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FOOD CROP MARKETING

FOR

ATEBUBU DISTRICT

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Food Crop Marketing for Atebubu District

Final Report

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Part I

THE ASSIGNMENT

In November, 1976, we were engaged by the Agency for International Development on behalf of the Bank of Ghana and the Ghana Ministry of Agriculture "to conduct a baseline marketing survey which will investigate alternative assistance interventions for the private sector to provide a basis for design implementation and evaluation of food marketing programs which provide adequate incentives to small farmers to expand their production." The contract specified that we should submit a final report, not later than two months after completion of the field work, "which fully describes the methodology used, the results and conclusions of the research, and a summary of the program recommended" for implementation and procedures for monitoring and evaluating it. This is that report.

THE METHODOLOGY

An intensive study of farm marketing of foodstuffs in parts of Manpong and Atebubu Districts was carried out in the first half of 1970 by V.K. Nyanteng and G.J. van Apeldoorn of the Institute of Statistical, Social, and Economic Research of the University of Ghana (13). The marketing of yams, a major food product of Atebubu District, had also been the subject of an earlier study by Nyanteng (11). In addition to these two excellent studies, a soil and

agricultural survey of eastern Brong-Ahafo and Ashanti carried out for AID in 1962 by G.E. Smith included the southern half of the District (17).

Our first task was to extend, update, and test the findings of these studies. Three approaches were used:

1. Direct testing of conclusions reached by Nyanteng and van Apeldoorn on the basis of more complete information. Examples include the seasonal rate of flow of farm commodities out of the District; the relationships between farm location, transportation network, and point of sale; and the relative bargaining power of farmers and traders.

2. A search for economic imperfections in the market and evaluation of their effect on price formation and market responsiveness.

3. Analysis of the behavior of prices of farm products within the District and between District and national markets.

To accomplish these objectives we relied on in-depth interviews with well-informed persons in Accra, Kumasi, and the District, repeated discussions with merchants and other market participants in the District, structured interviews of root traders resident in the District, and structured interviews of a representative sample of 404 farmers throughout the District. Produce movement was recorded at Amantin and Yeji 24 hours a day from mid-February, 1977, and will be continued through March 1978. Prices were also collected regularly in Amantin, Atebubu, Prang, and Yeji.

Merchants were interviewed in the Kumasi wholesale market and prices and commodity movements in that market were recorded. Prices recorded in the monthly Food Crop Situation Reports of the Department of Agriculture for the period June 1965 to September 1974 were used to test for spatial arbitrage, price spreads, seasonal variations, and evidence of monopoly profits.

The results of these studies are presented in Part II of this report.

The search for feasible innovations was initiated at the same time as research on the performance of the marketing system. Early in the field research a set of feasible alternatives was identified (and presented in our Interim Report). The acquisition of information needed in order to evaluate these possible interventions became a part of the research activity, both in terms of data gathering and in terms of socio-cultural attributes that might impinge on them. The interviews therefore covered considerably more than the simple economics of marketing.

Evaluation of the relative merits of the original set of proposed interventions, and of others suggested later, involved screening first for socio-cultural acceptability. Those that passed this test were then subjected to a modified cost-benefit analysis appropriate to the experimental character of the program.

The method of evaluation, the interventions that we recommend, and the reasons for our selections are presented in Part III of this report. We also set out procedures for monitoring the impact of proposed interventions on Atebubu District marketing and production, and for annual review and evaluation that will serve as a basis for adjustments in the interventions.

Messrs. Jones, Pearson, and Southworth went to Ghana in November 1976 to establish liaison with the Bank of Ghana, members of the staff of the University of Ghana and the University of Science and Technology, and the District Executive Office in Atebubu. Mrs. Southworth joined Mr. Southworth in January 1977 and they pursued the field investigations through November 1977. They were based in the District but with frequent trips to Kumasi and Accra.

and were in regular communication throughout this period with Messrs. Jones and Pearson who also directed the statistical analysis at Stanford.

Mr. Southworth was assisted in his field research in Atebubu District by Dr. V.K. Nyanteng and in Kumasi by Dr. K. Prakah-Asante of the University of Science and Technology. Messrs. Jones and Pearson went to Ghana in June 1977 to discuss our interim report with AID, the Bank of Ghana, and the Ministry of Agriculture. In October, Messrs. Pearson and Southworth, accompanied by Charles Humphreys and Patricia Rader of the Stanford/WARDA rice study team, visited major yam and grain markets in Kumasi, Sunyani, Techiman, Kintampo, Tanale, and Salaga.

ACKNOWLEDGEMENTS

We feel a special obligation to acknowledge assistance afforded to Mr. and Mrs. Southworth by Martin Homiah, Atebubu District Chief Executive Officer until August, 1977, and by Joseph Quansah, Principal of Atebubu Training College. Without their help the work in the District could not possibly have been as rewarding as it proved to be. Special thanks, too, are due to Henry A.K. Sam, Manager of the Agricultural Development Bank's branch at Atebubu. We are also under obligation to Dr. V.K. Nyanteng and Dr. K. Prakah-Asante for their expert counsel and assistance, and to various members of the Ministry and the Bank for their patience and courtesy in reviewing our conclusions and providing us with essential information. We were fortunate, too, in being able to draw on the expert knowledge of Polly Hill Humphreys of Cambridge University, Blair E. Rourke of the International Cocoa Organization, D.G. Coursey of the Tropical Products Institute, and David Evans, K.R.M. Anthony, and Peter Stutley of the British Ministry of Overseas Development. Our colleagues at Stanford, particularly M.P. Falcon, R.W. Gray, C.H. Gotsch, J.H. Page, and Anne E. Peck, and William Chancellor at the University of California have also provided valuable counsel.

HISTORY

Atebubu District is the easternmost extension of Brong-Arafo and lies in the transition belt between forest and savanna. Yeji Town marks an old crossing of the Volta River on the road from Kumasi to the North via Salaga, and Atebubu Town stands at the intersection of that road with the old rubber route from Wenchi and Techiman to the Keta Krachi crossing of the Volta (6, p. 87). Atebubu Town succeeded Salaga as a major entrepot. In the 1870s when Ashanti lost control of this route to the North and Atebubu came under British protection (1, p. 201).

The north-south trade through Atebubu based on kola and slaves declined after 1904 when domestic slavery was abolished and the frontiers of Ashanti were opened to Mossi kola buyers from the north (1, p. 207). Atebubu revived for a while as a major cattle market, but in 1927 that market was moved to Prang where it prospered until early in the 1960s. Meanwhile changes in District agriculture transformed the Atebubu market from entrepot to rural bulking center for major foodstuffs.

When the kola market collapsed early in the century many northern merchants invested their capital in commercial farming of yams, rice, and corn. In 1904 the Atebubu commissioner reported that the area planted to these crops had doubled in two years (1, p. 210-11). From this beginning Atebubu was to become one of three major yam-producing areas in Ghana and an important supplier of maize, rice, and kokonte.

Two aspects of Atebubu's earlier history are important today--the accommodation that was worked out between the earlier Akan-speaking occupants of the territory and the immigrant northerners (the people of the Zongo, who now outnumber them in many areas), and Atebubu's role as supplier first of caravans and later of lorry drivers who were engaged in trade over the great distances of the western Sudan. Today

northerners, with their long experience of the complexities of trade over long distances, are the principal grain merchants, while the Akan, whose women have been major traders in vegetable crops, are the principal yam merchants. Atebubu is the administrative center of the District, and it continues to be a major service center, although its growth was slowed when the Volta Lake made north-south travel more difficult. Its 1970 population of 6,630 was slightly smaller than the conurbation of Yeji, Salt Town, and Kajai, but its economic role is first in the District.

THE ENVIRONMENT

Certain aspects of the physical, economic, and socio-cultural environment must be taken into account when appraising the performance of the Atebubu District farm marketing system. Much of the physical character of the area has to be taken as given, although its most striking feature, the Volta Lake, is man-made. Other attributes like roads, fleets of transport vehicles, and settlement patterns are the work of man and alterable. Only those aspects of each that might be expected to influence farm marketing will be touched on below.

Physical Environment

Atebubu District extends 80 miles from east to west and 45 miles from north to south and has a total land surface of about 5,000 square miles. Atebubu Town is 100 miles from Kumasi, 250 miles from Accra, and 25 miles from Tamale. Most of the District is a fairly level, undifferentiated plain that is bounded on the north and east by the Volta Lake and deeply penetrated by the Pru and Sene arms of the lake. Parts of the

District south of the Senegal are so remote from the rest that they were not considered in this investigation. The unflooded area is traversed by a few small streams that cannot be crossed after heavy rains, but otherwise it is relatively open to tractor or lorry travel.

Vegetation.-- Vegetation is bushy savanna, and soils tend to be light, with low inherent fertility and poor water retention. As a consequence, they are rotated with a fairly long fallow. Groundwater supplies appear to be hard to tap and there is widespread complaint about shortages of household water.

Climate.--Annual rainfall at Atebubu Town averages about 50 inches with a relatively dry period from November through February (Table 1), and temperatures range from 70°F to 90°F with an average of about 80°F.

Farm crops.--The District produces yams, millet, sorghum, corn, rice, cassava, peanuts, tobacco, and various vegetables, most notably eggplant, okra, tomatoes, melon seeds, and beans and peas. The area is said to be infested with tsetse fly and therefore not suitable for cattle, but small herds are to be observed in some places.

Volta Lake.--The lake is about 7 miles wide at Yeji and the ferry crossing itself takes about 40 minutes. But the two ferries stationed at Yeji cannot accommodate the present volume of road traffic, even on the rare occasions when they are both in service. Delays of many hours, sometimes of days are not uncommon, and north-south traffic is less than it would have been with an easier crossing. The new road through Techiman and Kintampo avoids the lake and was intended to replace the Atebubu-Salaga road. It has not been completely surfaced between Kintampo and Yapei and is lightly traveled,

Table 1.--Monthly Rainfall, Atchubu District^a
(22 year average)

District	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Atchubu	1.27	1.67	3.26	5.24	6.89	7.16	5.96	4.16	7.65	6.90	1.48	1.79	51.43
Kwane Danso	1.27	1.50	1.51	5.91	5.68	7.89	5.80	4.76	7.32	6.67	1.60	1.61	51.62
Prang	1.33	1.96	3.25	4.45	5.03	7.32	5.26	4.50	7.50	5.51	1.05	1.45	47.77

^aSource: Ghana Meteorological Service.

partly for this reason and partly because vehicle repair and service facilities are few.

There is also a ferry at Kwadjokrom that crosses twice a day but is closed frequently for repairs. Some yams from Keta Krachi bound for Kumasi are carried on it.

Human Environment

In 1970 Atebubu District had a population of 90,223, almost all of them resident in villages and towns. This compares with 65,849 in 1960, for an increase of 37 percent. Distribution of District population as of about 1970 is shown in Map 1. The tendency to locate along main roads is marked. The route to the north, the eastern route to Keta Krachi and a western route to Techiman and Wenchi date back at least to the early years of the 19th century. (The western route is one of the roads scheduled for reconstruction.) These roads were opened to serve long distance trade, not the local communities that developed near them later. Soil quality and availability of water also must have played a part, and probably explain the considerable population between Kwame Danso and the Sene. Concentrations in the extreme southeast at Ntobona and at Kajeji west of Kwadjokrom resulted from resettlement of communities from the Volta Valley. Recent years have witnessed an opening up of the lands north and east of Kwame Danso but the population in that part of the District remains small. Farmers prefer to live near the Kwame Danso road, keeping enough laborers on their farms to protect them from damage and theft.

Immigrants from various parts of northern Ghana and more distant have been settling in the District for a hundred years or longer and continue to do so. As a consequence the community is quite mixed in terms of language and

culture. Of the 401 households in our farm survey who replied to our question about ethnic affiliation, 191 identified themselves as Brong, original inhabitants of the area, 181 were members of one of 21 tribes of northern origin, and 29 belonged to southern tribes.

Roads.--The District's road inventory is shown in Table 2 and the location of roads in Map 1. The main road is metalled and the two secondary roads are kept open throughout the year. No other roads are maintained regularly. All roads, including the trunk road, seem to have deteriorated markedly since Nyanteng and van Apeldoorn studied marketing in the area in 1970.

In the past the Ghana Highway Authority (GHA) has maintained only the main road and the Kwame Danso road. The District Council has maintained the Abease road. The District Chief Executive Officer was recently able to have a grader from the GHA regional office work on several of the feeder roads. Farmers themselves, individually or collectively, keep the tracks to their farms and villages open during part of the year. These tracks can be seen from the air to traverse every part of the District.

Four feeder roads have been under construction by private contractors working for the Department of Social Welfare for some years but little work was done on them from February to December 1977 and no estimate can be made of when they will be completed. One of these roads will eventually link Abease with Kintampo and another will link Atebubu with Nkrouza.

The GHA has recently assumed responsibility for all road maintenance in the country, but as matters stand it will not take over maintenance of the four new roads until they are completed.

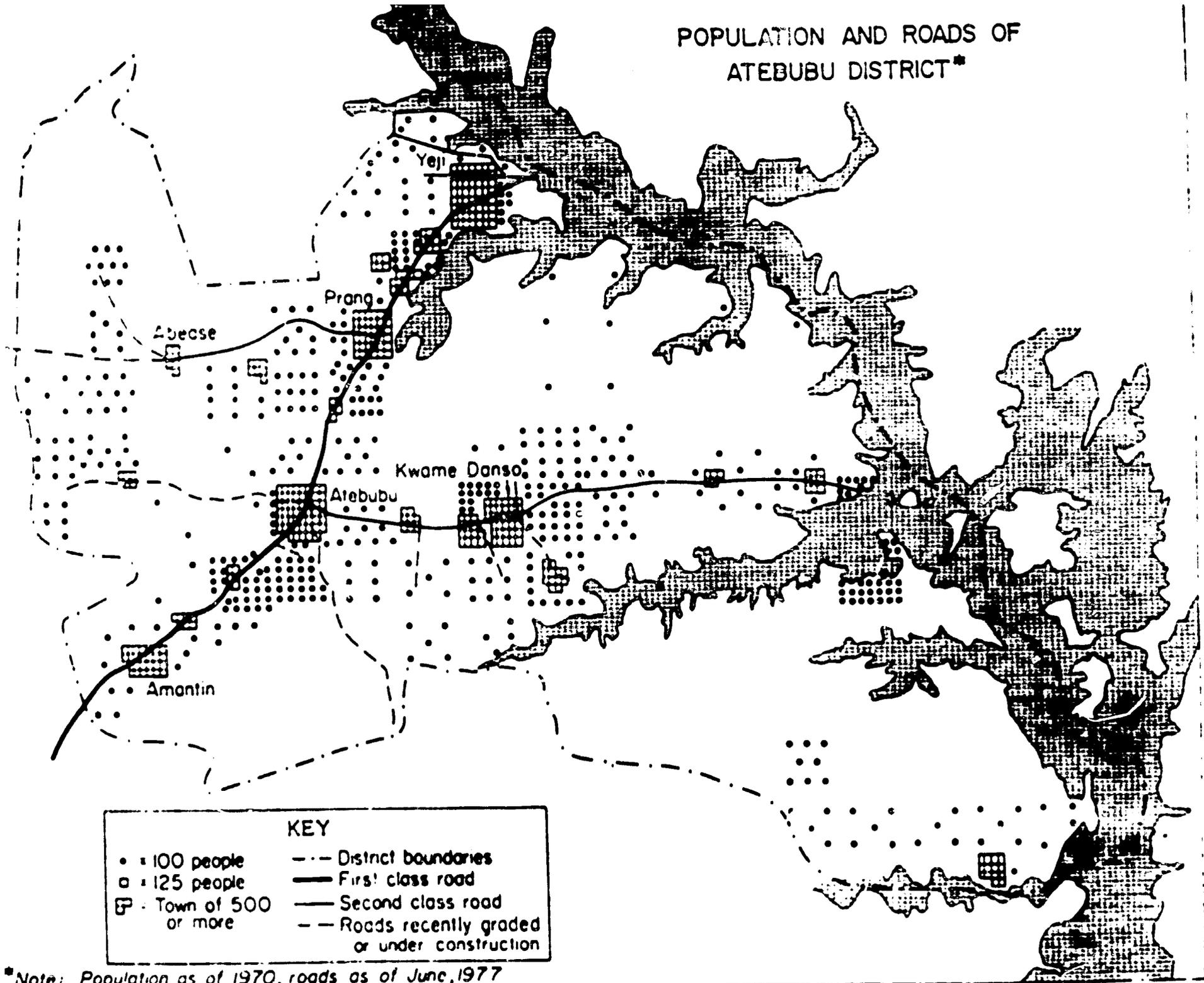
Table 2.--Roads in Atebubu District ^a

Road and class	Length (miles)
<u>Regularly maintained roads</u>	
Primary, Anantim to Yeji	73
Secondary, Atebubu to Kwadjokrom	61
Prang to Abease	<u>24</u>
Total	158
<u>Roads under construction</u>	
Feeder, Atebubu to Flakwasi	24
Abease to Kintampo	11 ^{b/}
Atebubu to Anyinofi	22
Kwane Danso to Akyernade	<u>13</u>
Total	70
<u>Roads recently graded but not regularly maintained</u>	
Feeder, Garadima to Boanyo	8
Shafo Zongo to Nframa	16
Abease to Kyernbo	13
Samwakyi to Old Kokrompe	4
Kwane Danso to Krankuase	<u>2</u>
Total	43
Grand total	<u>271</u>
Estimated mileage of ungraded tracks	500

^aSource: Files of the District Chief Executive Officer.

^bMileage in Atebubu District.

POPULATION AND ROADS OF ATEBUBU DISTRICT*



KEY	
• = 100 people	- - - District boundaries
□ = 125 people	— First class road
▣ = Town of 500 or more	— Second class road
	- · - Roads recently graded or under construction

*Note: Population as of 1970, roads as of June, 1977

Completion of the four new roads is a matter of the highest priority. When they are finished, about 180 square miles will lie within 5 miles of a motorable road. This area contains almost all of the District population north of the Seno. (The population around Trohwe may not be included.)

