617.4
Value	Million dollars	180.6	225.3	235.3	214.9	259.4
Share of U.S. trade	Percent	2.7	2.8	3.1	3.3	NA
Share of Nigeria trade	do.	91.4	82.7	94.7	95.4	NA
EEC--						
Value	Million dollars	13.6	43.4	12.1	3.4	NA
Rice:						
United States--						
Quantity	1,000 tons	190.0	402.1	343.1	124.2	22.5
Value	Million dollars	92.1	222.9	149.8	56.9	11.1
Share of U.S. trade	Percent	7.1	14.6	15.0	6.2	NA
Share of Nigeria trade	do.	57.0	65.0	71.1	32.0	NA
Thailand--						
Value	Million dollars	67.4	81.3	49.9	121.0	163.1
Corn:						
United States--						
Quantity	1,000 tons	156.9	273.2	279.2	37.9	86.7
Value	Million dollars	25.2	43.9	38.0	5.7	13.4
Share of U.S. trade	Percent	.30	.55	.68	.09	NA
Share of Nigeria trade	do.	98.1	98.1	82.9	89.9	NA
Brazil--						
Value	Million dollars	0	0	0	0	NA
Thailand--						
Value	Million dollars	.49	.87	7.2	.62	NA

NA = Not available.

Source: (33, 107)

Table 17--Nigeria: Cereal production, 1975-84

Crop	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
	1,000 tons									
Wheat	18	20	21	22	23	24	25	30	35	40
Rice, paddy	600	611	620	826	870	1,090	1,240	1,376	1,280	1,353
Corn	1,400	1,440	1,500	1,640	1,670	1,720	1,750	1,785	1,600	1,800
Millet	2,865	2,865	2,950	3,100	3,140	3,130	3,180	3,275	2,300	3,200
Sorghum	3,590	3,680	3,750	3,760	3,785	3,800	3,700	3,850	2,660	3,690

Source: (109)

offering a potential share in Nigerian imports which totaled 450,000 tons in 1984.

Domestic production should rise significantly during years of normal rainfall, displacing demand for imports. Consumer tastes seem to be shifting from rice toward wheat although no quantitative documentation of this trend is possible from available evidence. Finally, the Government has announced its intention to severely reduce rice imports in 1985 leading to a ban of unspecified duration on rice imports in October (*51*). Thus, the trend toward increased per capita rice consumption may be reversed in 1985.

The United States has provided 80-90 percent of Nigerian corn imports in all recent years except 1979. Because imported corn is used entirely for feed, the quantity imported has risen rapidly as higher incomes raised demand for poultry.

Domestic corn production has risen by 25 percent over the past 10 years (table 17), but the proportion of consumption which is grown domestically fell until licensing restrictions in 1983 severely reduced imports. The suddenly reduced corn imports led to greatly reduced poultry flocks although demand for poultry apparently remains high. Domestically produced corn does not substitute for imported corn because most domestic corn varieties are used for human consumption. Therefore, domestic corn substitutes for wheat, rice, and the traditional grains.

As per capita income stabilizes in Nigeria, demand for imported corn should stabilize. With no specific policy directed toward domestic feed corn production, its growth rate is unlikely to meet demand for poultry feed. The decline in imports during 1983 and 1984 did not affect domestic poultry production even though poultry prices rose 300 percent in 1984. Imports of U.S. corn will probably not reach the levels of 1981-82, constrained primarily by foreign exchange policy. In support of that policy, the Federal Government banned corn imports in October 1985 for an unspecified period.

Imported grains compete most directly with millet and sorghum among crops which are not traded internationally by Nigeria. The level of their production is stable in contrast to the superior grains (table 17). Per capita production has declined at approximately the population growth rate. These crops are relatively tolerant of drought; they tend to be grown in drought-prone areas. Thus, their production levels reflect the 1983 drought more strongly.

Animal Products Imports

U.S. animal exports to Nigeria are almost entirely animal fats and poultry although Nigeria also imports large amounts of milk from other sources (table 18). In some years, U.S. poultry and animal fats exports to Nigeria approached 3 percent of all U.S. exports of these commodities, but generally trade with Nigeria is not a large proportion of U.S. animal products trade.

Animal products are not a major contribution to the Nigerian diet nationally nor to Nigerian agriculture; however, recent import restrictions on poultry and on poultry feed sharply reduced consumption of the only meat whose use had been expanding substantially. Domestic flock size apparently dropped to 20 million birds by the end of 1984, about half the level at the start of the year.

Table 18--Nigeria: Animal products imports, 1975-83

Item	Unit	1975	1976	1977	1978	1979	1980	1981	1982	1983
Poultry:										
United States--										
Quantity	1,000 tons	0.4	3.8	7.6	3.2	6.7	4.7	8.0	6.9	0.4
Value	Million dollars	.5	3.1	6.4	5.7	5.6	8.5	7.9	13.6	.3
Share of U.S. trade	Percent	.5	1.7	3.5	2.6	2.0	2.1	1.0	2.6	.1
Share of Nigeria trade	do.	42.9	59.6	57.8	46.1	83.7	53.5	69.3	73.5	73.1
EEC--										
Value	Million dollars	.48	1.8	2.7	5.0	.9	7.3	3.0	4.5	.1
Milk:										
United States--										
Value	Million dollars	.14	.89	.13	.31	.14	.30	.40	.10	.31
Share of U.S. trade	Percent	.22	1.78	.16	.42	.54	.67	.92	.13	.18
Share of Nigeria trade	do.	.22	1.30	.14	.20	.09	.12	.17	.04	.27
EEC--										
Value	Million dollars	61.7	66.4	94.2	145.9	132.0	223.1	213.3	233.7	103.2
Denmark--										
Value	do.	10.4	5.7	10.3	16.5	10.1	16.8	8.0	6.5	.89
Germany, Fed. Rep. of--										
Value	do.	1.8	1.9	17.9	44.4	41.6	68.8	54.0	55.5	13.7
Netherlands--										
Value	do.	43.6	49.1	52.2	70.0	69.4	105.9	122.2	138.9	75.2
United Kingdom--										
Value	do.	.3	6.4	11.2	8.7	4.7	21.9	22.4	24.6	11.0
Animal fats:										
United States--										
Quantity	1,000 tons	20.8	27.3	34.0	34.8	31.5	39.0	32.6	32.9	30.9
Value	Million dollars	7.0	9.9	13.5	16.1	19.0	20.1	15.7	14.9	13.9
Share of U.S. trade	Percent	1.9	2.2	2.3	2.7	2.6	2.6	2.1	2.2	2.3
Share of Nigeria trade	do.	75.3	56.8	70.4	63.8	62.2	60.9	64.2	70.9	90.7
EEC--										
Value	Million dollars	.31	.45	.33	1.6	1.5	4.8	4.2	4.9	1.4
Other meats:										
United States--										
Value	Million dollars	.05	.16	.05	.34	.19	.61	.16	.08	.36
Share of U.S. trade	Percent	.01	.03	.01	.05	.02	.07	.02	.01	.04
Share of Nigeria trade	do.	.79	.62	.12	.94	1.52	3.53	1.37	.62	3.09
Argentina--										
Value	Million dollars	.13	.43	9.3	9.2	6.2	3.8	.22	0	0
Brazil--										
Value	do.	1.8	9.6	17.5	17.6	1.6	6.3	4.7	6.1	1.3
EEC--										
Value	do.	2.1	2.7	6.2	8.4	3.0	6.0	6.5	5.8	9.3

Source: (33, 10)

Beef consumption dropped in 1984 because of a major outbreak of rinderpest beginning in April 1983. Data on cattle are especially uncertain, so the dimensions of the epidemic cannot be known precisely; the National Veterinary Institute estimated loss of 400,000 animals from a total population of 10 million (*18*). Revival of the cattle immunization program has now controlled the outbreak. About 10 percent of meat consumption is supplied through live animals imported from neighboring countries.