There will still remain the problem of hauling produce from the field to the village or road. Fields of about half of the farmers interviewed were within 2-1/2 miles of the village, but 47 of the 404 said their fields were more than 7 miles from their houses, some up to 22 miles away (Table 3). All but two of these farmers lived on a motorable road and 22 said that their farms were accessible by lorry. The greatest number were along the main road between Prang and Yeji (14) and the area near Kwame Danso (14). Nineteen of the farmers with distant fields were among those we classed as large, i.e., they sold more than 5,000 yans, 100 bags of rice or maize, or 50 bags of kokonte (see below).

The solution now used for hauling produce from the fields, and a most reasonable one, is to carry the crop in carts drawn by tractors over tracks along the edge of the fields and through the bush. In many instances tractors haul the crops all the way to the market town. Our survey of 404 District farms in July 1977 found 137 farms to be accessible by lorry, 232 by tractor, while 33 could be reached only by foot. (For 2 farms there is no information.)

Most roads and tracks can be negotiated from November to May but the heavy summer rains raise streams and may isolate some areas. Farmers adjust their marketings, however, so as to compensate for this seasonality in transport. To serve all fields with roads motorable year round would be extremely expensive. It would require not less than 364 miles of road to bring all fields over an area of 180 square miles within one half-mile of a road if the area were a perfect square.

Table 1.--Distance from Village to Farms of
404 Atabubu District Farmers in 1977*

Distance (miles)	Number of farms
less than one	30
one but less than two	118
two but less than three	97
three but less than four	54
four but less than five	18
five but less than six	14
six but less than seven	24
Seven or more	47
No report	<u>2</u>
Total	404

* Source: Farm Survey.

Vehicles.--The fleet available to haul more than 17,000 tons of yams, maize, rice, cassava, and peanuts from the field consists of about 65 privately owned tractors (Table 4). No more than 50 of these tractors can be expected to be in operating condition at any one time. Government agencies own another 45 tractors in the District but only half of these run. They are used occasionally to transport food crops for private traders. Tractors were in acutely short supply from September 1976 to June 1977 because of import restrictions but two new tractors were received in July and four more in September-October. These tractors are included in the totals given above; the fleet contains the products of many manufacturers.

In March 1977 the Ghana Commercial Bank initiated a tractor hire service with 6 tractors that were stationed in Atebubu for the major plowing and planting season and returned to Tamale in May in time for rice planting. It was intended to use them primarily for plowing, but they were equipped with carts and were used exclusively for haulage in April and May. The Bank had no rental tractors in the District after June 1.

Tractor-drawn carts can carry about 3-1/2 tons of yams. At this rate it would have required 4,900 trips to evacuate 17,000 tons of produce that are estimated to have left the District in 1977. A fleet of 50 working tractors would have had to make 98 trips to accomplish this if all were used for carting, a difficult task even though farm marketing extends over a period of many months.

Table 4.--Privately Owned Tractor Fleet, Atelubu District
by Make and Location as of October 15, 1977

Make	Atelubu	Prang	Kwame Danso	Anantim	Freddie Akura	Prambo	Yeji	Seneso	Total
Missey Ferguson	7	6	3	1		2			23
David Brown	6	1	4						11
Ford	5	3					1	2	11
Zetor	4			3	2				9
Universal	4		2						6
Ursus	1		2						3
Inter- national		1							1
Sane			1						1
Total	27	13	12	6	2	2	1	2	63

The privately owned lorry fleet in the District consists of 30 bedfords, 9 Fords, and 3 Toyotas. Most lorries are of 3-ton capacity but there are a few 5 and 7 ton vehicles. The largest concentration of vehicles is in Atehubu Town (13) and Kwame Danso (15). Five lorries are based at Abease, 6 in the Yeji-Prang area, and 3 in Amautin. This small fleet probably carries a minor share of the produce moving out of the District but it is important for hauling within the District.

The predominance of tractor cartage is only partly explained by the fragmentary road system. Trucks can probably go most places tractors can during the drier part of the year, and may in fact exert better traction because the load is positioned over the drive wheels. But tractors also find a use in cultivation if they are in good enough condition and this increases their running time during the year as well as permitting farmers to crop a larger acreage. It may be that the popularity of tractors dates from the early 1960s when large numbers were imported by Government and official policy was to foster their use as widely as possible. There is a lively and vocal demand for tractors for haulage in the District; whether it would be as strong if trucks were more readily available is uncertain. Certainly charges for produce moved by trucks are much less than by tractor.

There is some evidence that shortage of long haul transport may at times be even more critical than shortage of tractors and lorries within the District. At one period during the 1977 harvest, yams accumulated more rapidly at Atehubu market than they could be hauled to the south, and the flow of yams from farms to Atehubu had to be slowed down until the southern lorries could catch up. The difficulty may have resulted from congestion in Kumasi and Accra wholesale markets, however, as well as from shortages of vehicles. The national

shortage of transport vehicles continued through 1977 and prospective buyers found it very difficult to get new vehicles.

Vehicle maintenance.--The most serious problem facing the owners of lorries and tractors is maintenance and repair. The useful life of vehicles is short, and down-time is long. Spare parts are chronically in short supply throughout the country. Many tractor and lorry importers use up to 50 percent of their import license, for spare parts, but the scarcity persists. The shortage is made more critical by the numerous different makes of lorries and tractors that are imported. Mechanics, too, are much needed (cf. 15, p. 8).

Inadequate vehicle repair facilities considerably aggravate problems created by the nationwide shortage of replacement parts for tractors and trucks alike. The useful life of these machines is much shortened and the demand for new ones greatly increased as a consequence. If tractors have an effective life of 3 years, Atebubu District would require 22 new tractors each year for replacement alone. In 1977 it obtained 6. Even if the average life were 5 years, 13 new tractors would be required each year.

Water transport.--The Volta is a barrier to transport but it is also beginning to serve in a limited way as a route for farm-to-market transport. Forty-eight open boats of 4 to 5 ton capacity (36 passengers or 40 to 50 bags of produce) and powered by 20 horsepower outboard motors ply the shores of the lake out of Yeji on regular schedules, travelling as far north as Yapei (Tamale Port) and south as far as Keta Krachi. Their principal cargo is fish caught from smaller sailing boats that go out from the lakeside villages, but farm produce is also carried (Table 5). Produce comes from both sides of the lake and much of it moves north from Yeji. A similar traffic is reported into Koman but we did not observe it.

Table 5. --Produce Arriving at Yeji Port from Lakeshore Farms,
May through August 1977^a

Commodity	Quantity	Tonnage
Yam, tubers	19,520	69
Gari, 150 lb. bags	1,815	186
Ekokoto, 150 lb. bags	1,899	<u>115</u>
Total tonnage		369

^aSource: Checkpoint count.

Many of the fishermen come from southeastern Ghana and southern Togo where cassava is a major starchy staple. They cultivate the crop in their villages along the lake and process it into gari and kokonte for sale. (It is, in-poor cassava is a good food where fish are plentiful.)

The boats operating out of Yeji are made locally. Most motors are American-made Mercury. This should make it much easier to resolve the maintenance and spare parts problems for boats than for trucks and tractors. Fuel, lubricants, and minor repair services are available at Yeji. Lack of better trained and better equipped mechanics and shortage of repair parts cripple water transport as well as land transport. As many as 50 motors may be out of service at any one time.

Port facilities at Yeji are few. The flat-bottom boats are driven up onto the gradually sloping beach and unloaded onto small market carts to be carried to the market, the traders' compound, or roadside. Presumably facilities at lakeside villages are similar.

A boat owners' society, the Volta Lake Transport Society, has 36 members.

Aerial photographs show numerous settlements along the lakeshore, where opportunities for farming seem interesting if a market is available. It would not be difficult to draw water from the lake for standby irrigation in the rainy season and full irrigation in the dry season. There is said also to be great opportunity for cropping that relies on the soil moisture retained in land exposed by the seasonal draw-down of about 10 feet (3, pp. 177-78).

Market facilities.--Market facilities are modest in the District. Market-places exist at Abense, Amantia, Atebubu, Kwame Danso, Prambo, Prang, and Yeji. All have some covered stalls and three have locked stalls. None of the marketplaces is

paved and will become unpleasantly muddy during the rains. Atebubu market, the largest, covers less than two acres. It has 120 retail stalls, 38 with locked stores, and 3 new locked stores for grain dealers. Attendance during peak hours is from 3,000 to 4,000 buyers and sellers. The front of the market serves as lorry park and assembly area for yams bound out of the District.

Market fees and tolls are an important source of revenue for the District and are expected to be collected whenever a vehicle is being loaded as well as in the various marketplaces. Total income budgeted from this source for 1977/78 is £102,000. Included in this total are £10,000 from the rates on rice, £36,000 from rates on yams, and £26,000 from rates on other produce. (The total budget is £305,750, of which £32,000 is a grant-in-aid from the national government.) It is planned to spend a total of £12,000 on market improvement.

Only /mantin and Atebubu have wholesale markets specializing in sale to buyers from outside the District, but there is no clearly defined wholesale marketplace. In Atebubu, which is by far the largest wholesale center, most trade in cereals and kokonte centers around the locked stores on the front of the market, although some wholesalers assemble supplies in their houses and may negotiate sales there. Yam traders are most likely to be found in the tree-shaded yam assembly area.

Telephone and telegraph are available in Atebubu and Yeji, as are banking services and facilities for minor repair of vehicles. (In addition to craftsmen in government employment, Atebubu has three electricians, two mechanics, one welder, and one tire repair shop. Auto repair equipment is very simple.) Motor fuel is available in all market towns but Abease.

The almost complete absence of facilities and services that are important for wholesale trading in farm commodities, even of a public place where buyers and sellers can come together on equal terms to negotiate transactions, is a serious handicap to efficient marketing. It not only increases the costs of moving farm products to market, but also impairs their optimum allocation over time and space.

Processing.--Processing activities in the District are elementary: maize and groundnuts are shelled, rice is hulled and corn is milled, and cassava is chipped and made into gari. All shelling and cassava processing is done by hand, with the instruments a knife for chipping kokonte and a roughened kerosene tin and a simple cooking pan for making gari.

There are about 50 small private mills scattered throughout the District. Many mills primarily serve consumers by milling small quantities of maize, kokonte, and beans. About 35 of the mills are also equipped to hull rice. In addition, a government rice mill operates in Kwame Danso. Last year this mill expected to process 6,000 bags but only handled 600 bags. The private mills usually operate on a custom fee basis with only two mill owners actually buying commodities for processing and later sale.

The mills are powered by diesel units, usually one- or two-cylinder Lister engines. Grinders for milling maize or beans are simple Graitex units while the rice units are either Billbrook or Lewis Grant hullers, with a daily capacity of about one ton.

As with vehicles and boat motors, spare parts are in short supply and new machinery is nearly impossible to obtain (not one Lister engine was imported by the distributor during 1977). In addition, there is a lack of maintenance and repair facilities causing large amounts of down time and poor quality products, particularly for rice.

The principal marketed crops in the District are cassava, maize, rice, and yams. The only census of agriculture in Ghana is the Sample Census that was conducted by the Ministry of Agriculture in 1970-71. Sixty-three locations were sampled in Brong-Ahafo, stratified into three subregions. One stratum comprised Kintampo and Atebubu Districts. (The schedules that would permit the derivation of estimates for Atebubu District alone are no longer available.) Published estimates for Kintampo and Atebubu Districts are given in Table 6. Atebubu is best known for its production of yams, but Table 6 makes clear that it is far from having a lion's share of national production.

A conservative estimate of the output of saleable yams per acre on Mampong District farms made by F.R. Bray is about one ton (3, p. 30). The 1971 Sample Census of Agriculture estimates yam yield for all Brong-Ahafo of 2.2 to 2.9 tons per acre on the basis of biological yields from randomly selected small plots. For a variety of reasons set forth by Bray this procedure is likely to lead to overestimates. If Bray's estimate is correct, the Census's acreage figures would indicate a production for all of Brong-Ahafo in 1970 of 105,000 tons, or about 60 percent that of the Ministry in 1967. Most farmers in our survey estimated one yam per mound. At 1,000 mounds per acre this would give 1,000 yams from which Bray and his associates would deduct 60 percent for losses in harvesting, smallness, and immaturity, leaving 400 saleable yams or about 1.4 tons per acre. But irregular field layout and obstacles in the field usually cause less than 1,000 mounds to be made. At 1.4 tons per acre, Brong-Ahafo's production in 1970 would have been 150,000 tons.

Table 6.--Acreage Planted to Principal Food Crops
in Kintampo and Atebubu Districts, 1970*

Crop	Acres	Percent of national acreage
Maize, main season	78,000	8.6
Maize, second season	48,000	22.0
Rice	11,000 ^a	8.1
Cassava, main season	63,000	7.8
Yams	85,000	20.0

* Source: Data from Ghana, Ministry of Agriculture, Report on Ghana Sample Census of Agriculture, 1970, vol. 1, 1972, p. 109. Cocoyams and bananas are important elsewhere but not in Atebubu District.

^a Includes Wenchi District.

A year-long Produce Movement Census in 1957/58 is more helpful. Lorries were checked at the Yeji, Buips, and Bamboi ferries north of Kumasi and again at Asankare and Prasu to the south. (Unfortunately there was no checkpoint on the Tarkwa road.) T.T. Poleman has estimated that annual net shipments out of the area enclosed by these checkpoints and centered on Kumasi totaled 11,000 metric tons of maize and a little over 4,000 metric tons of yams (14, p. 165). Most must have come from the savanna areas of Brong-Ahafo. Gould used the same data to estimate a gross annual outflow of yams from the Atebubu District of about 5,000 tons but an inflow at Yeji of 2,000 tons (7, p. 119). These figures are much below apparent sales of yams in recent years. The 1962 USAID study estimated that 45,000 tons of yams were grown and 9,000 tons were sold in the Seno and Obosum River basins, which include Atebubu District south of the Kwame Danso road. These figures were based on a "Pilot Census in Agriculture: East Brong-Ahafo of 797 Farmers in 31 Villages," published by the Economics Division of the Ministry of Agriculture. (We have not been able to find a copy of the report.)

Average production per farm of yams, maize, rice, and kokonte as given in that report is shown in Table 7. Similar figures from our survey of 404 farmers in Atebubu District in 1976/77 are shown in Table 8.

A very rough indication of the amount of produce marketed in the District can be derived from reports of market fee collection. Unfortunately for our purposes, a varying, sometimes large proportion of produce shipped out of the District avoids payment of the market fee, despite a nominal attempt to verify fee payment at a road checkpoint in Anantin. The effort required to collect taxes from every trader loading goods on trucks is substantial, especially on market days, and staff available for the job is small. Many loads leave the District untaxed. Nevertheless, historical records

**Table 7. Sene-Obosun River Basin: Average Production
of Major Crops per Farm, About 1960***

Commodities	Units	Percent of farms	Quantity
Yams	tubers	99	3,620
Rice	bags ^d	56	14
Maize	bags ^d	50	7
Kokonte	bags ^d	36	9

*Source: C.K. Smith, Team Leader, "Report on Soil and Agricultural Survey of Sene-Obosun River basins, East Brong-Ahaho and Ashanti Regions," Ghana, USAID-Ghana, June 1962, p. 74.

^dIn 1977 a bag of paddy rice weighed 180 lbs., a bag of maize 240 lbs., and a bag of kokonte 110 lbs.

Table 8.--Atehubu District: Average Production
and Sales of Principal Farm Crops, 1976/77^a

Commodity	Units ^d	Percent growing	Average production per farm growing ^a	Percent selling	Average sales per farm selling
Yams	tubers	89	3,371	74	2,112
Rice, paddy	bags	67	31	66	27
Maize, major season	bags	25	20	24	18
Maize, minor season	bags	49	16	48	14
Kokonte	bags		--	16 ^b	16
Groundnuts, major season	bags ^c	20	10	20	8
Groundnuts, minor season	bags ^c	13	6	13	6

^a Source: Farm Survey.

^a In 1977 a bag of paddy rice weighed 180 lbs., a bag of maize, 240 lbs., and a bag of kokonte, 130 lbs., and a bag of shelled peanuts, 180 lbs.

^b May be underestimated.

^c Expressed in shelled nuts.

of taxes paid provide some very tentative information (Table 9). These records are not likely to overstate the amount collected although there must be some question about yam fees reported for 1968/69 and perhaps for 1971/72. On the other hand, we cannot comfort ourselves with the thought that the percent of loan taxed tends to be fairly constant from month to month or year to year. Reports of monthly collections show an unusually high rate of fee payment in the last month or two of the fiscal year that is almost certainly the consequence of exhortation by the District government officials to bring receipts up to budget. Administrative and taxing capacity are affected by the kinds of governmental and financial crises Ghana has gone through since 1965/66 and these crises undoubtedly account for a considerable part of the year-to-year variation in receipts.

Other evidence suggests that the area planted to crops and therefore the output have increased over the last decade. The population increase of 26,000 or 37 percent from 1960 to 1970, and ratios of males to females of 1.24 and 1.19 in those census years can only be explained by large immigration in recent years. The principal employment of the immigrants must have been in farming. The lakeside populations as reported by the Census and as seen on aerial photographs are too small for fishing to have employed many of the immigrants. Aerial photographs of the area north of the Kwame Danso road show many farms in a large area without villages, consistent with recent development. It seems unlikely in the extreme that this expansion of farming would not be accompanied by increased marketings. Work on farms for wages and the sale of farm crops are overwhelmingly the principal sources of income for the people of the District.

Checkpoint Data

In an effort to obtain more reliable and detailed estimates of movement of produce out of the District we established checkpoints at Yeji and just south of Mantin in early February 1977. A summary of our findings

Table 9.--Produce on Which Market Fees Were Paid
in Atchaba District, 1965/66 to 1976/77*

Year	Yams (tons)	Rice (tons)	Other produce ^a (bags)
1965/66	6,839	1,129	49,055
1966/67	6,977	1,241	27,514
1967/68	7,097	961	33,229
1968/69	15,473	1,669	46,485
1969/70	7,818	1,339	39,276
1970/71	6,536	881	42,663
1971/72	10,238	1,278	40,219
1972/73	8,962	1,278	27,153
1973/74	5,958	1,073	21,211
1974/75	6,392	1,107	20,593
1975/76	5,838	857	20,590
1976/77	6,178	777	25,382

Source: Records of the District Treasurer.

*Principally kolonte at 100 lbs. per bag but also including maize (200 lbs. per bag), vegetables and packaged produce for which fees were converted at bag rate.

is presented in Tables 10 and 11. These figures, too, are underestimates. An unknown number of trucks travelling at night were missed in the early months, and after we instituted a 24-hour watch the checker sometimes dozed on his job. Nevertheless, our figures on rice movements were found to exceed greatly those derived from market fee records (Table 12). Because of the possibility that part of the difference might be caused by errors in the checkpoint recording of rice originating in the Northern and Upper Regions, we began to record southbound movement of produce at Yeji as well (Table 13). Tonnages passing through Yeji were comparable with the figures on out-of-District produce moving through Amantin. The checkpoint data are consistent with the hypothesis that District shipments, particularly of rice, are growing.

Reports from the farm survey indicate a greater concentration on rice production in the eastern part of the District where 88 percent of all farmers grew the crop and in the area north and south of Prang where 68 percent grew it. These are relatively thinly populated and newly settled areas. In old, more densely populated areas around Amantin and Atebubu slightly more than half of the farmers interviewed grew rice.

Yam shipments recorded at our checkpoint are also high compared with past estimates. Figures for the nine months of March through November, corrected for seasonal variation by the very imperfect records of fee collections, and the reports of marketings from the farm survey imply total shipments for the 1976/77 crop year of almost 10,000 tons of yams (assuming 59 percent of the yam sales were made between March and November). Similar calculations imply paddy rice sales of 2,100 tons (assuming 72 percent sold between March and November), maize sales of 1,500 tons (65 percent of sales between March and November), and kokonte sales of 2,400 tons assuming no seasonality in sales.

Table 10.--Produce Moving South at Abankin,
March through November 1977^a

(tons)

Commodity	Loaded in the District	Loaded elsewhere	Total
Yams	5,683	8,324	14,007
Maize	873	115	988
Paddy rice	1,303	101	1,404
Refined rice	603	1,205	1,809
Kokonte	1,624	327	1,951
Groundnuts	278	601	879
Gari	41	10	51
Pepper	37	5	42
Total	10,443	10,688	21,131

^aSource: Checkpoint count.

Table 11. - Produce Moving North at Yoff,
March through November 1977^a
(tons)

Commodity	Loaded in the District	Loaded elsewhere	Total
Yams ^b	10 ^c	1	11
Maize	180	4,363	4,543
Paddy rice	4	57	61
Kokonte	2,3	65	268
Gari	205	10	215
Groundnuts	2	6	8
Pepper	19	1	20
Total	734	4,503	5,237

^aSource: Checkpoint count.

^bMarch only.

Table 12.--Yams and Paddy Rice Moving Out of the District According to Checkpoint Count
and Market Fee Revenues, March through August 1977*

(tons)

Month	Paddy rice			Yams		
	Checkpoint	Market fees	Difference	Checkpoint	Market fees	Difference
March	237	141	96	859	624	235
April	248	30	218	950	366	584
May	213	-0	173	633	110	523
June ^a	196	128	68	274	332	-58
July	140	16	124	26	18	8
August	77	32	45	66	50	16
Total	1,111	387	724	2,808	1,500	1,308

* Source: Checkpoint count and Records of the District Treasurer.

^aLast month in the fiscal year. Note large increases in market fees reported.

Table 13. Fresh Produce Moving South at Yopu
 July through November 1977*
 (tons)

Commodity	Destined for District markets	Destined for other markets	Total
Yams	9	2,039	2,048
Milled rice	1	277	278
Maize	1	9	10
Groundnuts	4	421	425
Kokonte	8	141	149
Total	23	2,887	2,910

* Source: Checkpoint count.

The evidence we have been able to locate that bears on trends in production and marketing is sparse, but it points rather clearly to the conclusion that the trend is upward, not downward as Nyanteng and van Apeldoorn suggested (1, p. 145), and strongly so for rice.

MARKETING PATTERNS

The percentage of farm production that moves into commercial channels as reported by the farmers in our survey and shown in Table 14 is undoubtedly biased upwards. The general ignorance of quantities consumed in the farm household was compounded by the fact that farmers often arrived at their estimates of production by summing their estimates of sales; it is also probable that the sample contained a disproportionately large number of the more prosperous farmers. Selection of villages was random within strata, but for selection of farmers within villages it was necessary to rely on local leaders, and they inevitably thought of the more prosperous farmers first. With all this, the proportion of the yam crop that is said to have been sold is surprisingly small and consistent with this crop's position as the preferred starchy staple of the area. Rice and maize, on the other hand, are more peculiarly cash crops, although a significant amount of these staples, too, even in our biased sample, appears to go into the diets of those who grow them.

The proportion of yam production sold by the 404 farmers in our sample is much higher than that implied by the 1970 Census of Agriculture. If yam acreage in Kintampo and Atebubu Districts was in proportion to their populations, Atebubu District had 48,000 acres of yams; if it was in proportion to the number of households, there were 55,000 acres in the District. At one ton per acre--Bray's conservative estimate--production was from 48,000 to 55,000 tons, or about 5 times the estimated shipments out of the District in 1976/77. If yields were closer to those reported by the Census the proportion of yams marketed to yams produced was that much smaller.

Table 14. --Harvest and Sales of Major Crops
Reported by 405 Arable Farmers for the Period January 1976 to June 1977^a

(tons)

Commodity	Harvest ^a	Sales	Sales as a Percentage of Harvest
Yams	4,291	2,238 ^b	52
Rice	665	587	88
Maize	548	476	87
Kokonte	--	23	--
Groundnuts	96	80	83

^a Source: Farm Survey. Average weight of yams, 8 lbs., bag of rice, 180 lbs., bag of maize, 240 lbs., bag of kokonte, 130 lbs., bag of groundnuts, 180 lbs.

^a Harvest figures are much less reliable than sales because of the considerable amount held for own consumption.

^b Assuming 110 tubers per hundred sold.

If these figures are anywhere near correct, then most Atebubu yam farmers still regard yams primarily as a subsistence good rather than a commercial one. More recently introduced rice and maize, on the other hand, partake more of the character of a cash crop, and this is probably true of kokonte and other cassava products (cassava itself is probably grown most often as a hedge against failure of other crops).

First Point of Sale

Most sales of yams, maize, and rice are made in the village or field and the buyer takes delivery there. Purchasers are usually assemblers resident in Atebubu or Amantin towns who resell to wholesalers from outside the District, or they may be the "foreign" wholesalers themselves, occasionally retailers, who buy directly from farmers. Farmers' sales of yams, rice, and maize in the market are in smaller amounts, mostly to retailers but sometimes directly to consumers. Lesser commodities like kokonte and groundnuts are more apt to be sold first in the marketplace, although the degree to which this is so varies with distance from a major market (Table 15). Many yam buyers from Kuasi buy directly from farmers, particularly in the area around Kwame Danso. Nearly all rice and maize, on the other hand, is bought by local assemblers resident in Amantin and Atebubu. This difference in market patterns is apparent in Table 16 which shows where trucks passing through the Amantin checkpoint were loaded. The large tonnages of yams coming from Kwame Danso were purchased at the farm and hauled by tractor,

Table 15.--First Place of Sale of Principal Crops by Location of Farms*
(percent of total sales)

	<u>Commodity and Location</u>									
	Yams		Rice		Maize		Kokonte		Groundnuts	
Farms in Vicinity of	FV	Market	FV	Market	FV	Market	FV	Market	FV	Market
Amantin	72	26	59	36	84	15	26	72	36	44
Atebubu	82	16	72	28	75	25	48	52		61
Iwame Danso	99	1	99	1	100	-	100	-	100	-
Trang	91	9	86	14	76	24	91	9	92	8
Total Sample	84	16	84	15	83	16	71	28	67	33

Source: Farm Survey.

Note: FV = farm or village; Market = marketplace; small amounts were also sold at roadside. For location of villages see Map 3.

Table 16.--Origin Within Atebuba District of Produce
 Passing through Asantim Checkpoint, March through November 1977^a
 (Tons)

Origin ^d	Yams	Paddy rice	Milled rice	Milze	Kofonte	Groundnut	Total
Asantim	768	250	95	336	460	170	2,279
Atebuba	2,685	795	150	415	843	84	4,975
Kwame Ninsu	777	121	66	12	49	2	1,227
Prando	252	1	17	13	58	2	343
Prang	135	126	253	57	47	11	629
Ycji	441	3	15	1	125	7	592
Other	22	7	8	39	42	2	120
Total	5,683	1,301	604	873	1,624	278	10,365

^a Source: Farm Survey.

^d Where truck was loaded.

usually, to Kwame Danso to make up lorry loads for shipment to the south. Yam marketings in the Kwame Danso area are relatively more important than rice marketings, despite the importance of this area as a rice producer, because of difference in marketing patterns for these two commodities. This is discussed further in the section on intermarket price spreads.

Market Chains

Market chains within the District are fairly short, and they probably are so in the areas that receive District produce. Diagrammatically the chains are:

1. Farmer → consumer
2. Farmer → retailer → consumer
3. Farmer → resident assembler → retailer → consumer
4. Farmer → resident assembler → foreign wholesaler → THE SOUTH
5. Farmer → foreign wholesaler → THE SOUTH
6. Farmer → foreign retailer → THE SOUTH

The rice assembler may process rice himself or he may sell it to a processor who in turn sells it to a wholesaler or retailer, thus adding one link to the chain. The relative importance of these chains is suggested by Table 17. Numbers 4 and 5 are probably most important. Note the small part that local market demand plays, accounting for no more than 15 to 20 percent of marketed production.

We were not able to examine in much detail what happens to District produce after it crosses into Ashanti Region. Declared destinations of lorries are shown in Table 18. The dominance of Kumasi is marked for all commodities except kokonte. Kumasi receives more than two thirds of all yams shipped out of the District. The disposition of yams moving into Kumasi wholesalers' stores is a matter of particular concern to Atebubu growers and shippers. It is unfortunate that projected improvements in Kumasi markets include no provision for upgrading Kumasi's wholesale markets.

Table 17.—Percent of Marketed Supply Changing Hands at the Farm or Village and in District Markets, by Kind of Buyer and Seller*

Seller	Buyer ^a				Total
	Assembler	Processor	Wholesaler	Retailer	
YAMS, rural^b					
Farmer	45		35	5	85
Retailer					5
YAMS, District market town^c					
Farmer	5		5	2	15
Assembler			45	5	50
Retailer					7
MAIZE, rural^b					
Farmer	70		10	5	85
Assembler	10				10
Retailer					5
MAIZE, District market town^c					
Farmer	5		5	5	15
Assembler			65	10	75
Retailer					15
KOKONTE, rural^b					
Farmer	35		30	5	70
Retailer					5
KOKONTE, District market town^c					
Farmer	5		20	5	30
Assembler			35	5	40
Retailer					10
PEPPER, rural^b					
Farmer	45		10	5	60
Retailer					5
PEPPER, District market town^c					
Farmer	5		25	10	40
Assembler			45	5	50
Retailer					15

Table 17 (continued)

Seller	Buyer ^a				Consumer	Total
	Assembler	Processor	Wholesaler	Retailer		
GROUNDNUTS, rural^b						
Farmer	45		10	5		60
Retailer					5	5
GROUNDNUTS, District market town^c						
Farmer	10		25	5		40
Assembler			45	10		55
Retailer					15	15
RICE, rural^b						
Farmer	50	25	10			85
Processor				3		3
Assembler	10 ^d					10
Retailer					3	3
RICE, District market town^c						
Farmer	5	5	3	2		15
Assembler		15	40			55
Processor			37	5		42
Retailer					7	7

^a Source: Checkpoint data based on produce movement February through November, and on farm and traders survey.

^b Assemblers reside in the market town and buy produce from farmers to sell to wholesalers. Processors reside in market towns and buy rice from farmers and assemblers, process it and sell to wholesalers and retailers. Wholesalers reside outside the district and buy in the district for sale elsewhere. Retailers sell primarily in small lots to consumers. There is much overlapping among these categories.

^c Farm, village, or roadside.

^d Markets meet weekly in Abeame, Amantin, Atchubu, Kwame Danso, Prambo, Prangi, and Yeji.

^e Principally in Kwame Danso.

Table 18.--Destinations of Atebubu District Produce Moving South
Through Asantifi Checkpoint, March through November 1977^a

(Tons)

Town	Yams	Paddy rice	Milled rice	Maize	Kokonte	Groundnuts	Total
Accra	621	25	19	204	689	11	1,569
Efifidwase	151	36	14	6	11	21	239
Ehiasoenu	20	200	10	14	--	20	264
Ejura	223	456	62	55	46	92	934
Koforidua	282	15	1	22	22	9	351
Konongo	68	--	2	3	--	2	75
Kumasi	3,924	511	486	544	774	89	6,331
Minpong	134	17	4	3	10	15	183
Stono	40	7	--	1	12	4	64
Other	270	16	4	21	60	15	386
Total	5,683	1,303	604	873	1,624	278	10,365

^aCheckpoint count.

Seasonality

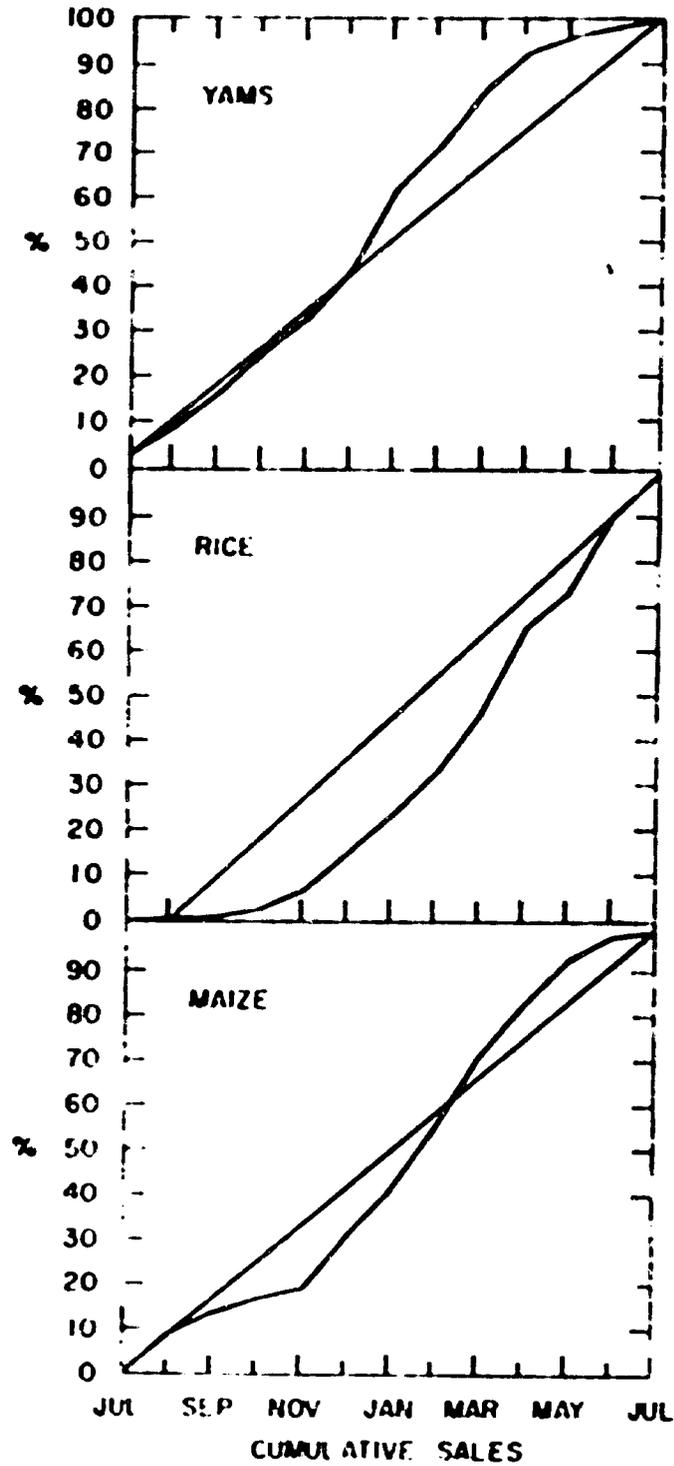
Chart 1 shows the cumulative sales of yams, rice, and maize as reported by farmers and Chart 2 compares reported monthly sales with movements of these commodities through Anantim and Yeji checkpoints. Traditionally the trading season when Atehubu was a major entrepot between north and south extended from November to March or early April, at which time the market met daily (1, p. 208). The major marketing period spreads over a longer period now, although markets are less active during the summer.

There is considerable difference in the timing of sales of yams, rice, and maize. Because several varieties of yams are produced with differing planting dates, time to maturity, and storability, harvest extends from September (puna) to January (water yam), and marketing is at a fairly high rate from September to May.

Yams are stored only by farmers. This means that our records of monthly farm sales, so far as they are accurate, also depict monthly supplies moving into retail positions, with a lag of 3 or 4 weeks. Yams are available in Ghana markets throughout the year, but the flow to market slackens as the crop year goes on. Consumers adjust to this situation by shifting without hardship to other staples, including plantains, cassava, cocoyams, maize, and rice. This is an important advantage of multistaple diet areas like those of Southern Ghana. Seasonal shifts of consumption are not as likely to happen when the principal staple is a cereal that can be stored at fairly low cost, as is the situation in Northern Ghana.