Domestic poultry production rose nearly 150 percent from 1975 to 1982 while other meat production grew more slowly (table 19). Table 19 does not clearly show effects of drought or epidemic either because of the poor quality of livestock data or because estimates of livestock loss due to these crises are overstated.

Milk imports fell in 1983 although the decline was not as large as for poultry. The EEC has provided nearly all Nigerian milk imports, but Canada entered the market with an agreement in April 1984 for $576 million worth of milk. The Canadian sale suggests that the United States may also be able to begin large milk sales to Nigeria even as Nigerian milk imports decline overall.

Other Imports

Table 20 traces imports of commodities other than grain or animal products. None of these commodities are currently imported in large value from the United States although potential exists for greater trade for some.

Animal feeds from the United States are mainly vegetable oil residues while the EEC exports food waste and fodder. If urbanization continues at the recent pace and demand for meat grows, the import of animal feeds may also expand, at least until the livestock industry in Nigeria is able to develop adequate domestic sources. If foreign exchange constraints remain in effect, however, feed imports are a likely candidate for further reduction.

Cotton imports began strongly in 1981 and doubled each year through 1984. Domestic production in 1984 is estimated at about 20 percent of consumption. It has declined since 1976 as competition with imports kept prices low in relation to food crops (table 21). Through 1983, the United States was the major supplier of cotton, but a recent $1-billion countertrade agreement with Brazil is expected to include over 30,000 tons of cotton in 1985 out of total imports of 55,000 tons (*3*).

Sugar is one of the highest value imports of Nigeria. In 1981, sugar and honey imports peaked at 877,000 tons costing over $500 million. The quantities imported in 1984 were probably comparable. Nearly all of this came from the EEC which offered low prices but, since the middle of 1984, Brazil has greatly increased sugar sales to Nigeria as part of the countertrade agreement. Over 200,000 tons of sugar were expected from Brazil by mid-1985 (*5*).

Domestic sugar production has grown slowly although it remains less than 10 percent of consumption (table 21). Two interrelated companies produce sugar on large plantations. Mohamed Lafiagi, general manager of one of the two sugar-producing companies and chief executive of the other, described the present production capacity of the country at 170,000 tons per year if sufficient Government support were provided (*9*). The Government has

Table 19--Nigeria: Animal products production, 1975-84

Crop	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
	1,000 tons									
Beef	165	170	166	177	200	205	208	215	215	225
Mutton	130	147	146	158	159	161	161	165	175	170
Pork	31	33	35	37	40	42	42	45	45	47
Poultry	102	113	125	154	182	228	252	270	250	240
Milk	360	370	370	370	380	385	380	380	345	360

Source: (109)

Table 20—Nigeria: Other imports, 1975-83

Item	Unit	1975	1976	1977	1978	1979	1980	1981	1982	1983
Animal feeds:										
United States--										
Value	Million dollars	0.1	0.1	0.5	1.1	1.0	5.0	4.5	7.7	2.5
Share of U.S. trade	Percent	.04	.03	.09	.19	.12	.44	.42	.74	.20
Share of Nigeria trade	do.	9.99	5.79	11.11	9.96	7.99	8.68	17.89	24.29	15.26
EEC--Value	Million dollars	.7	1.9	3.8	9.0	9.6	19.3	15.3	17.3	12.3
Cotton:										
United States--										
Quantity	1,000 tons	4.1	0	.32	.05	.02	.004	1.6	3.4	6.5
Value	Million dollars	4.5	0	.67	.14	.01	.003	2.7	5.2	12.6
Share of U.S. trade	Percent	.46	0	.04	.01	.001	.0001	.12	.27	.69
Share of Nigeria trade	do.	49.49	0	93.28	61.67	6.74	.14	44.58	22.79	81.86
Brazil--Value	Million dollars	0	0	0	0	0	0	1.4	7.6	2.4
Cameroon--Value	do.	0	0	0	0	0	0	0	6.0	0
Colombia--Value	do.	0	0	0	0	0	0	0	1.5	0
Israel--Value	do.	0	0	0	0	0	0	0	1.1	0
Pakistan--Value	do.	0	0	0	0	0	0	0	1.2	0
Togo--Value	do.	0	0	0	0	0	0	1.3	0	0
Burkina Faso--Value	do.	0	0	0	0	0	1.7	0	0	0
Sugar:										
United States--										
Value	Million dollars	4.2	4.4	2.4	.50	.40	1.1	1.9	1.8	.26
Share of U.S. trade	Percent	4.68	18.98	31.46	9.54	6.0	.32	.55	8.92	.21
Share of Nigeria trade	do.	4.64	3.67	2.00	.27	.23	0	.36	.65	.10
Brazil--Value	Million dollars	.02	.11	3.0	9.6	9.6	8.7	2.0	.15	2.5
EEC--Value	do.	71.7	111.8	112.2	167.2	161.7	417.7	511.9	292.7	256.1
Belgium--Value	do.	.5	14.8	14.3	19.5	38.9	100.5	127.9	63.4	38.5
France--Value	do.	40.9	69.3	61.1	104.7	81.5	214.7	273.7	145.1	168.7
Germany, Fed. Rep. of--Value	do.	1.5	7.0	14.8	22.0	21.9	49.4	70.7	46.0	25.3
Netherlands--Value	do.	.5	9.2	11.3	5.4	13.6	27.2	22.3	18.9	12.5
United Kingdom--Value	do.	27.1	10.9	10.4	15.2	4.9	11.7	9.5	15.4	.43
Tobacco, unmanufactured:										
United States--										
Quantity	1,000 tons	.57	.50	.25	.70	.54	.42	.42	.36	.47
Value	Million dollars	2.4	2.1	1.2	3.7	3.2	2.3	2.6	2.6	2.9
Share of U.S. trade	Percent	.28	.23	.11	.27	.27	.17	.18	.17	.20
Share of Nigeria trade	do.	93.03	94.49	95.05	82.58	69.16	78.13	64.71	84.39	98.69
Canada--Value	Million dollars	0	0	0	.37	.22	.23	1.1	.19	0
Vegetable oil:										
United States--										
Value	Million dollars	.38	.49	.71	.37	.13	.37	.34	.49	.35
Share of U.S. trade	Percent	.07	.10	.12	.08	.02	.08	.33	.04	.04
Share of Nigeria trade	do.	9.07	9.57	4.13	1.31	.28	.72	2.24	.26	.42
EEC--Value	Million dollars	.7	3.1	24.1	53.0	87.7	99.0	86.2	100.3	47.5
Malaysia--Value	do.	2.8	0	0	0.0	3.2	16.5	36.7	49.6	0
Singapore--Value	do.	0	0	0	0.1	1.0	7.6	27.5	34.4	34.0

Source: (33, 107)

Table 21--Nigeria: Other agricultural production, 1975-84

Crop	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
	1,000 tons									
Cassava	10,600	10,800	11,000	11,500	12,000	13,100	11,800	11,700	9,950	11,800
Cocoyam	1,640	1,680	1,700	1,710	1,710	1,710	1,727	1,765	1,600	1,760
Coffee	4	3	3	3	2	3	4	4	3	3
Cotton lint	58	81	36	37	29	27	21	20	14	15
Cottonseed	106	130	70	80	52	48	40	38	25	28
Peanuts	332	350	643	469	540	560	610	580	500	650
Palm oil	500	500	510	515	500	520	520	525	530	540
Plantains	1,420	1,450	1,400	1,425	1,425	1,430	1,425	1,440	1,270	1,420
Pulses	540	555	365	450	480	500	500	510	450	520
Soybeans	65	70	70	72	73	55	60	65	50	60
Sugar	50	40	36	34	30	42	47	53	55	60
Tobacco	18	10	8	12	12	18	12	10	9	10
Yams	15,500	16,000	16,500	17,000	17,500	18,120	18,200	18,840	16,625	18,500

Source: (109).

promised support to raise production at Numan plantation, in Gongola State, to 100,000 tons, but increases in the next few years will probably be more modest.

Most tobacco consumed in Nigeria is produced domestically with about 10 percent of total consumption imported for blending (table 21). Recent controls on smuggling have led to increased plantings in 1984 and a 35-percent rise in production. The proportion of imported tobacco is expected to remain constant, with most coming from the United States.

Vegetable oil has generally come from the EEC in the form of soybean oil or rapeseed oil although large quantities of palm oil have also been imported from Asia since 1981. Imports from Singapore generally represent palm oil originating in Malaysia; the Nigerian Government is now attempting to return to direct trade with Malaysia (*113*). Approximately $77 million of palm oil imports were contracted through the Malaysian Government in mid-1985 (*114*).

Yields per unit of land on domestic production of peanuts, soybeans, and cottonseed are apparently improving, but total oilseed production remains well below 1968 levels. The capacity of oil crushing facilities greatly exceeds domestic output of oilseeds. The general manager of the largest processing facility in Nigeria reported that his company had operated at an average of 10 percent of capacity and at a peak of 30 percent of capacity during the past 10 years (*104*).

Demand for vegetable oil imports will probably remain strong because this import has a high priority with the Government. U.S. entry into this market, however, would be difficult, because the soybean portion of demand will mostly come from Brazil under the large countertrade agreement, at least in 1985 (*28*).

Root Crops and Plantains

In addition to the food mentioned above, a substantial portion of the Nigerian diet is provided by root crops and plantains, neither of which is an important item of Nigeria's international trade. Export of roots and tubers is specifically prohibited.

Plantain, cassava, and cocoyam (taro) production has remained relatively constant while yam production has risen slowly since 1975 (table 21). Large losses of cassava from 1975 to 1980 were attributed to mealybug infestation.

The proportion of total calories represented by these foods is clearly declining although per capita consumption is undiminished in many rural areas. Research on controlling cassava pests, primarily through breeding strains resistant to mealybugs and green spider mites, has been very successful. Output of root crops

may grow from extension of these varieties in the next few years.

U.S. Share of Exports

Table 22 includes the largest agricultural exports of Nigeria and, in addition, sheepskins. Nigeria supplies a relatively large proportion of U.S. sheepskin imports.

Cocoa has been the dominant agricultural export during the past decade. The cocoa market is influenced by the International Cocoa Council Agreement (ICCA) made in 1980. The ICCA was originally scheduled to end in September 1984 but has been extended twice for 1 year each time.

The ICCA purchased buffer stocks worth $235 million in 1981 and 1982 to stabilize world prices. This purchase was insufficient to raise the indicator price above the intervention level. The ICCA has not been able to control prices although it did support prices when they were at their lowest.

Production apparently peaked in 1970 at 323,000 tons. The slow production decline since then was caused, in part, by swollen shoot disease. Although that problem is now past, aging trees limit the potential for rapid recovery.

U.S. purchases of Nigerian cocoa have fallen from their high in 1976, 48,300 tons, to 6,100 tons in 1984, only 1.4 percent of U.S. cocoa purchases. Total Nigerian cocoa exports peaked in 1978 in value terms (table 23) but quantity exported has risen 30 percent to around 150,000 tons in 1984.

All other Nigerian agricultural exports are relatively small in value terms. Revenues of each crop have declined since 1979 or 1980 although production levels have been maintained or have slightly risen over the past decade.

AGGREGATE PROSPECTS

I simulated three alternative production scenarios to project potential agricultural imports through 1990. Table 24 presents a brief description of the scenarios; appendix A describes the model I used in these scenarios.

One obvious candidate for a scenario is based on a trend analysis of each crop, but the time series on production is too weak to support this technique. Instead, I used the trend of total agricultural production to project the first scenario. Values of various crops are aggregated for each year using weights based on average prices (*109*), yielding a 1.5-percent annual growth rate over the past decade. In the steady growth scenario, the production level of each crop rises at that rate.

I considered the effect of planned increases in fertilizer use in another scenario. Cereal production was raised for each year through 1986 following the program funded by the World Bank, which pays for increased fertilizer imports through 1985 and then maintains them until the completion of a Nigerian plant around 1989. The magnitude of crop response is based on World Bank estimates. The combined effects of underlying steady growth of agriculture and of increased cereal production due to fertilizer are shown in the high agricultural growth scenario.

Two further scenarios also listed in table 24 reflect alternative assumptions about food consumption. In place of following recent trends in choice among foods, the constant preferences scenario maintains the tastes implied by recent patterns. The alternative population estimates scenario is based on population growth rates expected by the World Bank (*120*).

The prices used in the model (table 25) are patterned after the world price projections developed by the World Bank (*95*). The naira amount paid in Nigeria was determined by comparing standard-location world prices to revenues and quantities reported in trade statistics for Nigeria (*107*). These price projections are generally stable, or slowly rising, in spite of a strong trend during the past 15 years of declining real prices.