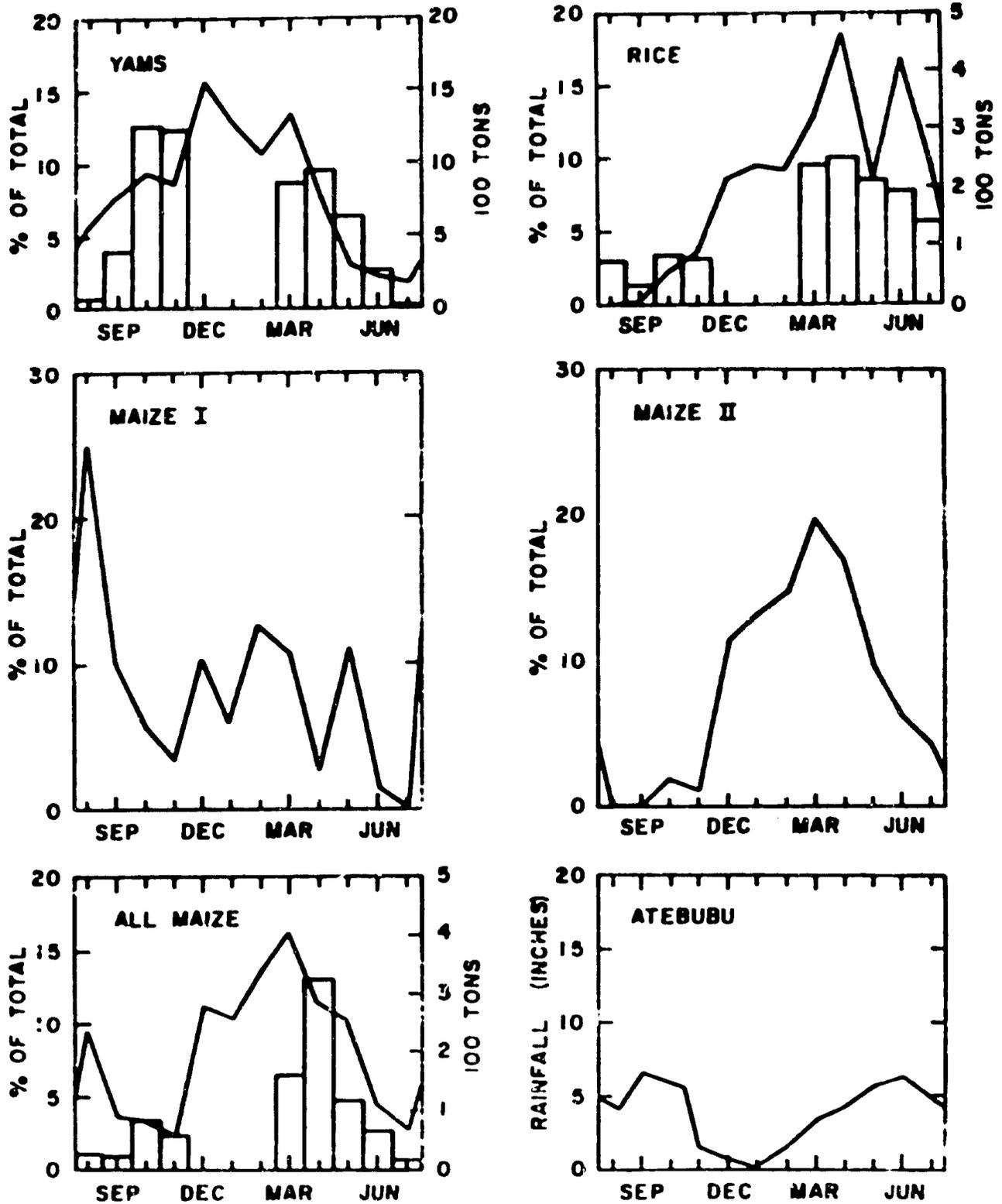
The monthly pattern of maize marketing is more complex. The so-called major crop (Maize I) is harvested in June and the minor crop (Maize II) in September and October (Chart 2). Maize II is the big crop in Atehubu

Chart 1.- Monthly Sales by 40% Achaba District Farmers, 1976/77*
 (Percent of total sales from 1976 crop)



*Source: Farm Survey.

Chart 2. --Monthly Sales of 40+ Atebubu Farmers, 1976/77,
 Monthly Shipments Out of the District, March through November 1977,
 and Average Monthly Rainfall, Atebubu*



*Source: Farm sales are from Farm Survey; solid line shows percent of total sales from 1976 crop. bars represent total tonnage passing through Yei; one Anantim and are from checkpoint count. Rainfall is from Table 1.

District and important quantities are sold from December through May. More than half of the crop is sold in the first three months, more than three-fourths in 5 months. Sales of Malze I as reported by farmers were quite different: one fourth of the crop was sold in the first month, but it required 4 more months to sell half of the crop and almost 8 months in all to sell three-fourths.

Farmers appear to have been confused by the question about sales of kokonte--often kokonte is made by specialists from purchased cassava--and monthly sales have therefore not been calculated. But there is in fact little need to do so. Cassava can be harvested in every month of the year, and kokonte probably has a shelf life of little more than a month. Seasonality and storage between harvests, therefore, are not significant problems, although seasonal availability of labor might affect supplies.

Seasonal Response of Farm Marketing to Prices

It is well established that the timing of farm marketing is affected by a complex of forces, and that a major reason for holding stocks is because farmers expect prices to rise as the crop year progresses (8, pp. 102-03, 207; 1, pp. 72a, 73). This is confirmed by the farmers who were interviewed in Atebubu District (Table 19). There also appears to be a preference to hold financial reserves in the form of a commodity rather than as cash or in bank deposits. Some produce, of course, must be sold to repay loans at harvest time, and other sales must be made when cash is needed for taxes, school fees, and various expenses of the farm and of the household. Some stocks, too, may be held as reserves to protect the family's food supply until the new crop is more or less assured.

Table 19.--Reasons Given by 404 Atebubu
Farmers for Storing Farm Produce^a

	Number
<u>Reasons for storing</u>	
Waiting for the price to rise	212
Holding until cash is needed	53
Waiting for transportation	7
Cannot sell after harvest because road is flooded	33
<u>Reasons for not storing</u>	
Needs the money	39
No storage facilities	21
Afraid of theft	1
No report	34 ^b

^a Source: Farm Survey.

^a Reported from half of the villages, but from only 4 on primary or secondary roads.

^b 9 in Atebubu.

The importance of storage in expectation of a price rise can be seen by comparing the timing of farm marketings as reported in our farm survey with the seasonal behavior of wholesale prices at Atebubu during the period for which prices were available to us. Seasonal indexes of the wholesale prices of yams, paddy rice, maize, and kokonte at Atebubu and Amantin from June, 1965, to March, 1974, are shown in Table 20. They indicate large fluctuations of prices from post-harvest to pre-harvest months, even for kokonte. But the standard deviations of these indexes are also large, reflecting the fact that the price series from which they are calculated are short and cover disturbed times. In examining the impact of seasonal price changes on Atebubu farmers, therefore, it is helpful to consider year-to-year variations in the departure from trend. This is implied by the standard deviation, but the farmers' views of seasonal price variations are more likely to be in terms of price relationships in individual years, as shown for maize in Chart 3, where short horizontal bars show price as a percentage of trend in each year, and large dots show the mean monthly value for the nine years.

The year-to-year variation is large. In July the wholesale price of maize might be 10 to 14 percent below the year's average or as much as 36 percent above it. In August the value ranged from 20 percent above to 36 below. The price of maize in some years could easily have been higher relative to trend in August than in the preceding month (it was in 1966), and, if trend is ignored, August prices could often be above July prices, especially in a period of inflation. (In Atebubu, the reported wholesale price of maize in August exceeded the July price in 6 of the 9 years for which records were examined.) If farmers have some general awareness of the persistent rise in prices between harvests, as they almost certainly

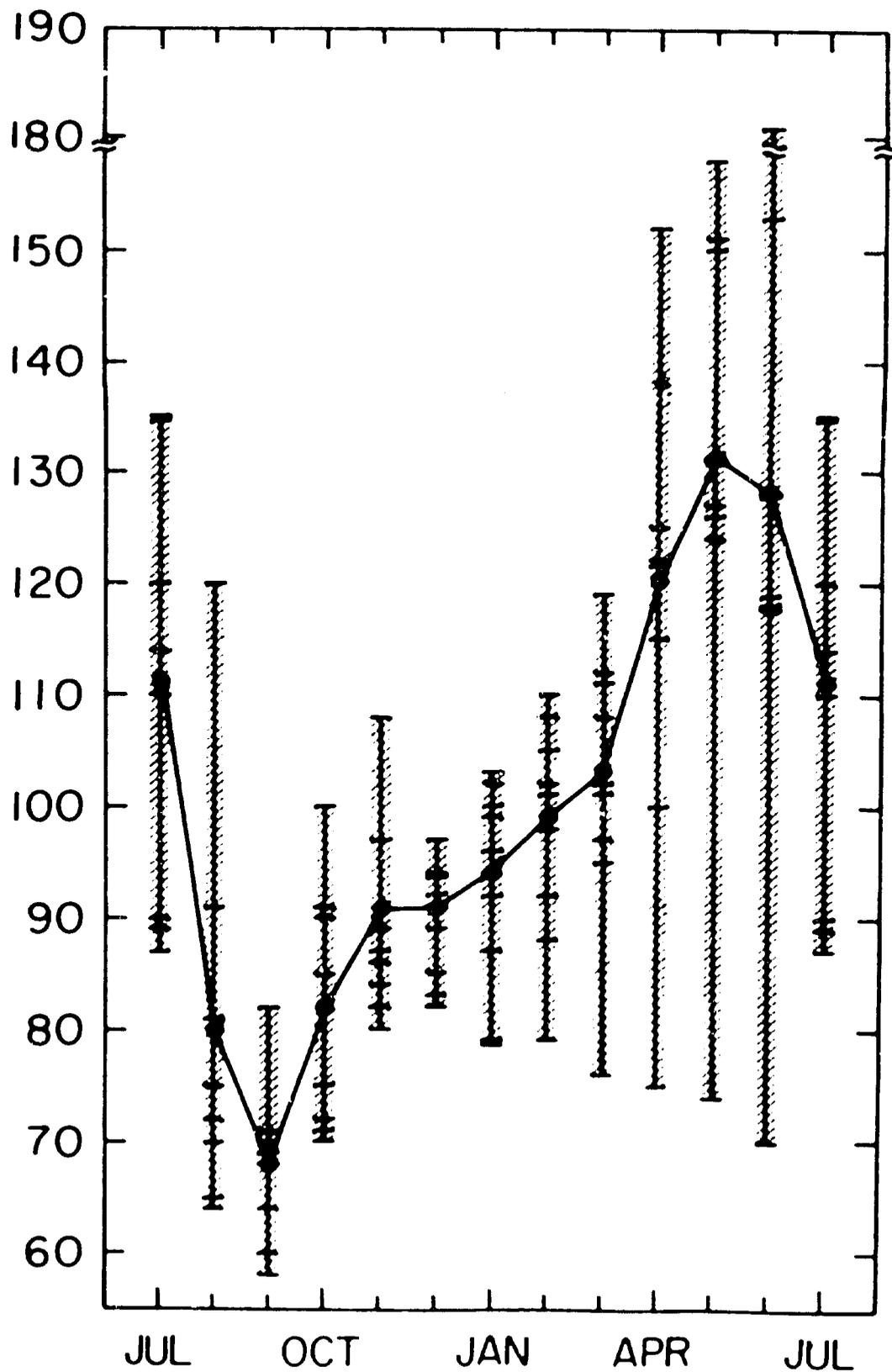
Table 20.-- Index of Monthly Wholesale Prices of Yams,
Paddy Rice, Maize, and Kokonte in Atebubu and Anantim Markets,
1965-74^a

	J	F	M	A	M	J	J	A	S	O	N	D
<u>Atebubu</u>												
Yams, mean	104	111	109	126	135	139	90	67	66	67	91	95
standard dev.	11	20	10	19	17	20	28	15	16	15	16	22
Paddy, mean ^d	91	93	96	105	111	110	109	109	110	99	85	82
standard dev.	10	15	5	12	8	11	16	30	13	6	9	11
Maize, mean	91	99	103	120	131	128	111	80	68	82	91	91
standard dev.	10	10	13	23	26	32	20	19	8	11	10	10
Kokonte, mean	101	103	83	83	97	102	103	120	126	103	95	83
standard dev.	42	40	13	13	14	18	15	54	51	26	23	12
<u>Anantim</u>												
Yams, mean	108	108	121	132	132	128	78	75	67	71	87	90
standard dev.	14	14	20	21	30	35	21	16	13	11	14	19
Maize, mean	93	105	104	121	131	127	115	86	70	75	87	87
standard dev.	7	16	10	22	28	35	20	20	10	7	11	9
Kokonte, mean	83	89	89	90	103	107	116	124	117	106	95	80
standard dev.	12	16	16	21	11	17	23	62	42	23	20	12

^a Source: Ghana, Ministry of Agriculture, Monthly Food Situation Report (title varies), July 1965 to March 1974.

^d January 1969 to July 1974.

Chart 3.--Monthly Wholesale Price of Maize in Atabubu, 1965 to 1974*
(as percent of trend)



*Source: Ghana, Ministry of Agriculture, Monthly Food Situation Report, various issues. Horizontal bars show prices in individual years, large dots show monthly averages for the period.

must, then the information that they have to work with is probably something like that shown in Chart 3. As displayed there, August, September, and October price expectations would not differ much among themselves but they clearly would differ from expectations about prices in April, May, and June. At the same time, expected price in July must be quite uncertain. Reports of monthly marketings of the two maize crops give some confirmation of this notion about farmers' price perceptions (Chart 2).

The timing of sales from the Maize I crop can be read as saying that pressure for money induces farmers to sell about a fourth of their crop at once, even though prices then can be expected to be low. Thereafter stocks are held as long into the summer months as money requirements permit, with the consequence that slightly more than one fourth of the crop is sold from March through June. Consideration of the prices when the second maize crop is marketed suggests that its peculiar popularity with Atebubu District farmers, who grow more maize in the "minor" season than in the "major" season, stems at least in part from differences in price expectations. Maize II is harvested in September and October. More than half of the crop marketings are in the period March through July, although this means holding sales stocks for up to nine months.

Similar behavior may be observed in yam marketing, with a fourth of the crop held in expectations of higher prices from March through July. Because it costs less to store rice and because rice is probably less important than yams and maize in local diets, two thirds of crop marketings can be postponed until the period of higher prices in March through July, from 4 to 6 months after harvest. That stocks of maize, rice, and yams are not held even longer into the period of expected high prices is undoubtedly due to the increasing difficulties of transportation in the rainy season.

It is frequently asserted that farmers are exploited by merchants through their ability to provoke great seasonal variation in prices. Seasonal rises in District prices are in fact large. For yams, though, they are quite consistent with the price of storage. Yams require storage conditions--protection from excessively high temperatures and provision of adequate ventilation--that can be met much more easily on the farm and most of the crop is stored there (4, p. 172). Even under these conditions, "very serious losses in weight occur and may be from 30 to 50 percent after six months" (4, p. 180). Despite the extended harvest, therefore, prices tend to rise a great deal in the course of the crop year. (The large fluctuation in kokonte prices probably reflects the fact that its products easily substitute for yams or supplement them in many Ghanaian dishes.) It should be possible to store maize much more cheaply than yams, and maize is harvested twice a year. Yet maize prices rise even higher than yam prices do. Prices of paddy rice, too, vary much more than storages costs should require, and their movements are not as much dampened by rice imports as are the prices of milled rice. Nevertheless, Atebubu District farmers seem well able to adjust their sales so as to take good advantage of the anticipated price rises.

Farmers provide all of the yam storage, they hold a large part of the rice crop into the period of higher prices, and they endeavor to do the same with maize. If profits are being made from storage, they are mostly being made by farmers and there is no evidence in Atebubu District that farmers suffer from seasonal price increase. Better storage facilities for maize and rice, and greater financial capacity to hold stocks, especially of maize, would be desirable in order to reduce the magnitude of the seasonal rise and thus improve the position of consumers. It should also considerably reduce the large week-to-week fluctuations in retail prices that characterize markets such as these. It is not certain, however, how much this seasonal increase is caused by the high cost of yam storage that no ways have yet been found to reduce.

THE PRIVATE TRADE

The wholesale trade in Atebubu District is characterized by commodity and ethnic specialization. Northerners, mostly Dagomba, Hausa, and Gonja, dominate the grain and kokonte trade and the Akan-speaking southerners the yam trade. Women outnumber men in the wholesale trade but a few Akan and northern men trade in yams and the larger traders in grain and kokonte are most often men.

Both yam and grain assemblers have organizations that might serve as instruments for development. The yam sellers association in Atebubu has 87 members and the association in Anantin has 20. The Atebubu association includes 28 men in its membership. The association's most important roles are to regulate disputes among its members and to represent the yam sellers before the local authorities. (The Atebubu association recently prevented the destruction of the tree cover over their assembly yard in front of Atebubu market.) They also provide some storage and prevention from theft to their members and sometimes intervene to balance the flow of produce to the availability of transport.

Association funds can be given as loans when members face financial difficulties that threaten to wipe out their working capital. For instance, Schwimmer describes the social and financial obligations involved in funerals (15) and indeed the association's contribution in these situations can do much to maintain a member's working capital.

Most large grain traders and almost all brokers in Atebubu are members of one of three "companies." Each group has a different organizational structure. The largest has three senior partners who contributed £6,000 shares towards working capital. Three junior partners do not contribute to working capital but they are in charge of the store room and assist in buying and selling.

Four other people are employed as carriers and grain handlers and receive a commission for their work. The company assembles commodities from farmers and buys from other assemblers for sales in the Atebubu market. They also act as commission selling agents for both assemblers and farmers. Profits are shared among the members, the senior partners taking about two-thirds and the junior partners receiving one-third. About 40 percent of each market day's profits, including commissions, are distributed among the partners after the market. The remaining 60 percent is accumulated until the end of the Muslim year when it is also distributed.