Consumption expected under the assumptions of the base run is presented in table 26. Data for the period 1975–82 is included for comparison. This scenario indicates the value of agricultural imports will grow faster than either the population growth rate or the import growth rate of the early eighties (table 27). Import growth, however, will be

Table 22--Nigeria: U.S. share of exports, 1975-83

Item	Units	1975	1976	1977	1978	1979	1980	1981	1982	1983
Animal feeds:										
To United States—										
Quantity	1,000 tons	0	0	0	0	0	2.1	16.5	3.9	3.6
Value	Million dollars	0	0	0	0	0	0.7	2.9	.52	.6
Share of U.S. imports	Percent	0	0	0	0	0	0.8	2.8	.53	.5
Share of Nigerian exports	do.	0	0	0	0	0	1.8	9.3	2.6	4.1
Total Nigerian exports	Million dollars	15.6	25.8	32.3	23.7	38.0	38.1	31.2	20.3	13.6
Cocoa:										
To United States--										
Quantity	1,000 tons	19.2	48.3	21.6	33.0	20.1	30.1	23.5	9.4	17.1
Value	Million dollars	24.6	61.9	60.2	113.0	70.6	72.5	45.5	13.6	24.6
Share of U.S. imports	Percent	5.9	12.0	7.7	10.0	7.5	10.3	6.0	1.9	2.9
Share of Nigerian exports	do.	11.0	20.6	12.8	19.1	15.5	18.0	18.5	6.9	9.1
Total Nigerian exports	Million dollars	224.0	300.9	470.4	591.8	456.0	403.1	246.7	198.3	270.6
Palm kernel oil:										
To United States—										
Quantity	1,000 tons	0	0	0	0	0	1.2	6.5	.42	0
Value	Million dollars	0	0	0	0	0	1.0	3.9	.34	0
Share of U.S. imports	Percent	0	0	0	0	0	1.6	8.9	.69	0
Share of Nigerian exports	do.	0	0	0	0	0	2.3	14.2	2.1	0
Total Nigerian exports	Million dollars	13.7	6.8	8.6	26.5	44.6	44.4	27.7	13.2	23.0
Rubber:										
To United States—										
Quantity	1,000 tons	6.0	.4	.8	.5	.1	0	.2	.3	0
Value	Million dollars	2.6	.3	.6	.4	.1	0	.2	.2	0
Share of U.S. imports	Percent	.75	.05	.09	.06	.01	0	.02	.04	0
Share of Nigerian exports	do.	9.8	1.1	2.9	2.2	.4	0	.8	1.1	0
Total Nigerian exports	Million dollars	27.0	23.9	19.3	18.2	34.5	17.0	22.9	19.7	20.4
Sheepskins:										
To United States—										
Quantity	1,000 tons	.5	.1	.2	.1	.1	.2	NA	NA	NA
Value	Million dollars	1.2	1.6	2.6	1.2	0.9	2.4	2.2	2.2	2.6
Share of U.S. imports	Percent	2.1	2.5	3.9	1.7	1.0	5.4	4.6	6.7	7.8
Share of Nigerian exports	do.	63.1	54.0	63.5	51.2	17.4	19.6	19.7	21.1	63.8
Total Nigerian exports	Million dollars	1.9	2.9	4.2	2.3	5.0	12.3	11.1	10.3	4.0

NA = Not available.

Source: (33, 107)

Table 23--Nigeria: Export crop production, 1975-84

Crop	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
	1,000 tons									
Cocoa beans	218	167	205	141	175	155	182	154	125	160
Kola	150	154	152	160	160	165	165	168	168	170
Palm kernels	295	321	340	350	335	345	345	350	295	320
Rubber	68	56	60	65	65	66	68	70	70	72

Source: (109)

Table 24--Assumptions of alternative scenarios

Scenario	Difference from base run of model
Steady growth	Production of each agricultural commodity increases 1.5 percent every year.
Increased fertilizer use	Grain production rises sharply through 1986 in response to fertilizer project.
High agricultural growth	Fertilizer response in grains is added to 1.5-percent annual increase in production of each crop.
Constant preferences	No effect from urbanization or income growth.
Alternative population estimates	Based on World Bank population estimates.

considerably below that experienced in the seventies. Under these assumptions, the value of per capita consumption would rise because new urban residents would substitute relatively expensive imports for domestic agricultural products; the increased value would not necessarily indicate improved nutrition. The value of agricultural exports would remain approximately constant.

The macroeconomic model suggests a large decline in import capacity for 1985, followed by small rises in ensuing years (table 28). A shortage of foreign exchange reserves caused the 1985 decline, and reduced debt service payments will allow the subsequent recovery. Total planned imports for 1985 are close to the level shown in the model, but many observers doubt that such a drastic reduction will be maintained. If food imports continue to rise as projected in the base run, nonagricultural imports will decline to less than 40 percent of the 1984 level. Even in that year, the shortage of spare parts and of imported raw materials greatly constrained the economy. The largest share of imports taken by agriculture was in the first half of 1984, when 35 percent of the import permits issued were for agricultural goods (*75*).

Whether Nigeria will continue to reduce new borrowing and whether it will apportion its foreign exchange to maintain the consumption levels of the model, are more political than economic questions. The agricultural imports implied by the base run are not excessively greater than Nigeria's capabilities. The problems of realizing these imports are small in relation to the uncertainty inherent in these projections or in relation to the food problems of most other African nations.

In the steady growth scenario, I adjusted the base run of the model to allow a growth rate for each crop of 1.5 percent annually, about half the growth rate of population but consistent with the pattern over the past decade. (The essential results of all alternative scenarios are presented in table 29.) Under this scenario, agricultural exports would rise 6.5 percent between 1985 and 1990, compared with no change under the base run assumptions. The additional earnings of 13 million naira, however, are not a significant contribution to the 4.8 billion of export capacity. The growth assumptions reduce import needs by 136 million in 1990. This is still less than 3 percent of import capacity, so the assumed steady growth at 1.5 percent seems to change nothing relevant to decisionmaking indicated by the model.

Another agricultural growth projection is based on the response to increased fertilizer use as estimated by the World Bank, which is funding major investment in fertilizer.

Fertilizer use should increase in the next 2 years and affect mainly cereal production. Thus, export earnings are no different in this scenario from those of the base run. By the end of 1986, the import needs shown in this scenario have increased from the base run by nearly 400 million naira, which is one-tenth of import capacity and one-third of agricultural imports. Subsequent changes in import needs in the model are due to price changes so the difference between the scenarios remains stable in value terms. These results indicate that substantial impact on import needs is possible from short-term investment in available technology. The improvement in domestic agricultural production assumed here is insufficient to alter the fundamental policy decisions on debt accumulation, but planned investment would probably lead to reduced imports compared with base run levels.

Both of the above growth assumptions were combined into a high agricultural growth scenario. This scenario is the most optimistic considered here. Results show agricultural imports in 1990 which are 630 million naira below the base run levels (table 29). This reduction represents 13 percent of import capacity. In 1987, the difference between the imports of these scenarios is nearly half of the agricultural import needs. To the extent that such growth in domestic production is likely, total agricultural import needs could be as low as indicated here.

A sudden rise in production, whatever the source, would have price effects in Nigeria which this model cannot show. These effects might reduce the rate of substitution of imported food for traditional crops.

I tested the sensitivity of the model to the assumptions about demand first by removing the effect of substitution toward certain imported foods. In this constant preferences scenario, agricultural import needs fall to 20 percent less than in the base run by 1990. Apparently the pace of urbanization and the rise of cash income which has accompanied urbanization in the past have significant effects on agricultural imports.

I used alternative population estimates to determine sensitivity of the model to population change. The World Bank figures, which were chosen as the alternative, have a growth rate over the period of analysis which is close to the rate indicated in the series used in the base run, but the larger population size indicated by the World Bank affects the model by finding different per capita consumption during the base period (*120*). The use of World Bank figures implies a 3-percent lower need for agricultural imports in 1984 and similar

Table 25--Price projections used in model

Commodity	1975-82 1/	1983	1984	1985	1986	1987	1988	1989	1990
	1980 naira per head								
Cattle	157.6	140	153	165	164	163	162	161	160
	1980 naira per ton								
Meat	1,461.7	1,190	1,320	1,450	1,444	1,436	1,429	1,421	1,413
Wheat	157.5	78	100	110	111	111	112	112	113
Rice	416.7	201	245	290	290	290	290	290	290
Corn	243.3	153	148	143	138	133	133	133	133
Pulses	596.1	175	175	175	175	175	175	175	175
Sugar	468.9	163	211	260	260	260	260	260	260
Animal oil	469.8	246	246	246	246	246	246	246	246
Soybean oil	380.1	293	356	420	421	422	423	423	424
Palm oil	465.0	277	341	405	406	407	408	409	410
Cotton lint	1,599.6	740	940	1,140	1,157	1,174	1,190	1,207	1,224
Coffee	1,771.7	957	1,006	1,055	1,055	1,055	1,055	1,055	1,055
Cocoa	1,683.1	732	716	700	700	700	700	700	700
Rubber	604.7	445	533	620	640	660	680	700	720
Palm kernel oil	439.3	245	282	318	319	321	323	325	326
Poultry	481.6	336	336	336	336	336	336	336	336

1/ Average.

amounts for future years. This finding illustrates the importance of the arbitrary choice between unreliable data sets.

The simulation model indicates that agricultural import needs for 1985 will total 1.3 billion to 1.5 billion 1980 naira. By 1990, such needs will have risen from 1.4 billion to 2.0 billion naira. Import capacity will rise over this period from 3.0 billion to 4.8 billion naira. These results are fairly robust in the face of very poor macroeconomic data for Nigeria. Agricultural import needs are dominated by anticipated rapid population growth and slow agricultural growth.

Nigeria's ability to pay for this amount of food is well established although numerous other interests are competing for foreign exchange. Compared with other countries in the region, Nigeria appears able to maintain high import levels based on petroleum revenue. The critical factor determining the total value imported seems to be how much new debt will be accepted. While debt repayment is currently a heavy burden on the economy, Nigeria seems capable of further borrowing soon. The political issues of domestic redistribution and international relations obscure the probable path Nigerian food imports will take.

Table 26--Nigeria: Consumption, 1975-82, and projections of base run, 1983-90

Commodity	1975-82 1/	1983	1984	1985	1986	1987	1988	1989	1990
	Kilograms per capita	1,000 tons							
Cereals:	150	12,627	13,057	13,517	13,976	14,450	14,954	15,458	15,992
Wheat 2/	15	1,535	1,619	1,709	1,803	1,901	2,007	2,116	2,233
Rice 2/	17	2,050	2,162	2,283	2,408	2,539	2,680	2,826	2,982
Corn	24	2,020	2,088	2,162	2,235	2,311	2,392	2,472	2,558
Millet	42	3,272	3,352	3,436	3,518	3,600	3,686	3,769	3,855
Sorghum	51	3,751	3,836	3,926	4,012	4,099	4,189	4,275	4,364
Cassava	160	13,371	13,826	14,313	14,799	15,302	15,835	16,369	16,934
Yams	230	19,899	20,577	21,301	22,025	22,772	23,566	24,360	25,201
Cocoyam (taro)	23	1972	2,039	2,111	2,183	2,257	2,335	2,414	2,497
Soybeans	.90	77	79	82	85	88	91	94	97
Soybean oil	.64	54	56	58	60	62	65	67	69
Peanuts	6.9	590	610	632	653	676	699	723	748
Palm kernels	4.5	388	401	415	429	443	459	474	491
Palm kernel oil	-.45	-38	-40	-41	-42	-44	-45	-47	-49
Palm oil	7.5	641	662	686	709	733	759	784	811
Cottonseed	1.0	82	84	87	90	93	97	100	103
Cotton lint	.70	59	61	63	66	68	70	73	75
Plantains	19	1,650	1,706	1766	1,826	1,888	1,954	2,020	2,090
Cocoa beans	.17	14	15	15	16	16	17	17	18
Rubber	.48	41	42	44	45	47	48	50	52
Beef	2.6	218	225	233	241	249	258	267	276
Poultry 2/	2.6	262	276	292	308	325	343	361	381
Mutton	2.1	177	183	190	196	203	210	217	225
Pork	.52	44	46	47	49	50	52	54	56
Cattle 3/	3.6	307	317	328	340	351	363	376	389
Meat	.38	32	33	34	35	37	38	39	41
Animal oil	.48	41	42	44	45	47	48	50	52
Milk 4/	12	985	1,019	1,055	1,090	1,127	1,167	1,206	1,248
Pulses	6.7	575	594	615	636	658	681	704	728
Sugar	8.0	678	701	726	750	776	803	830	858

1/ Average.
2/ Based on post-1980 per capita levels.
3/ Head per capita average for 1975-82. 1,000 head for 1983-90.
4/ Projections are based on a price for imported milk of 281 1980 naira per ton.