The main business of the second company is commission selling. Formerly the second group consisted of three Hausa men who operated out of a store room across the road from the market. An assembler, a male Akan, regularly used these men as commission sellers. The assembler is a member of the District Council and was allocated one of the new stores built at the front of the market. He then entered into an informal partnership with the three Hausa men. They still sell on a commission basis for him and other traders. He pays the rent on the store and earns a share of profits from all commission sales. Aside from commission selling, the northern partners also buy on their own account. In such instances they retain all profits. At other times two or more of the partners will go together to buy commodities and share the profits.

The head of a third group supplies all the working capital. The others help in buying and selling. Profits are shared among the partners after each market. The head takes 40 percent of the profits and the others earn 15 percent each.

Aside from these organizations, most other grain assemblers operate independently.

Sales made in the village may originate with the buyer or with the seller. A farmer who is ready to sell may call on or send word to an assembler, usually one he has dealt with before. In other instances farmers may call on potential buyers who have been recommended by friends. Or a buyer travelling from village to village in search of supplies can make the initial contact with a producer on the basis of information from his other suppliers or from buying agents.

The next step is for the prospective buyer and seller to inspect the commodity for sale. Visual inspection of a commodity is required whenever title to the produce is transferred because there are no generally recognized quality standards and units of sale or means to enforce them. After the commodity has been inspected, bargaining begins. Farmers get price information before they sell from visits to the markets or from other farmers (see Table 25, p. 45a).

Yams vary greatly in size and quality, so that there is wide latitude for bargaining. Yams are stacked into piles of 110 similar sized tubers of the same variety for inspection by the buyer. The farmer begins negotiation by stating his asking price. Usually no other buyers or sellers are present and the negotiation is essentially private, although it may be observed by other farmers. Important factors entering into the negotiations include size, quality, and transportation costs. If agreement is reached the trader travels back to the nearest market center to arrange for transport from the farm.

Prices of grains are less variable as the bag, supplied by the trader, provides a more or less standard unit of measure. The bags are often overfilled and the excess skimmed off when the bag is sealed. In many instances the extra amount represents the traders' margin because the same price may be paid for the overfilled bag as the sealed bag if the farmer were to transport it to the market.

The volume handled by assemblers can be large. The largest grain assembler interviewed claimed to have £20,000 available for grain purchases. Mean weekly volume handled by 57 assemblers of grain and kokonte was 26 bags. Capital available to these assemblers averaged about £2,860 (based on 35 interviews). The average weekly volume for yam assemblers was about 1,100 tubers and average capital availability was approximately £1,935.

Figures on average size of transactions from the farm survey give an indication of what volume traders handle. The mean sizes of transactions for each crop are as follows: yams, 966 tubers; rice, 22.7 bags; maize, 14.2 bags; kokonte, 14.1 bags.

When purchase agreements have been completed the buyer must arrange to haul the commodity to a District market or consuming center outside the District. Tractor charges for hauling from the farm to a point where lorry transport is available are large. Typical transport charges for yams from villages in the District to Atetubu are presented in Table 21. Charges vary with distance and condition of the roads, ranging in 1977 from £6 per 100 yams (£20 per ton) to £25 per 100 (£65 per ton).

The services of brokers (dillali in Hausa) are utilized all along the marketing chain. Brokers are often employed to locate supplies and establish initial contact with potential sellers. Occasionally brokers complete the purchase but more often they merely supply information about possible sources of supply and supervise loading the commodity. For their services brokers are paid a commission which averages about 40p to 60p per bag for grains or from £1 to £2 per 100 for yams. Brokers are also present in the wholesale markets on each market day and they sell commodities for assemblers and farmers alike. This type of commission selling is confined to the grain trade. Regular market attendance gives

Table 21.--Charges for Transporting Yams by Tractor
and Cart from Various Villages to Atebubu*

Village	Distance (miles)	Charge per 100 (cedis)	Charge per ton mile (cedis) ^a
Ananifrom	3	6	5.10
Samwakyi	4	7	4.46
Agona	6	8	3.40
Tintari	6	8	3.40
Mim	6	8	3.40
Old Konkrompe	7	10	3.64
Fiano	8	8	2.55
Patoda	8	8	2.55
Kokotu	8	8	2.55
Pruso	10	14	3.57
Aseebu	11	14	3.25
Boanyo	15	12	2.03
Bantana	17	16	2.40
Bakyaso	18	14	1.98
Yabraso	18	16	2.27
Ademera	19	16	2.15
Yaw Tufuo	20	14	1.78
Troshe	22	16	1.85
Agyetegya	21	16	1.94
Seneso	24	16	1.70
Anyanofi	28	20	1.82
Abease	42	25	1.52

*Source: Interviews with transporters.

^aAssuming 110 tubers per hundred weighing 8 lbs. each.

the brokers an advantage in assessing market information and dealing with potential buyers (8, pp. 252-57). Because of their position in the market, brokers often facilitate credit transactions by guaranteeing credit sales. Brokers may also stand witness to the terms of a transaction; Arhin says that the broker used to be paid one shilling for witnessing the sale of a cow and a sixpence for witnessing the sale of a sheep or goat (1, p. 210). Most brokers also trade on their own account. They smooth the flow of produce and price fluctuations during slack periods holding for a short period and selling for a small profit.

Rice processors handled about 40 percent of the marketed rice crop in 1976/77 (assuming an extraction rate of 60 percent). Processors buy paddy from farmers or from assemblers, parboil it, and pay to have it hulled at one of the small mills. They sell to resident retailers, or foreign retailers and wholesalers. A few arrange to have dillalis sell for them in the Kumasi market. Processors are usually northern women who operate on a small scale. Weekly turnover typically does not exceed five bags.

Assemblers and processors earn their living from rapid turnover of their capital. During peak buying periods most assemblers attempt to turn over their stocks weekly. Few store speculatively, although they may sometimes hold stocks when sudden price drops face them with a loss. However, few see storage as part of their business or as a means to earn profits.

Traders view the main risk of losses as coming from sudden price declines. Decisions to purchase are made on the basis of the last price quoted in the market. Prices can change sufficiently from week to week to face traders with potential losses. When prices fall yam traders in particular must sell because of the rapid deterioration of their stocks.

Trade at all levels of the marketing chain is facilitated by credit. Traders loan money to farmers whom they trust as a means of ensuring supplies. Through the careful use of credit a trader can establish a network of friendly relations in several villages. Through these relations he can be put in contact with other producers who are willing to sell and establish a larger clientele.

Though traders emphasize the importance of continuing relations with regular producers, purchases from other producers whom the trader does not regularly deal with are also important. Traders' ability to secure supplies through credit is limited. To gain access to continuing supply the trader must compete with other traders for new sources of supply. Such competition for supplies helps to explain the use of buying agents by some assemblers. Though usually not empowered to negotiate purchases these agents locate potential sources of supply for the trader to follow-up.

Of the 404 farmers interviewed, 238 (59 percent) borrowed from banks, friends, relatives, traders, or money lenders. Sixty farmers borrowed from more than one source. Shown below are the numbers of farmers who customarily borrow from each source:

<u>Source</u>	<u>Number of farmers</u>
Agricultural Development Bank	112
Traders	110
Friends and relatives	78
Money lenders	6
Other	1
Total	307

The group credit scheme of the Agricultural Development Bank (ADB) has increased credit availability to producers, but there is no evidence to suggest that the ADB loans have decreased the demand for loans from traders. In fact, the survey shows that 32 percent of those borrowing from the ADB also borrowed from traders.

Detailed information was recorded about 133 loans made by traders (Table 22). (Some farmers had more than one loan.) Loans by traders are most commonly made against a specific crop. Of the 133 loans, 58 were for yams, 49 were for rice, and 16 were for maize. The remaining 10 were for cassava, groundnuts, or combinations of the above crops. Traders secure the right to buy the commodities for which the loan is made, but the terms are typically negotiated at time of purchase. The farmer is expected to inform the trader when he is ready to sell. The price at which the sale is to be made is then negotiated, and the amount of the loan is deducted from the total amount to be paid.

The median loan is less than £200, but loans of up to £4,000 were reported. Distribution of credit by size of transaction is shown in Table 22. Duration of loans is usually for the crop season but may extend to a year.

Farmers usually pay off their loans in cash, but may pay partly or entirely in kind. Less common forms of repayment include a predetermined amount of commodity to be given in return for a loan or a repayment partially in cash and the remainder in a commodity. These arrangements usually occur for grain crops rather than yams because of the difficulty of establishing a predetermined quantity of yams to repay. Implicit interest is often charged on yam loans through a reduced price or a dash of forty to fifty tubers.

Of the 133 loans, 20 were repaid in kind, 10 in cash and kind, and 103 in cash. Interest is not usually large in these transactions. No explicit interest was charged on 78 of the 103 cash repayments.

Table 22.--Size of Loans Made to Farmers
by Traders, 1976/77

Amount (cedis)	Number of loans	Percent of loans	Amount loaned (cedis)	Percent of total amount loaned
less than 100	32	24.1	2,425	6.3
101-200	40	30.8	7,250	12.7
201-300	8	6.0	2,360	4.1
301-400	19	13.5	7,480	13.1
401-600	11	8.3	6,150	10.8
601-800	4	3.0	3,200	5.6
801-1,000	10	7.5	9,640	16.9
1,001-1,500	3	2.3	4,100	7.2
1,501-4,000	<u>6</u>	<u>4.5</u>	<u>14,400</u>	<u>25.3</u>
Total	133	100.0	36,995	100.0

* Source: Farm Survey.

Producers also often sell commodities to traders on credit, receiving payment after the commodities are sold. This arrangement is often a "part down, the balance later" transaction. Moreover the credit chain is extended by traders in town to their customers.

These routine credit relations expand traders' ability to take advantage of commercial opportunities that their otherwise limited working capital could not cover. They also involve an element of risk sharing. If the credit buyer finds that she cannot resell without facing a loss she can sometimes arrange with the supplier to reduce the original purchase price. In times of price uncertainty credit can be a means by which the risk of loss is shared along the marketing chain. This sharing can also extend back to the producer if he has given his crop to an assembler for later payment. Sharing of risk through renegotiating purchase prices only occurs in credit sales. Prices in cash sales are final.

Capacity of traders to lend to farmers is limited. Most traders can only make about seven to ten loans which requires from £1,400 to £2,000 of their working capital. Any additional loans would be likely to cause shortages in working capital. As a percentage of total volume, the quantity directly secured through extending credit to producers is low. Limitations in financial resources of traders are a principal cause of weak intermarket correlation and irregular price changes.

ADB has initiated a lending program for traders that is intended to ease their situation. Loans are made individually or to groups (yam traders and fish traders only). Total loans to groups in 1977 amounted to £101,600.

Loans totalling £111,600 were made to 38 individuals. The largest, £30,000, was to a food contractor and two others were £10,000 or £20,000. The rest were around £1,000 to £1,500. Two-thirds of these loans were to yam traders.

THE NATIONAL MARKETING SYSTEM

Some impression of how well the national marketing system for domestically produced food crops performs can be obtained by examining the extent to which prices in various market towns are related. The Ministry of Agriculture has published records of wholesale prices since 1954, with an interruption in the early 1960s. Publication of market prices stopped again in 1974, but prices are still being collected by the Ministry. Retail food prices have been reported for a shorter period and for fewer towns. The analysis in this section depends on wholesale prices reported from June 1965 to September 1974 for the sixteen market towns with the most complete records (Map 2).

As a test of spatial arbitrage, the correlation over time of wholesale prices in pairs of markets was calculated for each of four commodities--yams, rice, maize, and kokonte. Table 23 shows the distribution of correlation coefficients so calculated. Their general level proved to be markedly higher than had been obtained in a similar study in Nigeria based on retail prices from 1952 to 1967 (8, p. 141). This results partly from the fact that the present study examines prices only for towns with relatively good records, whereas in Nigeria all towns for which there was any sort of price record were included. Nevertheless, the absolute number of pairs at higher levels is also conspicuously larger for yams, rice, and maize in Ghana as is seen in Table 24. (Correlations would tend to be increased by the long term upward movement of farm prices in Ghana, but this change was irregular prior to 1973, and prices after December, 1972, were not used in calculation of the intermarket correlations.)

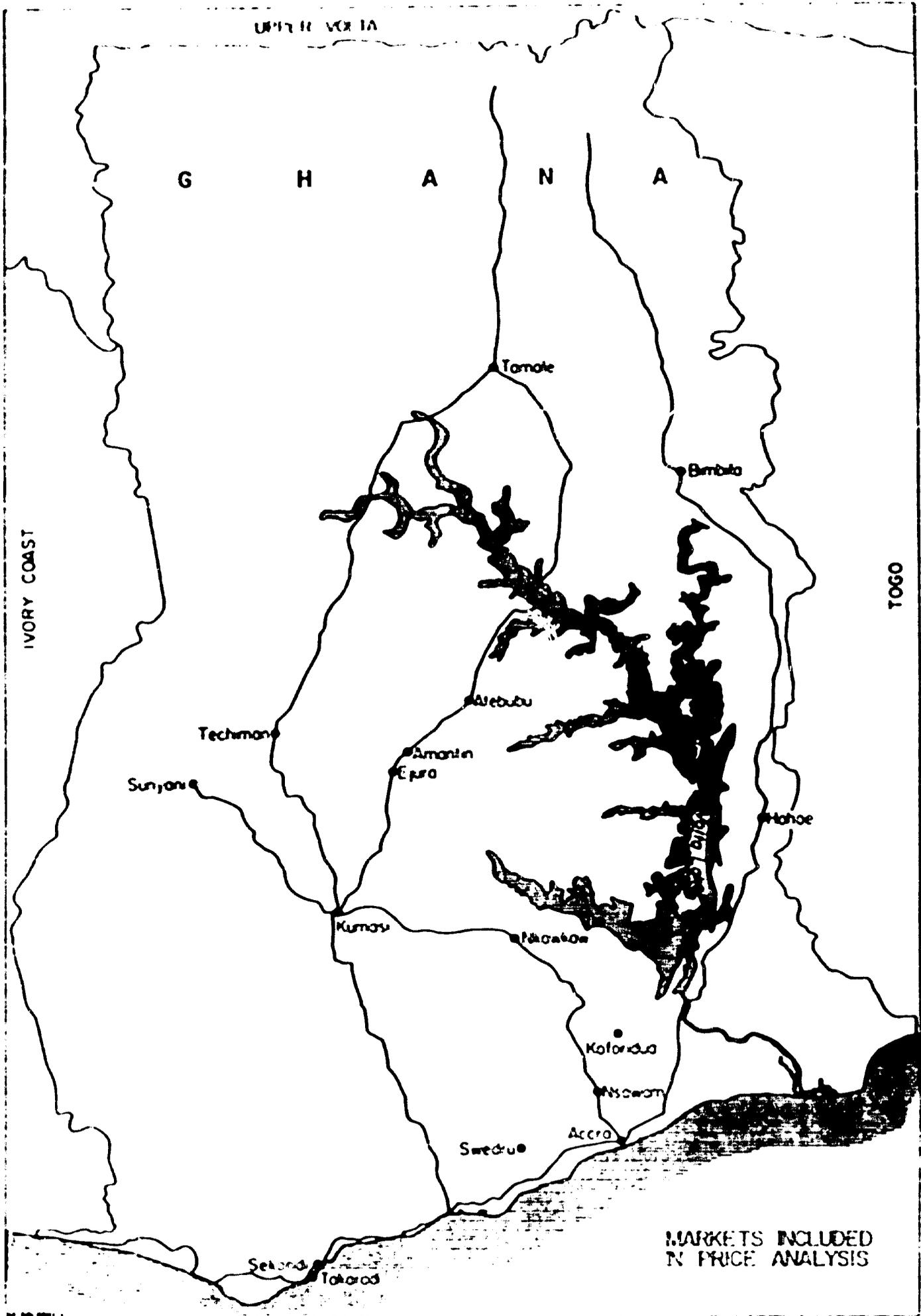


Table 23. --Correlation of Wholesale Prices among Pairs
of Markets, Ghana, 1965-72*

(proportion of total coefficients by commodities)

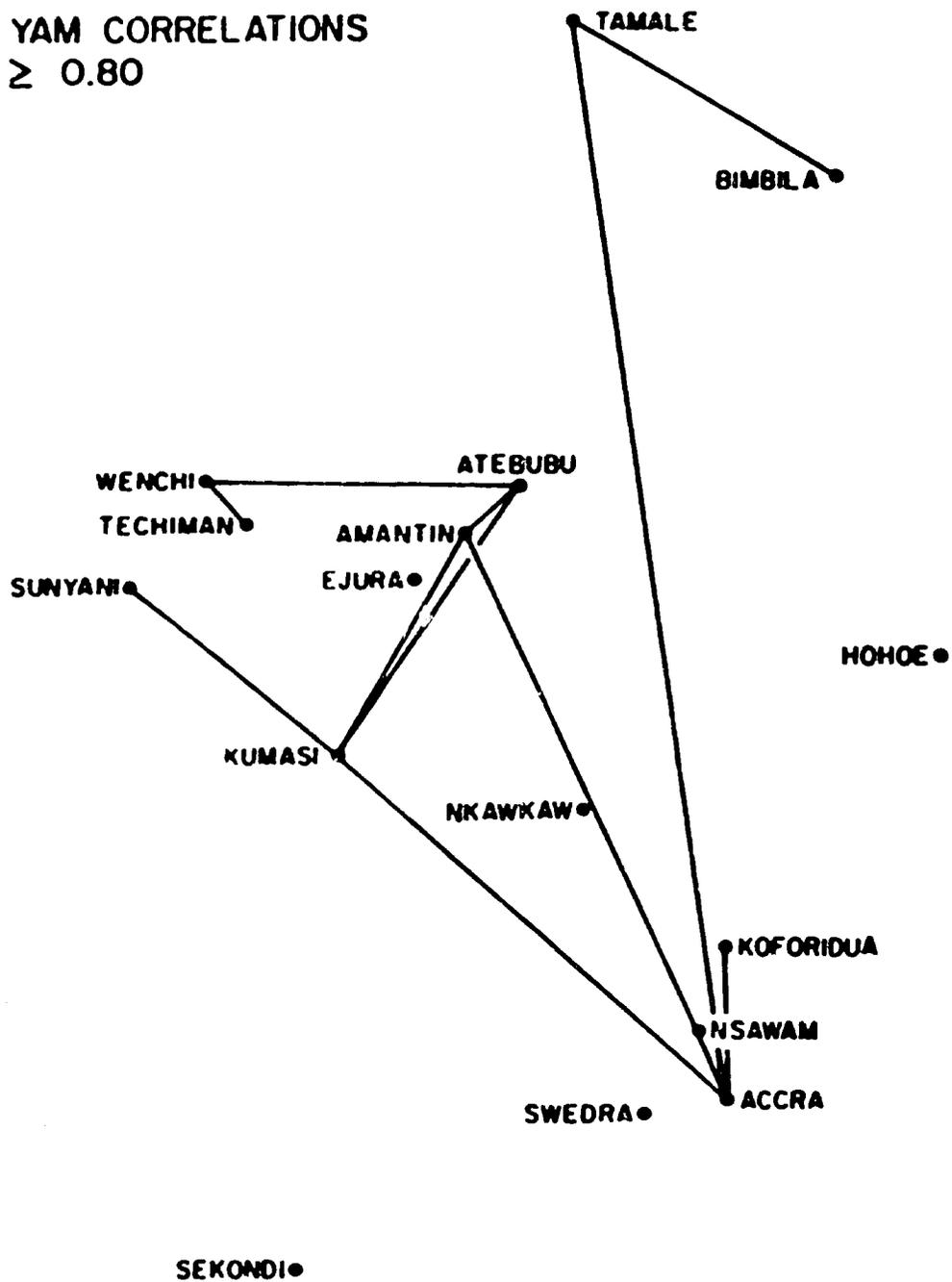
r	Yams	Rice	Maize	Kokonte
.95+	.02	.04	.02	0
.90-.94	0	.03	.20	.01
.85-.89	.02	.03	.43	.03
.80-.84	.06	.08	.17	.03
.75-.79	.11	.13	.06	.08
.70-.74	.07	.17	.01	.08
.65-.69	.11	.13	0	.17
.60-.64	.13	.09	.03	.09
.55-.59	.07	.07	.03	.13
.50-.54	.11	.03	.04	.10
0-.49	.30	.18	.02	.23
0	0	.03	0	.06
Total	1.00	1.00	1.00	1.00
Number of markets:	16	16	16	16
Number of pairs:	120	120	120	120
First quartile	.70-.74	.75-.79	.85-.89	.65-.69
Second quartile	.60-.64	.65-.69	.85-.89	.55-.59

* Source: Ghana, Ministry of Agriculture, Monthly Food Situation Report (title varies), various issues.

Intermarket arbitrage may have been better in Ghana in the 1960s and 1970s than it was in Nigeria ten years earlier, but it could have been much better. Correlations of prices among markets may, of course, be masked by inaccurate price statistics, but to some degree these inaccuracies simply reflect imperfect knowledge within the wholesale markets themselves. Accurate knowledge of prices and supplies at various points in the system and the ability to respond to market opportunities thus revealed are essential for strong relationships of price movements among markets, and the relatively low correlations are caused in part by traders' inadequacies of information and resources.

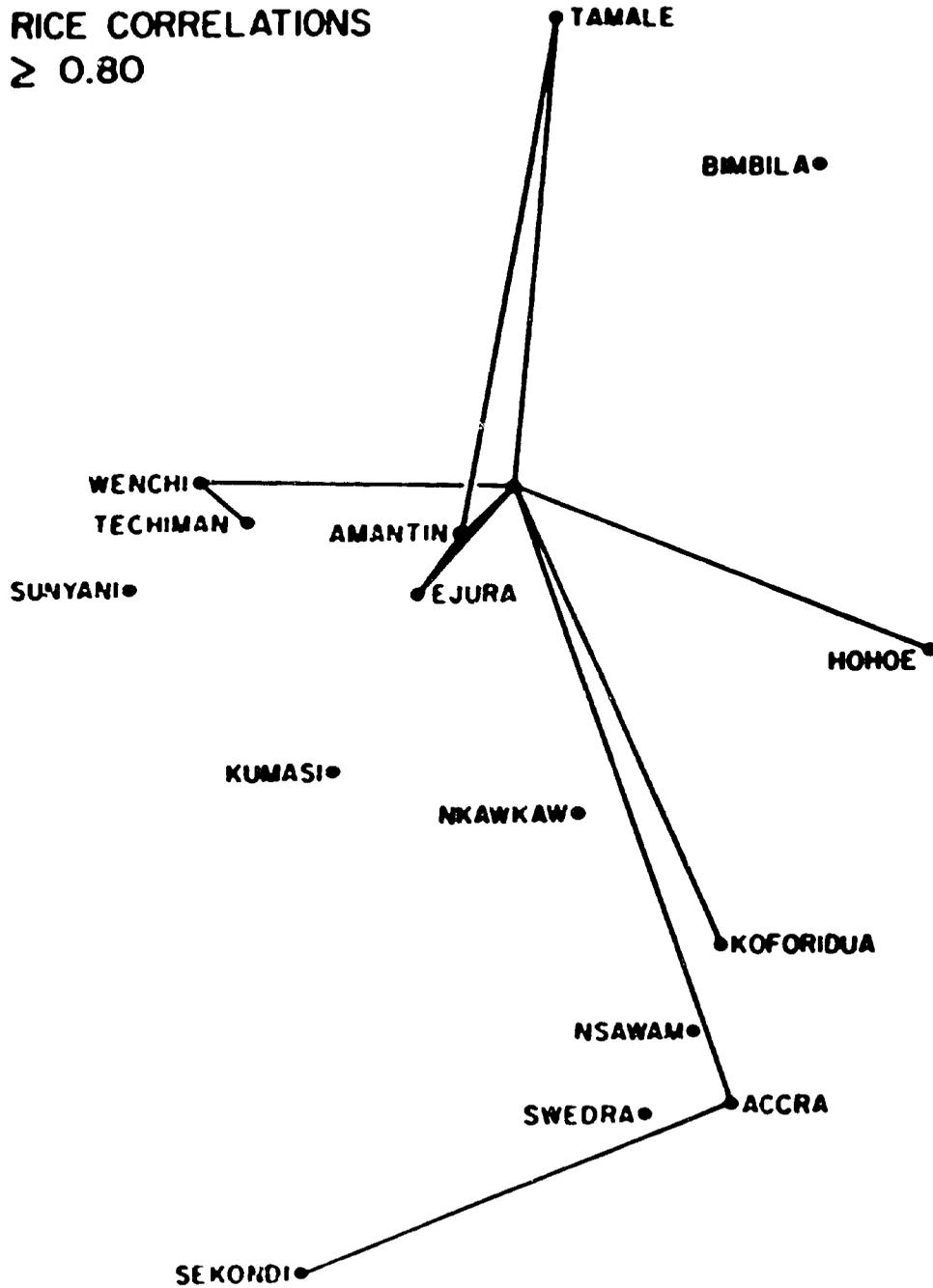
The difficulties encountered in moving produce from one market to another also affect intermarket relationships, and this can be expected to be greater on bulky and delicate commodities like yams than it is on kokonte, rice, and maize. In 1977 it cost about £50 per ton to haul produce from Atebubu to Kumasi, and about £85 per ton from Atebubu to Accra. Yams at the height of the season in August through November sold for £180 to £330 per ton in Atebubu, paddy rice in November and December when its prices are usually lowest sold for about £800 per ton, and maize in August to October for £500 per ton (based on wholesale prices reported by the Ministry of Agriculture; paddy rice price derived from milled rice price; Kumasi price used for maize because of gap in Atebubu data). The relatively higher cost of moving yams might be expected to result in poorer spatial integration of yam markets than of those for maize and rice (9, pp. 319-21). Maize does in fact show more correlations of .80 or greater than do yams, and the chart of maize correlations (Chart 6) shows a tightly integrated system with all towns but Bimbila, Swedru, and Tamale included at $r = .90$. (Tamale and Swedru are correlated

Chart 4.--Intermarket Correlation of Wholesale Prices: Yams*



*Source: Ghana, Ministry of Agriculture, Monthly Food Situation Report, various issues.

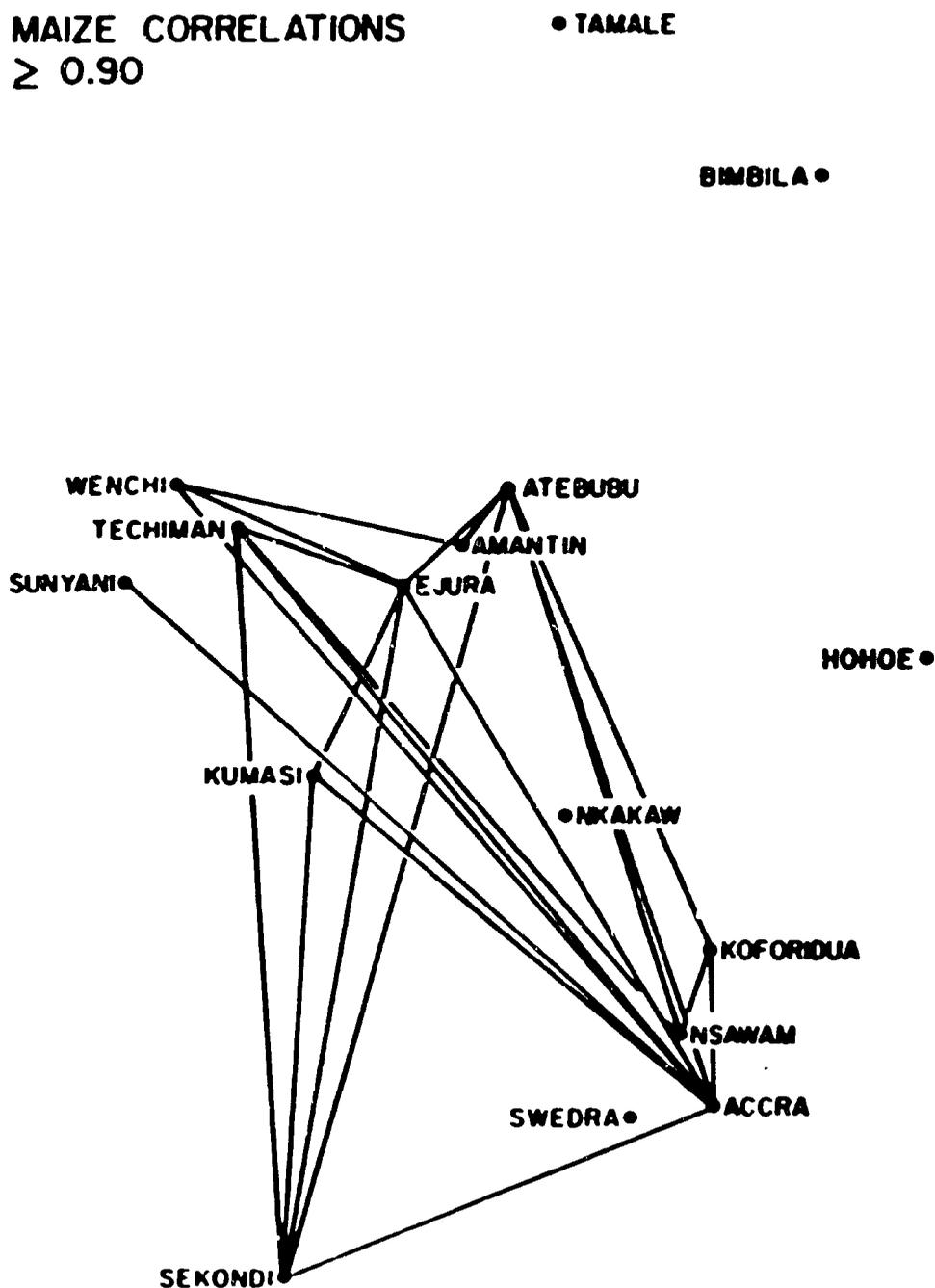
Chart 5.--Intermarket Correlation of Wholesale Prices: Rice



Source: Ghana, Ministry of Agriculture, Monthly Food Situation Report, various issues.

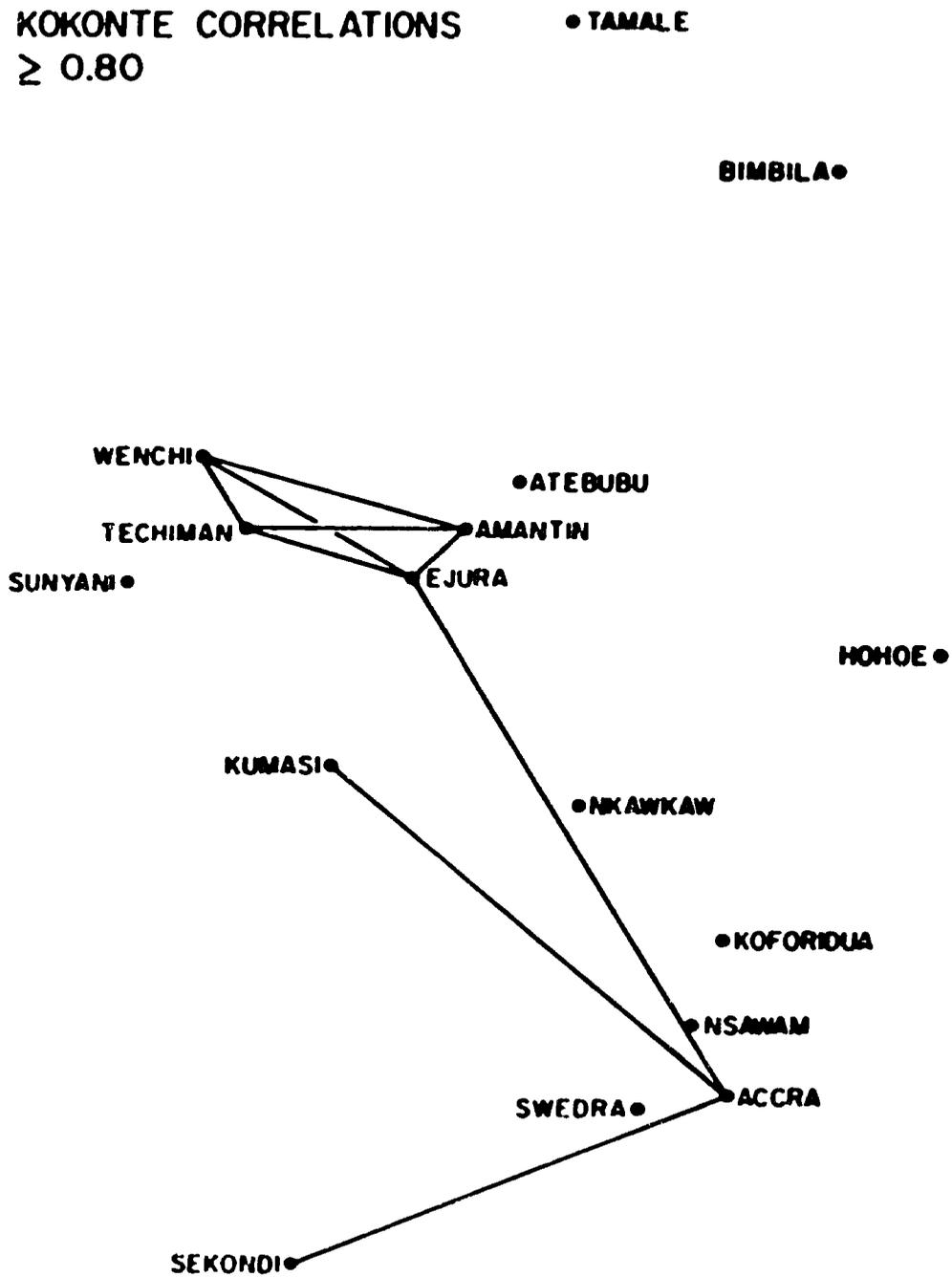
Chart 6.--Intermarket Correlation of Wholesale Prices: Maize*

MAIZE CORRELATIONS
 ≥ 0.90



*Source: Ghana, Ministry of Agriculture, Monthly Food Situation Report, various issues.

Chart 7.--Intermarket Correlation of Wholesale Prices: Kokonte^a



^aSource: Ghana, Ministry of Agriculture, Monthly Food Situation Report, various Issues.

with most other towns at $\underline{r} = .80$.) Atebubu prices are correlated at $\underline{r} = .90$ or higher with six other markets and at $\underline{r} = .85$ with all markets except Bimbila. It is noteworthy that Kumasi seems unimportant in this trade (only two links at $\underline{r} = .90$).