Source: 1975-82 data from (107, 108); projections by ERS

Table 27--Trade projections in base run

Item	1983	1984	1985	1986	1987	1988	1989	1990
				1,000 head				
Import demand:								
Cattle	306.9	317.3	328.5	339.7	351.2	363.4	375.7	388.7
				1,000 tons				
Meat	32.1	33.2	34.3	35.5	36.7	38.0	39.2	40.6
Wheat	1,500.0	1,579.0	1,669.5	1,762.9	1,861.4	1,967.1	2,076.2	2,193.0
Rice	770.0	809.2	930.0	1,054.8	1,186.3	1,327.4	1,473.2	1,629.2
Corn	419.6	288.3	361.8	435.3	511.1	591.7	672.3	757.7
Cereal subtotal 1/	4,752.5	2,974.3	3,433.7	3,893.2	4,367.4	4,871.4	5,375.3	5,908.8
Pulses	124.8	74.4	95.3	116.2	137.8	160.8	183.7	208.0
Sugar	622.8	640.9	665.5	690.2	715.7	742.7	769.8	798.4
Animal oil	40.8	42.2	43.7	45.2	46.7	48.3	50.0	51.7
Soybean oil	54.5	56.3	58.3	60.3	62.3	64.5	66.7	69.0
Palm oil	640.5	662.3	685.6	709.0	733.0	758.6	784.1	811.2
Cotton lint	45.2	46.3	48.4	50.6	52.8	55.2	57.5	60.0
Milk	640.2	658.8	694.6	730.5	767.5	806.8	846.1	887.7
Poultry	12.0	36.3	51.8	67.7	84.5	102.6	121.2	141.1
Export supply:								
Coffee	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Cocoa	110.8	145.4	144.8	144.3	143.8	143.2	142.7	142.1
Rubber	29.1	29.7	28.2	26.7	25.2	23.6	21.9	20.2
Palm kernel oil	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
				Million 1980 naira				
Import value:								
Cattle	43.0	48.6	54.2	55.7	57.2	58.9	60.5	62.2
Meat	38.2	43.8	49.8	51.2	52.7	54.3	55.8	57.4
Wheat	117.0	157.9	183.6	195.7	206.6	220.3	232.5	247.8
Rice	154.8	198.2	269.7	305.9	344.0	385.0	427.2	472.5
Corn	64.2	42.7	51.7	60.1	68.0	78.7	89.4	100.8
Cereal subtotal 1/	278.1	187.9	235.9	267.1	296.8	331.1	362.3	398.6
Pulses	21.8	13.0	16.7	20.3	24.1	28.1	32.1	36.4
Sugar	101.5	135.2	173.0	179.5	186.1	193.1	200.1	207.6
Animal oil	10.0	10.4	10.7	11.1	11.5	11.9	12.3	12.7
Soybean oil	16.0	20.1	24.5	25.4	26.3	27.3	28.2	29.2
Palm oil	177.4	225.9	277.7	287.8	298.3	309.5	320.7	332.6
Cotton lint	33.5	43.5	55.2	58.5	62.0	65.6	69.4	73.5
Milk	179.9	185.1	195.2	205.3	215.7	226.7	237.8	249.5
Poultry	4.0	12.2	17.4	22.8	28.4	34.5	40.7	47.4
Other	294.4	300.8	361.4	386.0	410.5	437.6	463.6	492.4
Total	1,197.8	1,226.4	1,471.8	1,570.7	1,669.6	1,778.5	1,883.5	1,999.4
Export value:								
Coffee	2.9	3.0	3.2	3.2	3.2	3.2	3.2	3.2
Cocoa	81.1	104.1	101.4	101.0	100.7	100.3	99.9	99.4
Rubber	12.9	15.8	17.5	17.1	16.6	16.0	15.3	14.5
Palm kernel oil	12.3	14.1	15.9	16.0	16.1	16.2	16.3	16.3
Other	46.8	58.7	59.1	58.8	58.5	58.1	57.7	57.2
Total	156.0	195.7	197.1	196.1	195.0	193.7	192.3	190.6

1/ Includes other substitutable cereals which may vary from year to year.

Table 28--Base run projections

Item	1983 1/	1984	1985	1986	1987	1988	1989	1990
	Million 1980 naira							
Foreign exchange reserves	2,788	1/705	833	700	700	700	700	700
Debt payments	856	1/1,686	2,244	1,500	1,000	500	500	500
Oil revenue	4,990	1/5,130	5,130	5,130	5,130	5,130	5,130	5,130
Agricultural imports	1,240	1,226	1,472	1,571	1,670	1,779	1,884	1,999
Agricultural exports	295	196	197	196	195	194	192	191
All imports	6,218	5,723	2,955	3,959	4,325	4,824	4,822	4,821

1/ Actual data rather than projections.

Source: (61)

Table 29--Agricultural imports implied by alternative scenarios

Scenario	1983	1984	1985	1986	1987	1988	1989	1990
	Million 1980 naira							
Base run	1,240	1,226	1,472	1,571	1,670	1,779	1,884	1,999
Steady agricultural growth	1,240	1,226	1,450	1,527	1,604	1,690	1,772	1,863
Increased fertilizer use	1,240	1,230	1,276	1,173	1,276	1,387	1,498	1,617
High agricultural growth	1,240	1,226	1,247	1,070	1,139	1,214	1,289	1,369
Constant preferences	1,240	1,230	1,276	1,173	1,276	1,387	1,498	1,617
Alternative population estimates	1,240	1,184	1,420	1,516	1,613	1,716	1,821	1,935

Source: ERS projections

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APPENDIX A: MODEL OF AGRICULTURAL TRADE IN NIGERIA

Several models to assist crop by crop projection of agricultural trade for Nigeria have been attempted by the World Bank and others (*52, 95, 103*). The analysts building these models are uniformly cautious in claiming confidence about any specific projections based on the poor quality of available data and on the volatile institutional environment. Even so, the models on record rely too heavily on outdated estimates of critical parameters, and they tend to be too complex to assist readers today in assessing the effects of more recent experience.

The simulation model presented here responds to the lessons provided by these antecedents by emphasizing quantitative exposition of the structure of the Nigerian economy as it affects agricultural trade. I constructed this model to help readers interpret new information. The importance of relevant variables is revealed by considering alternative scenarios representing feasible future economic environments for Nigerian agriculture. I chose the included variables both because they are important determinants of agricultural trade and because they have been measured well enough in recent years that assessing their present and future values becomes practical. Specific reasons for excluding certain variables which are often used in such models are also presented.

The model recognizes three possible sources of constraint on agricultural trade. First are restrictions on imports of specific commodities, or on the agricultural sector, which may be imposed directly by the Government. Previous Governments have often attempted to replace the market's determination of relative values with their own. Although future policies of this nature are anticipated, the base run of the model presented below does not attempt to measure such effects, so it assumes direct import restrictions are not constraining trade. Second, the aggregated supply and demand functions of Nigerians imply quantities of agricultural goods which would trade as a result of microeconomic factors. Third, the amount of foreign exchange available for imports encapsulates the macroeconomic variables which constrain trade.

Microeconomic Submodel

The microeconomic submodel projects imports and exports of major crops in Nigeria based on numerous assumptions which imply, when taken together, that production will stagnate near 1984 levels while consumption will grow with population and urbanization. These conclusions imply, in turn, that rising agricultural imports will be required in order to maintain per capita consumption levels.

Production Equation

In the base run of the model, production of each crop is set at 1984 levels. The choice of 1984 as a base year is appropriate because it was a generally good year, not reflecting much distortion from poor weather, and because it captures the most recent shifts among crops. I chose constant production for the base run because it provides a reference point which is easy to understand and which is close to the expected production level.

I did not include in the model several variables which are often used in predicting production: changes in producer prices, capital investment, labor quantity, land area, and weather.

I did not use producer prices even though numerous researchers and development agencies claim that raising prices would lead to higher production. The quantitative response of farmers to price change cannot be measured for past periods because a long-term price series is lacking and because production estimates are so imprecise. Furthermore, with the relatively constant predicted prices used in the model, supply response would be small compared with unexplained variation. Producers respond primarily to price expectations rather than to current prices, so a lag between price change and response is probable. Since recent prices show little impetus for change in production, little producer response would appear in a model projecting only 5 years.

Similarly, capital investment is not useful in predicting changes in crop production up to 1990 because there is a time lag between

investment and response. Agricultural investment has not changed significantly recently (except for fertilizer). Labor quantity is not used here both because estimates of changes in labor use in the agricultural sector are of dubious reliability and because the effect of labor on productivity is unmeasured for most crops. Land area is not used to predict production because there is too little evidence to allow any confidence in projected changes in area by crop. Weather is excluded because it affects only the variation in yield rather than the expected value.

Consumption Equations

In the model, I based consumption for most crops on the average per capita consumption between 1975 and 1982. I chose this period as a foundation for consumption because it includes the years after petroleum revenue became important and before the most stringent direct import restrictions were imposed. For wheat, rice, and poultry, however, I used recent (post–1980) consumption levels in order to incorporate the strong increase in consumption of these products compared with 10 years ago. I calculated total consumption by multiplying per capita consumption by population for each year. Consumption is also adjusted to account for continuing substitution among cereals and for rising poultry consumption due to changing tastes and income. I attributed these changes to urbanization and projected consumption to rise at the urbanization rate. The base run results appear in text table 26.