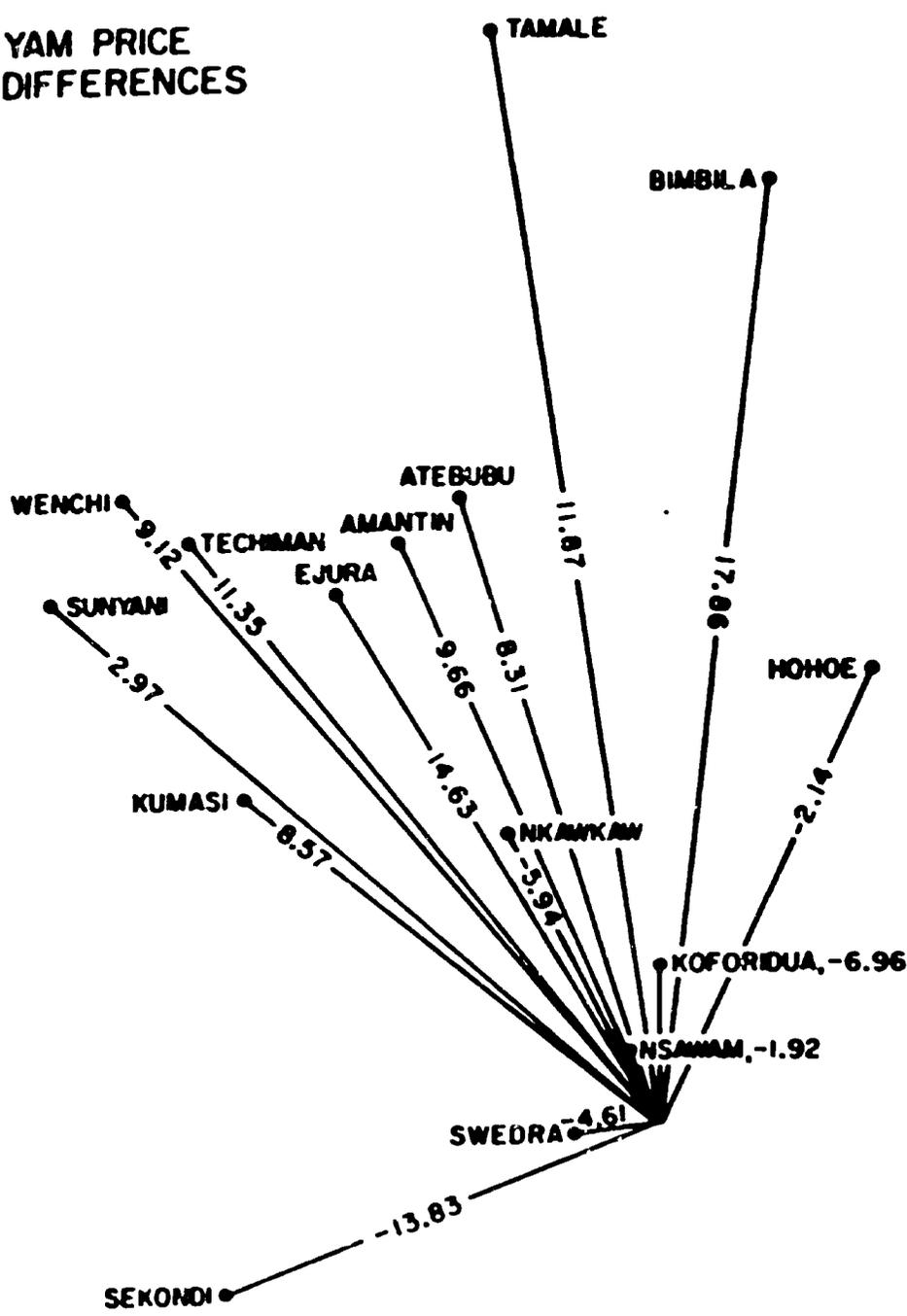
Other networks, even when plotted at $\underline{r} = .80$ or more, show patterns that are much less complete. Atebubu figures prominently in the correlation map for rice, consistent with the growing importance of the crop in the District, but Kumasi is not included in the rice system at all. The kokonte map suggests a concentration of production for market in the area between Amantin-Ejura and Techiman-Wenchi. Atebubu is only loosely connected with this system by a correlation of $\underline{r} = .74$ between its prices and prices in Amantin, despite the fact that our checkpoint data show Atebubu to have shipped nearly twice as much kokonte as Amantin. The yam map confirms the marketing relationships between Atebubu District, Kumasi, and Accra. It is surprising, though, not to find a higher correlation than $\underline{r} = .73$ between Techiman and Kumasi.

Intermarket price spreads

The estimates of intermarket price spreads between Accra and the other 16 market towns for the period 1965 to 1974 that are shown in Charts 8 to 11 should be treated with even more caution than intermarket correlation coefficients. Transport costs, even for yams, are likely to make up a small enough part of wholesale price to be swamped by errors in the original data, whatever their cause. Although the difference in wholesale prices between Atebubu and Amantin averaged £1.17 per hundred throughout the period, monthly values ranged from -£12 to +£22, with a standard deviation of £5 (Atebubu wholesale prices minus Amantin wholesale prices). In a most general sense,

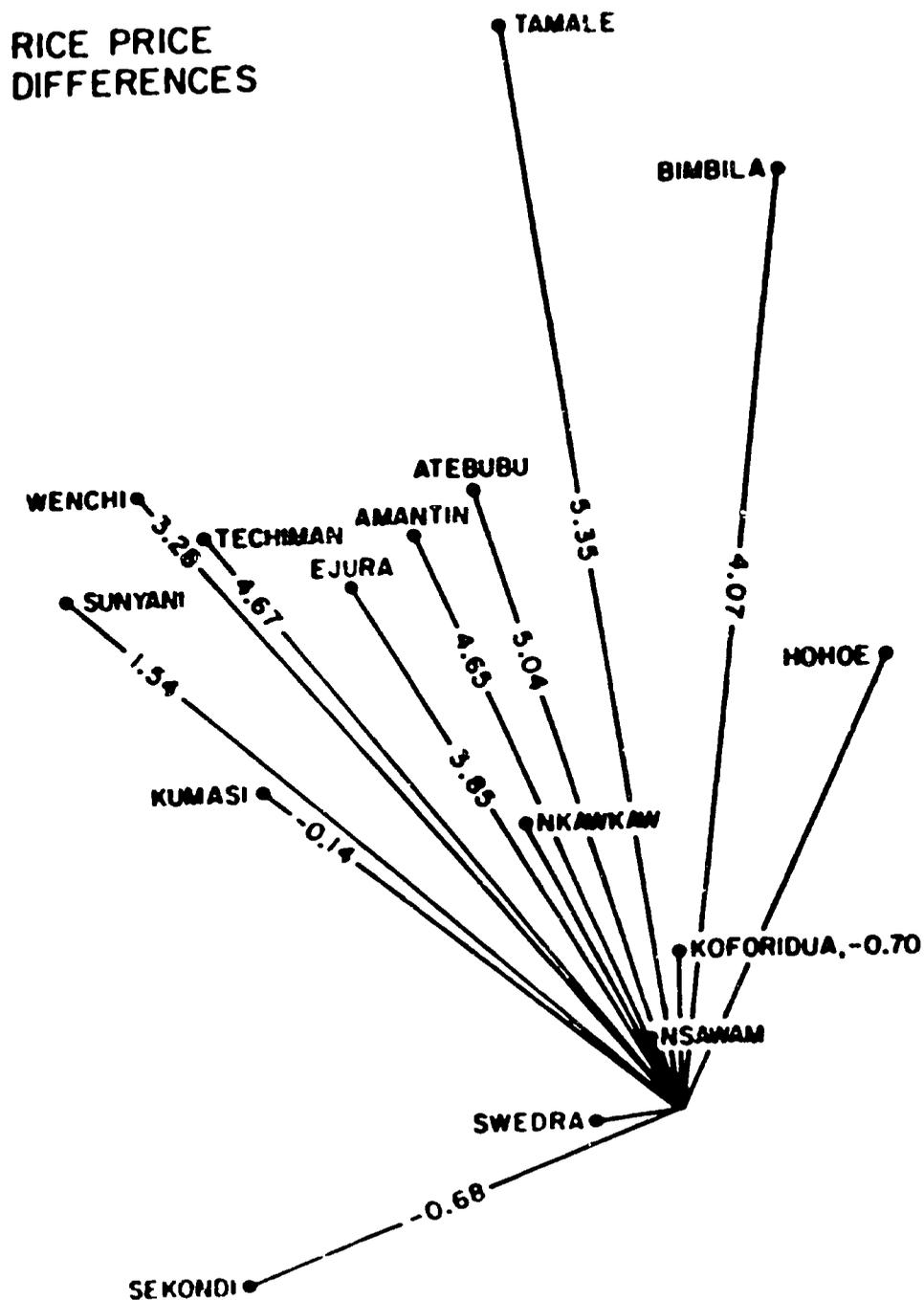
Chart 8.--Average Difference in Wholesale Prices of Yams, 1965 to 1974
 (Amount less than Accra in cedis per ton)

YAM PRICE DIFFERENCES



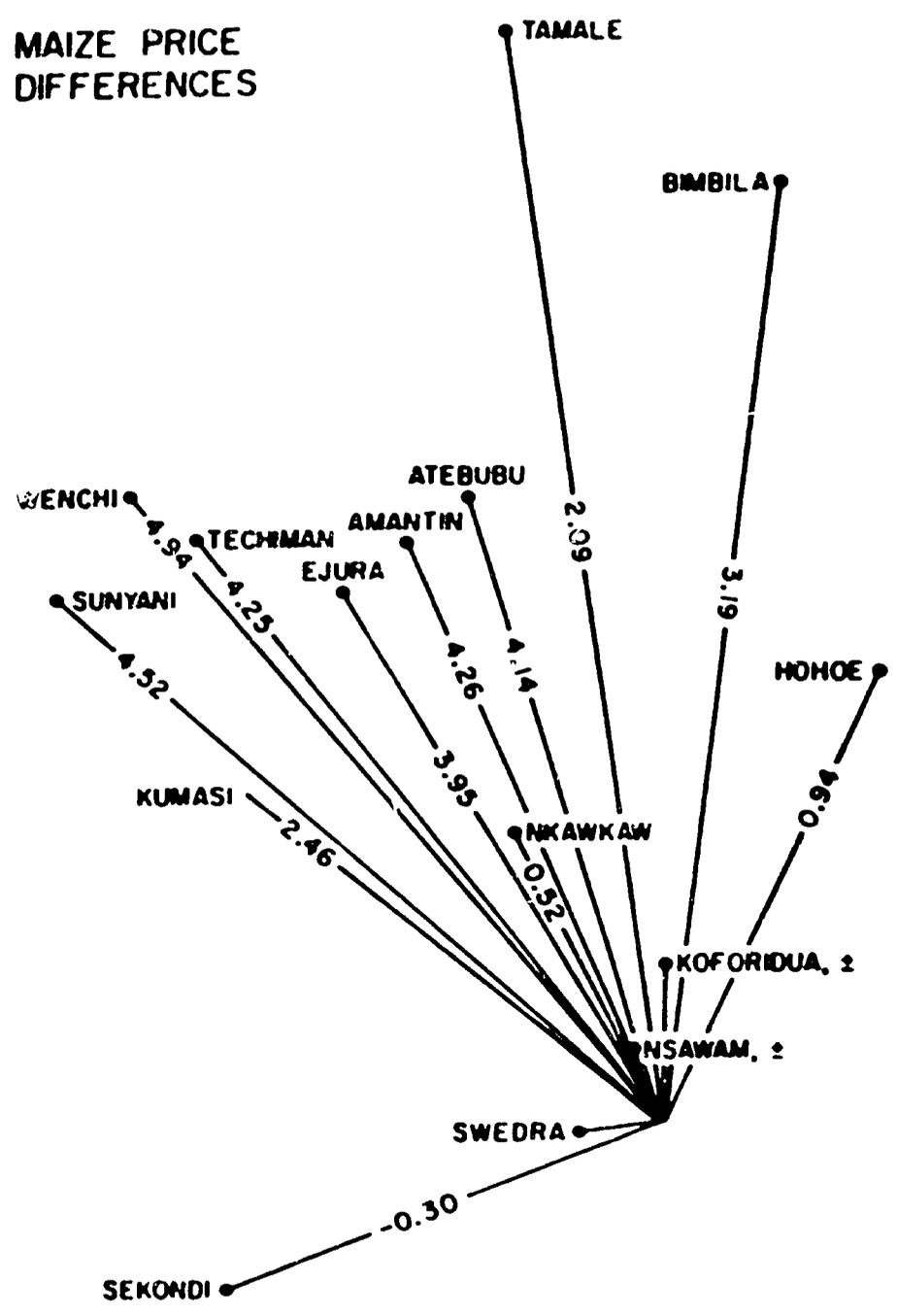
Source: Ghana, Ministry of Agriculture, Monthly Food Situation Report, various issues.

Chart 9.--Average Difference in Wholesale Prices of Rice, 1965 to 1974*
 (amount less than Accra in cedis per ton)



*Source: Ghana, Ministry of Agriculture, Monthly Food Situation Report, various issues.

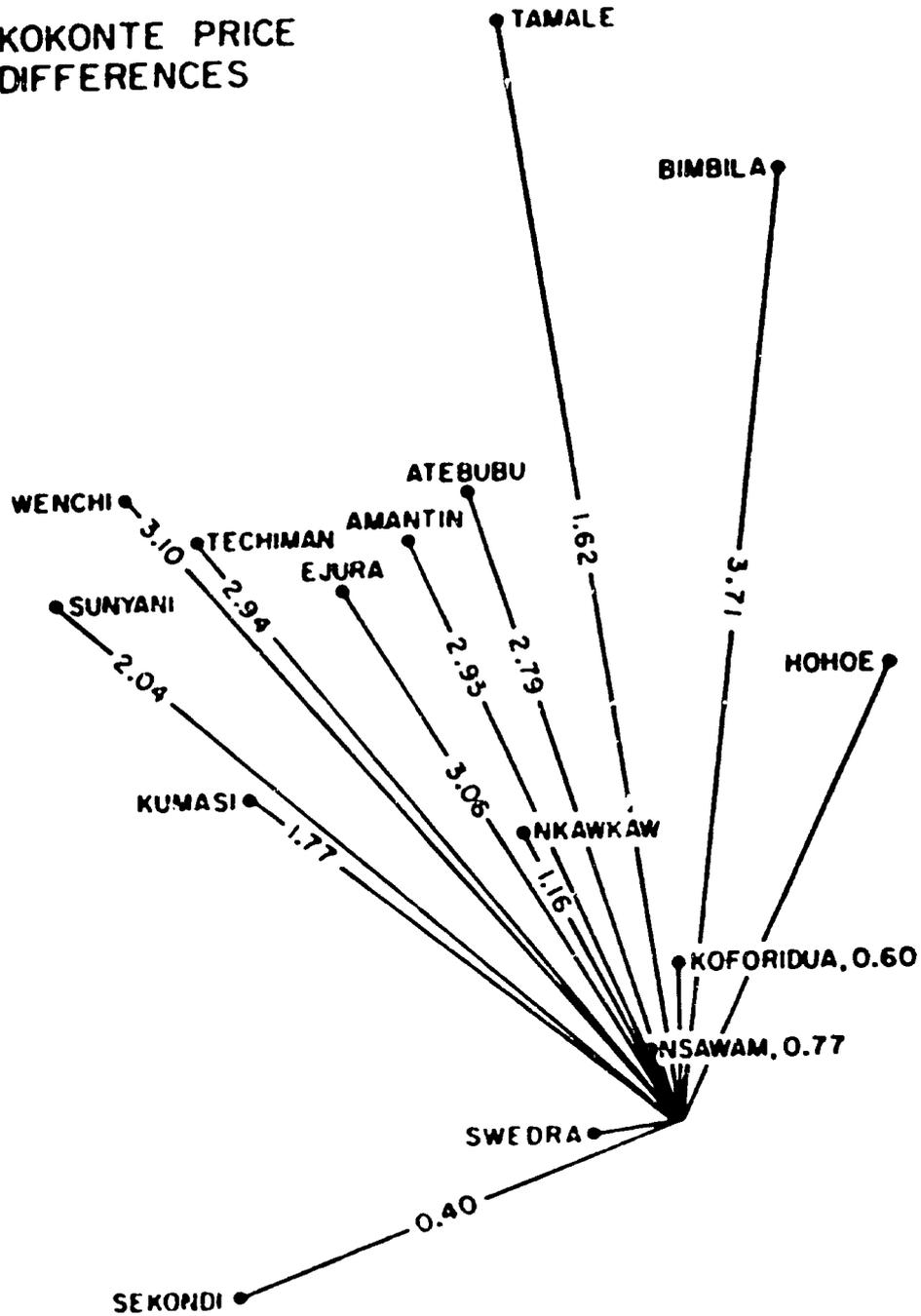
Chart 10.--Average Difference in Wholesale Prices of Maize, 1965 to 1974
(Amount less than Accra in cents per ton)



*Source: Ghana, Ministry of Agriculture, Monthly Food Situation Report, various issues.

Chart II.--Average Difference in Wholesale Prices of Kokonte, 1965 to 1974
 (amount less than Accra in cedis per ton)

KOKONTE PRICE DIFFERENCES



*Source: Ghana, Ministry of Agriculture, Monthly Food Situation Report, various issues.

however, the maps of price differences are consistent with other information about these systems. Prices of all four foodstuffs tend to be highest in Accra and Sekondi-Takoradi, with few exceptions. Considerably lower prices are apparent in most of the producing zones than in the consuming centers. Nevertheless, there are a few puzzles.

Yam prices in Kumasi and Atebubu markets averaged £8.57 and £8.31 per hundred less than in Accra throughout this period, when the average price of yams in Accra was about £45 per hundred. This is a larger spread relative to commodity value than is suggested by comparison of transport costs and wholesale prices in 1977, although not out of line with Atebubu-Accra market spreads and values in the 1960s and early 1970s for rice, £5 and £30, and for maize, £4 and £14. But it does seem strange that average prices of yams over the period were almost exactly the same in Atebubu as they were in Kumasi, despite the fact that information from our Amantin checkpoint shows Kumasi to be the first destination for 69 percent of yams leaving the District. From March through November 3,924 tons of yams went to Kumasi. If Kumasi took all the yams loaded outside of Atebubu and Amantin, and it may have done, this would only account for 2,027 tons and leave 1,897 tons to come from Atebubu and Amantin markets, where average prices differed little from those in Kumasi.

How could traders make money by hauling yams from Amantin and Atebubu to Kumasi under these circumstances? The answer begins to appear when monthly price differences are considered rather than average differences over nine years. In 57 of the 115 months for which prices were examined, yams cost more at wholesale in Atebubu than they did in Kumasi; in 58 they cost more in Kumasi. These relationships were distributed fairly uniformly through the year. The average annual price was higher in Kumasi,

though not by much, during the first half of the period, and lower from 1970 to 1973. (Data for 1974 were incomplete when the analysis was done.)