I tested sensitivity of the model to the assumptions about changing tastes by comparing a scenario with constant per capita consumption of all products. Sensitivity to selection of a population series was tested by comparison with the World Bank population estimates.

I did not include in this model several variables which are sometimes used to model consumption. Among such excluded variables are own price, price of substitutes, and income levels.

Prices of goods consumed and prices of substitutes undoubtably affect consumption levels, but I did not use those prices to predict consumption because the magnitude of response is unmeasured and because anticipated price changes are small. Data on consumption are too poor in quality to support quantitative determination of price elasticities. In both equations, price itself disguises the variety within exchange of goods in diverse markets and environments across Nigeria. Thus, even at the level of theory, prices of international trade are not necessarily linked strongly to consumption levels in Nigeria.

Although I did not incorporate income as such in the model, the included variables imply that income will rise. Effective demand is modeled as a function of population growth and changing tastes, both of which generate higher aggregate consumer expenditures for food. Because I did not include an explicit income effect on demand, the model implicitly assumes income is growing at a greater rate than population.

Trade Equation

The difference between projected production and consumption for the principal traded crops is shown as trade in text table 27. In addition, there is a category displayed there which projects the shortfall in production of all cereals. Sorghum and millet have not been imported, but imports of other grains substitute for these traditional cereals. The model shows the total quantity of cereal imports as well as the quantity of wheat, rice, and corn needed to maintain per capita consumption at assumed levels. I did not attempt to allocate the additional shortfall in traditional cereals among imported crops.

Unfortunately, the data on which production is estimated include different categories of agriculture from the data on trade, so the consumption projections contain some anomalies. For example, the trade data show palm kernel oil, but the production data measure only whole kernels. The consumption table lists negative consumption of palm kernel oil and overstates consumption of palm kernels. Taken together, these entries probably represent very little consumption in Nigeria with a ratio of 10:1 by weight for kernels compared with kernel oil from the same crop. A similar problem occurs with soybeans and soybean oil except that no

negative entries appear in the table because Nigeria does not export soybean oil.

Macroeconomic Submodel

The macroeconomic submodel projects the total value of imports in Nigeria to 1990 based on foreign exchange reserves, debt payments, and exports. These are related additively where

import capacity	=	foreign exchange reserves	+	new debt
	+	exports	−	debt payments

The values of these variables for the base run appear in text table 12.

Foreign exchange reserves were reported in October 1984 by the Nigerian Government to be 1,100 million naira. This figure is inconsistent with IMF estimates of exchange reserves in table 12, although the annual pattern of exchange spending reported by the two sources is similar. Reserves grew rapidly as oil revenue accumulated and declined precipitously as oil prices fell and imports grew. A further drawdown of reserves is not expected because present levels are near the minimum needed to facilitate trade arrangements. The 1985 budget shows a 200-million naira increase in reserves. No significant buildup of exchange is expected over the next 5 years as Nigeria attempts to reduce its debt commitments.

The foreign debt of Nigeria is widely perceived as the key variable determining Nigeria's short-term capacity to import. A review of the debt incurred by Nigeria through recent years shows conservative borrowing through 1977 replaced by fiscally excessive levels in 1982 and 1983 (table 12). Much of the debt in the latter years was unplanned, coming in the form of trade arrears and State borrowing. By the end of 1983, more than a third of external debt came from trade arrears.

The repayment burden has risen almost as rapidly (table 12) and is planned to increase further in 1985. Some debts have been rescheduled, notably $1,350 million of trade arrears in July and $480 million in September 1983, but the two Governments since January 1984 have shown a strong commitment to paying debts on schedule. That schedule is weighted heavily toward the period up to 1987. For example, the second "jumbo" Eurodollar loan is scheduled for final payment in 1987. The first was paid on schedule in 1985. Little new borrowing occurred in 1984, and the Government claimed it would continue to avoid borrowing through 1985. During 1984, the Government negotiated with IMF, but IMF insistence on devaluation of the naira apparently blocked the agreement. Nigeria might be able to finance its needs from sources other than the IMF, but those sources generally require agreement with the IMF as a precondition to their loans. The administration which came to power in August 1985 originally expressed renewed determination to reach an agreement with the IMF, but the public debate culminated in December 1985 with a declaration that Nigeria was no longer seeking an IMF loan.

In early 1985, several lending actions were announced. Six European nations offered loans totaling 474.3 million naira (*48*). The EEC granted $35.3 million and lent $106 million on concessionary terms (*6*). The World Bank lent $13 million to assist in managing information necessary to account for national debts. By mid-1985, the World Bank had lent over $1 billion, over half of which is planned for agricultural projects (*4, 9, 10*). Several large loans from private sources in Europe were also completed, including $77 million for a feed mill in Bendel and $220 million for four commercial airplanes. These loans, however, were underway prior to the standstill in negotiations with the IMF.

The base run of the model does not show any new borrowing. If new commitments are accepted, however, their effect would be to raise imports by an equivalent amount. The repayment schedule in the model is based on IMF evaluations of Nigerian data released in 1983 and on Nigerian Government releases during 1984.

Exports in the model are composed of petroleum and agriculture. Since the midseventies, the value of petroleum exports has been at least 10 times as great as that of agriculture (table 12), and the sum of the two sources accounts for virtually all official export value. I generated future value of

agricultural exports using the microeconomic submodel.

Future petroleum exports are set in the base run at the real 1984 level. Both price and quantity of Nigerian petroleum are uncertain for the next 5 years. As a member of the Organization of Petroleum Exporting Countries (OPEC), Nigeria has been active in negotiating international prices and market shares, but the ability of OPEC to lead the market has become increasingly questionable recently as OPEC's overall share of world production has declined. A loss of control of the market by OPEC will probably lead to destabilized prices, but no consistent trend either up or down is widely foreseen. Nigeria's dependence on petroleum for foreign exchange clearly creates an import capacity which is highly sensitive to petroleum prices. Just as the level of imports has closely followed petroleum prices in the past decade, import demand will probably follow this unpredictable variable over the next 5 years.

Effect of Risk

Economists sometimes distinguish between the variations from expected values which have a measurable distribution, called risk, and those variations whose distribution is unmeasurable, called uncertainty. The variation which is caused by poor data collection on production, prices, and population is uncertainty. Several sources of risk are influencing the independent variables of the model, and they permit a quantitative evaluation of the probable variation in the dependent variables. Comments below relate to risk associated with oil revenue, prices of agricultural goods, and agricultural production.

Oil Revenue—In the model, oil revenue is stable from year to year, reflecting the apparent balance between the forces which would cause it to rise and those which would cause it to decline. There have been large changes in oil revenue in the past, usually because of price change. Even though the trend in prices seems to neither rise nor fall, the prices themselves should continue to be unstable. Thus, even though the model may fairly represent the middle of the range of probable oil revenues, the model masks the effects of price instability by offering only point estimates. A feasible lower bound on likely oil revenues might be set at 4 billion naira 1/ in any year. This figure is equivalent to the lowest production level since 1970 and the lowest price since 1974. The upper limit considered likely is about 6 billion naira, which is equivalent to 1983 production and 1979 prices. This range of oil revenues is about five times the size of the effects resulting from any particular assumption altered in the scenarios discussed above.

A low revenue year could reduce foreign exchange earnings enough to limit import capacity to as little as 125 percent of agricultural import needs. Subsequent recovery of oil revenue would be likely, but the variation in oil revenue could place untenable demands on the foreign exchange budget, greatly increasing the pressures for accumulation of new debt.

A high revenue year could bring significant relief from foreign exchange constraints, raising the amount available for nonagricultural imports by as much as 35 percent. Since such a high revenue would probably be followed by a period below the trend level of oil revenue, a high revenue period would also signal future demand for debt accumulation exacerbated by raised expectations. Because revenue from above-trend years would probably not be saved to cover future periods below trend, variation itself places further pressure on the foreign exchange balance.

Prices of Agricultural Goods—Risk caused by variation in the price of agricultural commodities is important in evaluating the value of specific crops but less important when considering the whole agricultural sector. Little price variation is found in the data used for the simulation model because only one annual observation was recorded for each crop, even though prices vary consistently with season and location. The impact of a price rise in any particular commodity is reduced through substitution of other goods by consumers. Quantitative evaluation of the effect of price variation is considered in this paper simultaneously with

1/ All money units in this discussion are constant, 1980 naira, unless otherwise specified.

the effects of variation in quantity by evaluating value produced.

Agricultural Production—Risk caused by weather and other factors which bear on agricultural production has contributed to a variation of 10 percent below and 5 percent above trend in the past decade for the production index reported by USDA. Using these as limits on the magnitude of production risk indicates that variation from this source is second in importance to oil revenue variation among the variables used in the model. A 10-percent decrease in agricultural production along with the associated price effects would reduce the value of agricultural production by about 300 million naira, 25 percent of recent imports.

Devaluation of the Naira

The naira has become overvalued in relation to the currencies used in international trade because of the Government's policy of maintaining a relatively constant official exchange rate even though inflation in Nigeria has been greater than inflation of the trading currencies. Official figures on the Consumer Price Index indicate inflation has been about 20 percent annually during the past 10 years, reaching 40 percent in 1984. The official exchange rate of dollars to naira rose by 20 percent from 1971 to 1980. Since then, that rate has declined from $1.84 per naira to $1.00 per naira in 1986, a nominal loss of 45 percent. Current estimates of the amount of overvaluation range between the Nigerian Government figure of 25 percent and the IMF figure of 60 percent. The issue of devaluation became especially important when it became the central precondition for an IMF loan.

Because the Nigerian Government plans on equal imports and exports, devaluation has no impact on the aggregate figures in the simulation model. Devaluation would change the prices, as expressed in naira, for both imports and exports by the same ratio. The model uses international prices to value domestic production, so that value would also change nominally at the same rate. These results within the model reflect that the first round effects of devaluation are entirely distributional in an economy with an even trade balance.

The IMF strongly supports devaluation partly to facilitate trade. The IMF promotes market determination of value for currencies. Even if the trade balance situation in Nigeria separates it from the typical situation of IMF debtors, the IMF is hesitant to allow the precedent of agreement without market valuation of the currency.

Creating and maintaining a certain public image emerging from the negotiations on devaluation is also important to the Nigerian Government. In its campaign for legitimacy, the Government wants to appear strong in relation to the IMF, which is seen as representing the richer Western nations. The Government is also concerned with the distributional impact of devaluation. A lower value for the naira would raise the domestic price of imports and would severely affect the urban poor who rely on imported food. Maintaining the implicit subsidy to these people which results from overvaluation may be a necessary stratagem in the volatile politics of Nigeria.

APPENDIX B: REGRESSION MODEL OF AGRICULTURAL IMPORTS

Neoclassical economic theory suggests several variables which may determine demand for agricultural imports. I tested the available data on several of these variables by linear regression for the period 1970–83 in an attempt to build a model which could be used to predict future agricultural imports. I assumed that increases in the variables of population, urbanization, and national income would lead to increased agricultural imports. Increased domestic agricultural production and increased prices of agricultural imports, on the other hand, would lead to decreased agricultural imports. Some lag between the observation of a variable and its effect was expected for certain variables. All data were expressed in real terms.

I encountered several problems in identifying data series corresponding to the hypothesized variables. Separating demand effects of population from urbanization or, indeed, from any other variable for which data are a linear function of time was especially impractical. No time-specific observations are contained in the data series on these variables; rather, I

estimated them on the basis of long-term trends. The trend variable incorporated in the model is a proxy for both population and urbanization simultaneously.

I substituted several sources into the model as estimates or proxies of income. I used gross domestic product (GDP) as the broadest measure of national ability to pay, but the uncertain accuracy of this data suggested that alternative measures might be useful. Oil income is measured relatively well and was substituted for GDP. Also, the sum of oil revenue and the change in foreign debt was tried as an income measure. Both of these variables are important components of foreign exchange. In the final model, GDP was used because it displayed much greater significance in addition to its closer correspondence to the theoretical variable.

I estimated domestic agricultural production using a production index based on all commodities weighted according to their average 1976–78 producer prices. I tried an alternative index based on total weight of grains produced because the data on grains are better than those on other crops, but the alternative index had no effect on the model's performance.

Price of agricultural imports was measured by an index of price paid for grain imports weighted by the quantity of each type of grain. No effect on the model resulted from expression of prices in dollars versus naira.

I also considered several forms of the dependent variable. A 1-year lag in agricultural imports and consideration of all imports and all imports lagged yielded results essentially similar to those based on current-year agricultural imports. Correlation coefficients between any pair of these import measures are high.

Appendix table 1 contains statistics from an ordinary least squares regression model based on these variables. Trend and domestic agricultural production are significant, but their coefficients each carry the wrong sign. GDP and price of agricultural imports are not significant. Correlation coefficients of the independent variables indicate only the correlation between GDP and domestic agricultural production is significantly different from zero.

When lagged imports are used, GDP is significant, and domestic agricultural production is insignificant. Trend is again significant and negative. Explanatory power of the lag model is equivalent to the unlagged form. Specifying the lag between cause and response probably requires observations made more frequently than the annual ones available.

The results advise against using this model to predict agricultural imports. The negative sign of the trend coefficient indicates that time is not influencing imports in the way that theory anticipates population and urbanization would do. The lack of significance for import prices shows the poor explanatory power of that variable. That these results are robust over changes in data source indicates consistency, if not accuracy, in the data. Further manipulation of available figures is unlikely to reveal an adequate model for prediction.

Appendix table 1--OLS regression results on estimation of agricultural imports

Variable	Coefficient	t statistic of coefficient
Trend	-4.2	-4.1
Gross domestic product	.69	1.3
Domestic agricultural production	72	2.7
Price of agricultural imports	-.59	-.29

Degrees of freedom 8
Durban - Watson statistic 2.9
$R^2 = 0.84$

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