A possible explanation of this paradox may be that Kumasi wholesale market for yams is often quite congested (it could only accommodate 20 lorries a day in 1977). Buyers from Accra may be able to shorten their trip time at the cost of modest increase in mileage if they go directly to Atebubu market, bypassing Kumasi market and Kumasi town entirely. They do this by leaving the main road at Konongo and joining the Atebubu road at Ntonso or Mampong. Some evidence that yam buyers do use this route is provided by the appearance of Konongo, Effiduase, and Ntonso, among the destinations of yams passing through Anantin checkpoint. Mampong, too, may be an entrepôt for yams destined for Accra. Higher yam prices at Atebubu than Kumasi could occur if buyers from Accra found the cost of time lost in Kumasi town and Kumasi wholesale market greater than the increased price they had to pay in Atebubu. At such a time, the only yams going from the District to Kumasi would be those that were purchased directly from farmers, rather than through resident assemblers. When prices assumed a more customary relationship, Kumasi traders would also buy from Atebubu assemblers. This hypothesis cannot be confirmed, but it seems at least to be plausible. When combined with the known difficulty of determining what wholesale prices are and the general inaccuracy of price discovery and price reporting, it seems reasonable.

The rice chart map also presents anomalies in that Kumasi prices average the same as Accra prices, and Tamale, more or less in the heart of major rice production, reports higher prices than several markets farther south, particularly Atebubu and Anantin. A possible explanation lies in the

Impact rice imports have on prices of domestic rice. (When foreign rice arrived in Ghana in August, 1977, two months before the Atebubu rice harvest, prices of paddy at Atebubu fell from ₵160 to ₵80 per bag and domestic rice disappeared from the markets except for small distressed stocks in the hands of local assemblers.) Foreign rice is unloaded at Tema and its affect on domestic prices weakens with the distance of markets from the coast, so that prices in Brong-Ahafo tend to be appreciably lower than prices in the major rice areas farther north. This may also help to explain difficulties sometimes reported in bringing rice down from the Northern Region.

The map of maize price spreads, too, has a special pattern reflecting the very widespread production of this crop. Prices averaged about the same in Tamale, Atebubu, Sunyani, Kumasi, Sekondi, and Swedru and tended to be highest in Accra and nearby Nsawan, presumably reflecting the large effective demand in the metropolitan area of the capital city. Why they should also have been at this higher level in Wenchi, Techiman, and Hohoe is a puzzle.

The kokonte price difference chart adds Atebubu to the cluster around Techiman and Ejura that the correlation map indicated might be a center of distribution.

Price Analysis and Market Imperfections

Inferences must be drawn with care from the kind of price information that is available in Ghana, but some tentative conclusions are possible.

Seasonal variation in prices for yams is lower than storage costs would imply, simply because the harvest extends over so many months. Seasonal increases of maize prices are very high, and rice prices, too, rise considerably

for a food grain. There is no evidence that stocks of either of these crops are being accumulated by traders so that they can manipulate prices and obtain a return much greater than the cost of storage. On the contrary, as Charts 1 and 2 show for Atebubu District, stocks are mostly held by farmers and released at a fairly constant rate. It is hard to see how farmers could collude to exaggerate the seasonal price rise, although ignorance of the true size of a short crop could produce this effect. It seems hard to escape the conclusion that the cost of storing maize and yams is high in Ghana because of poor storage conditions. Studies of losses of these cereals under traditional storage are few, but those that have been made of maize on the Accra Plain show that heavy infestations occur when mature ears are left in the field to reduce their moisture content. Introduction of improved corn cobs and rice storage bins seems certainly worth trying (cf. 2). No explanation suggests itself for the large variation in kokonte prices other than that they reflect seasonal movements of yam prices.

Intermarket correlations of prices confirm that a national marketing system exists and functions moderately well. Taken with the information about intermarket price spreads, however, there is a strong implication that although the general levels of wholesale prices move more or less together among Ghanaian markets, these interrelationships are somewhat handicapped by deficiencies of financial resources and market facilities. Measures that would assist in the development of better organized rural assembly markets and urban terminal or redistributive markets could not help but improve the efficiency of staple food crop marketing and reduce its costs. For farmers in Atebubu District this would mean better prices, and for urban consumers it would mean more and cheaper food.

MARGAINING POSITION OF FARMERS

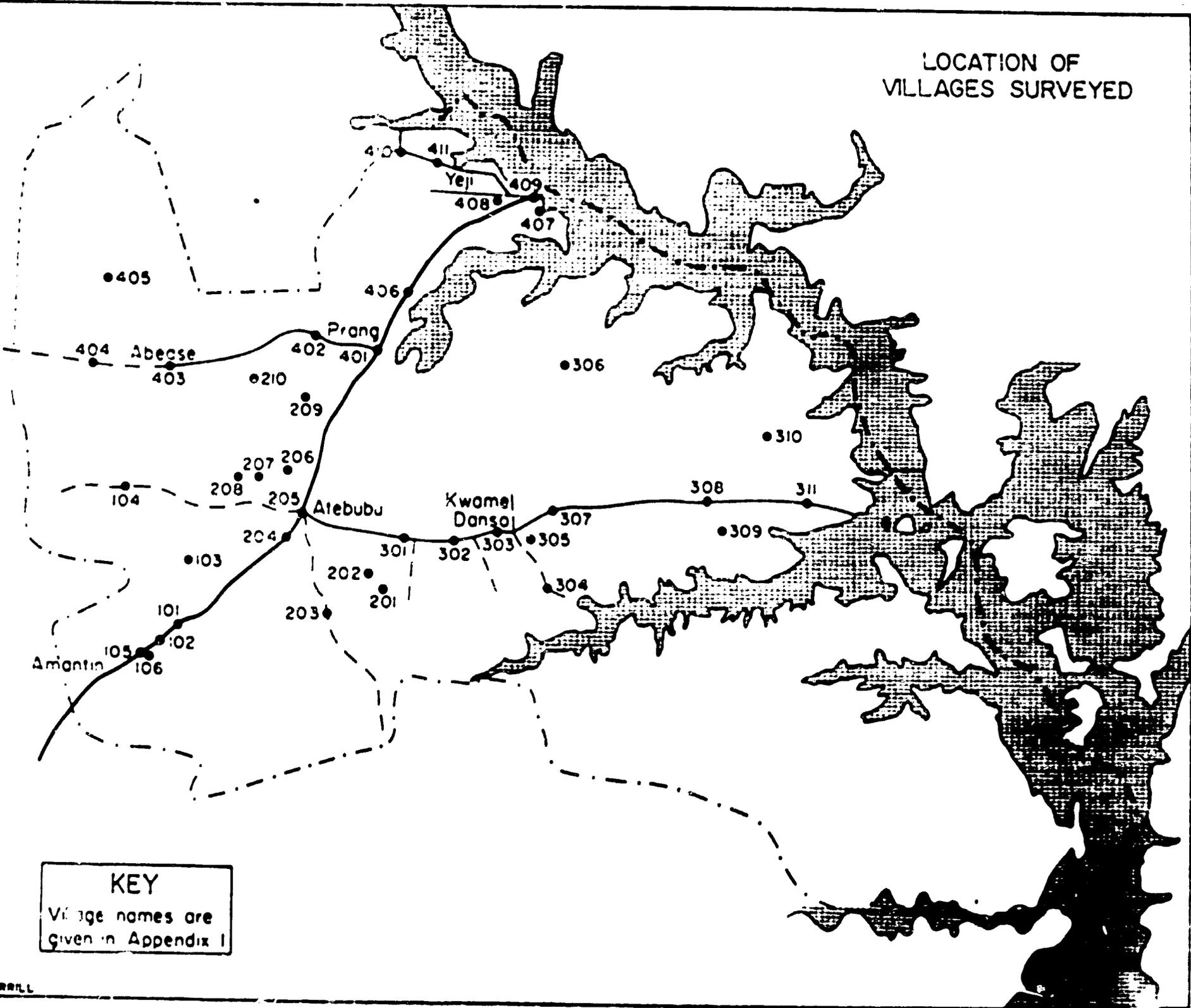
Our farm survey focused on marketing problems and built on surveys by Nyanteng and van Apeldoorn in 1970. Special attention was given to the principal marketing problems reported in the earlier study--difficulties of transport and lack of choice in selling. Nyanteng and van Apeldoorn found that poor roads and insufficient vehicles raised costs of transport so much that farmers were unwilling to take the risk of hauling their produce to market and endeavoring to sell it there. But costly transport also made traders less willing to come to the villages in search of produce, with the consequence that villages were visited infrequently and farmers felt obliged to take what was offered. In our survey, therefore, we asked various questions about the accessibility of fields and about farmers' relationships with traders.

Evidence from the farm surveys

Villages in which farmers were interviewed were selected randomly by strata so as to assure samples in each major farming area (Map 3). Within the village an attempt was made to interview less prosperous as well as more prosperous farmers, but almost inevitably the sample was biased toward the latter. Statistics derived from the sample provide reasonably good estimates of differences among farmers and among areas and can be used to estimate certain characteristics of villages on a District basis. When used to estimate District production and sales of the farm products investigated, however, they can lead to serious overestimates. Nevertheless, they tell quite a bit about the economic position of District farmers.

Because Nyanteng and van Apeldoorn concluded that many farmers were essentially isolated from markets by the poor transport system, we asked farmers directly whether they had difficulty finding buyers when they wanted

LOCATION OF
VILLAGES SURVEYED



KEY
Village names are
given in Appendix I

to sell produce, whether they ever bought back food crops at the end of the crop year that they had sold earlier and why, whether they sold crops before harvest, and how they knew what prices were when they decided to sell. A summary of the answers to these questions is given in Table 25.

Of the 40+ farmers who were interviewed, only 16 said that buyers were not usually available when they wanted to sell. One who complained of lack of buyers was a large farmer in Amantin whose farms were more than 7 miles away. He said that he had harvested 29,000 yams and that he had sold yams four times--in August, October, December, and May--but he declined to say how much he had sold. He did report having sold 40 bags of rice for ₦4,400 in February. The other farmers who said buyers were not available reported much more modest sales. The largest sold 500 yams and 30 bags of rice. Seven lived on primary and secondary roads. All but two said their farms were accessible to tractors and two of these could be reached by lorry. The farms of two were 7 miles distant from their residences but one was on the main road.

These results do not confirm the hypothesis that poor roads and shortages of vehicles have reduced farmers' bargaining advantage and sales opportunities. In fact farmers seemed to be generally satisfied with the prices they received. (Food crop farmers were probably better off in real terms and their money incomes had certainly risen sharply in the past year.) Many farmers thought our question naive, some thought it impertinent. Why would they produce what they could not sell?

A companion question about prices found only 90 farmers willing to say that they knew what prices were at the time they were interviewed, and we did not check to find out how many in fact did know prices in Atebubu or Amantin. It is not too surprising that so few should profess to this kind of information in June when few had anything to sell, and the second price question about sources of price information is more informative. (The

Table 25.--Sales Practices and Opportunities of 404
Atebubu District Farmers Interviewed in July 1977*

When you were ready to sell, were buyers always available?

Yes	387
No	16
No response	1

After you have sold the crop you grew, do you ever have to buy the same crop for yourself at a later date?

Yes	23
No	370
No response	11

If yes, why?

Not enough storage capacity.	22
Poor harvest.	1

Do you ever sell your crops before harvest?

Yes	9
No	395

If yes, why?

No time to harvest himself.	5
Sells to gari makers.	1
Needs money before harvest.	2
Other.	1

Do you sell to the same people each year?

Yes	119
No	282
No response	3

Table 25 (continued)

If yes, why?

buyer gives financial aid.	116
buyer gives physical assistance in farming	3

Do you know what prices are currently being paid in the market for the crops you grow?

Yes	90
No	314

When you sell your crops, how do you learn what price to charge?

other farmers tell me.	128
I check in the market.	160
Relations or friends tell me.	8
I set the price so as to give me more than the crop cost to grow.	40
From buyers.	58
No response.	99

^a Farm Survey.

question was open ended and the coded tabulation conceals nuances.) It sketches a picture of farmers who are at ease in commercial transactions, who know how to find what prices are when such information will be of use, and a few who think they can influence prices so as to cover their "production costs." Only 35 out of 395 farmers said that they learned about prices from traders.

Another criticism of the farm marketing system that is frequently heard alleges that farmers must buy back at high prices late in the season those same foodstuffs they sold early in the year to pay their creditors. When asked this question directly, 23 Atchubu District farmers out of the 393 who replied said that they did in fact sometimes have to buy produce late in the season like that they had sold earlier. The reason given by all but one, however, suggests that they were simply letting someone else pay the cost of storage. They were able to do so because most of them lived on year round roads or in market towns and could easily buy what they needed.

Somewhat less than one third of the farmers who were interviewed said that they customarily sold to the same trader each year, reflecting the trading relationships developed over time that are described in the earlier section on market practices. A typical farmer's explanation of why he sells to the same trader might be "they are my customers and they always supply me with clothes for farming and at times supply me with cutlasses." Where shortages are as prevalent as they were in Ghana in 1977, to have a reliable supplier is a valuable thing to farmers as well as to traders.

Larger farms

Table 26 shows the considerable variation in size of farms in the District as measured by volume of sales. No farms are very large, although inflated 1977 prices may suggest the contrary. In the

Table 26. --Volume of Sales of Yams, Rice, Maize, and Kokonte,
by 344 Atebubu Farmers, 1976/77*

	Yams, tubers		Rice, bags	Major maize, bags	Minor maize, bags	Kokonte, bags
Less than 1,000	12	Less than 10	79	44	99	37
1,000-1,999	94	10-19	64	28	50	15
2,000-2,999	37	20-29	33	9	19	5
3,000-3,999	16	30-39	29	6	11	5
4,000-4,999	6	40-49	24	1	6	3
5,000-5,999	13	50-59	6	3	3	2
6,000-6,999	8	60-69	7		2	1
7,000-7,999	3	70-79	6	1	2	
8,000-8,999	1	80-89	5		1	
9,000-9,999	2	90-99	4			
10,000-14,999	2	100-149	6	2		2
15,000-20,000	4	150-200	3	1		
Total	298		266	95	193	68

* Source: Farm Survey. Excludes farmers who sold less than the equivalent of the produce of one acre.

entire sample there were 13 farms that reported selling 5,000 or more yams in the previous year, 9 that sold 100 bags of rice or more, 3 that sold 100 bags of maize (from the major season), and 2 that sold as much as 100 bags of kokonte. At November prices in Atebubu, 5,000 yams were worth about ₦6,800, and 100 bags of paddy rice, 115 bags of maize, and 188 bags of kokonte were worth about the same. At average yield figures reported in the survey, 5,000 yams are the output of about 5 acres (16 or 17 acres according to Bray), 100 bags of rice the output of about 22 acres, and 100 bags of maize the output of 23 acres. These are not large farms, but they are big enough to reduce considerably the costs of marketing their output. There is no need for them to seek other produce to make up a 3-ton tractor load or a 5-ton lorry load (5,000 yams = about 20 tons). And when merchants contract for delivery from farms of this size they can be reasonably assured of substantial supplies even when crops are poor.

Estimated gross value of product is given for five of these farms in Table 27. Farms Nos. 1 and 2 have the greatest output in money terms of any in the sample. Farm No. 2 lies on the main north-south road, while No. 1 is accessible only by a sometimes graded dirt road.

Although most of these larger farms are primarily producers of yams, they are distributed randomly throughout the farming areas. The tribal split displayed by the full sample is altered here in favor of the Brong and other Akan-speakers who own 26 of the larger farms while the people of the various northern groups own only 18. The larger farms do tend to include more than average that are 7 or more miles from the village (19 out of 47), perhaps part of the price of finding larger areas for cropping. In this sense larger farmers may be pioneering out into empty areas. But 20 of their farms (mostly in yams) are within 3 miles of the village. All fields are accessible to tractors, and 17 can be reached by lorries. Sixteen are located on the main north-south road, and 7 more on the two secondary roads. All this points to the importance of transportation in stimulating production.

Table 27.--Gross Value of Sales of Some Larger Farms
in Atebubu District*

<u>Farm No. 1</u>		
Sales:	Yams, 20,000 sold April 1977 @ £210 per hundred	£42,000
	Rice, 43 bags sold February 1977 @ £90 per bag	3,870
	Maize, 54 bags sold February 1977 @ £120 per bag	<u>6,480</u>
	Total value of sales of these crops	£52,350
<u>Farm No. 2</u>		
Sales:	Yams, 1,900 sold September 1976 @ £117 per hundred	£2,223
	18,000 sold January 1977 @ £180 per hundred	32,400
	Rice, 50 bags sold April 1977 @ £90 per bag	4,500
	28 bags sold June 1977 @ £180 per bag	5,040
	Maize, 30 bags sold March 1977 @ £180 per bag	<u>5,400</u>
	Total value of sales of these crops	£49,563
<u>Farm No. 3</u>		
Sales:	Yams, 2,500 sold January 1977 @ £240 per hundred	£6,000
	5,000 sold February 1977 @ £140 per hundred	7,000
	5,000 sold March 1977 @ £140 per hundred	7,000
	3,500 sold May 1977 @ £300 per hundred	10,500
	Maize, 35 bags sold March 1977 @ £100 per bag	<u>3,500</u>
	Total value of sales of these crops	£34,000
<u>Farm No. 4</u>		
Sales:	Yams, 3,000 sold December 1976 @ £80 per hundred	2,400
	2,000 sold December 1976 @ £130 per hundred	2,600
	Rice, 80 bags sold January 1977 @ £70 per bag	5,600
	100 bags sold April 1977 @ £80 per bag	8,000
	Kokonte, 8 bags sold April 1977 @ £40 per bag	<u>320</u>
	Total sales of these crops	£18,920
<u>Farm No. 5</u>		
Sales:	Rice, 120 bags sold November 1976 @ £60 per bag	£7,200
	80 bags sold March 1977 @ £120 per bag	<u>9,600</u>
	Total sales of these crops	£16,800

* Source: Farm Survey of June 1977.

Summary, Bargaining Position

Information obtained by the farm survey seems to refute the proposition put forth by Nyanteng and van Apeldoorn that farmers suffer from a bargaining disadvantage in selling their crops because of isolation and paucity of buyers. Both the timing of sales and the more direct information reviewed in the preceding pages argue that farmers have the ability and the skill to obtain fair prices for what they sell.

Larger farms enjoy certain scale economies in transportation and marketing as a result of the lower costs their larger unit sales permit, but the farm survey shows no indication either in prices received or in relationships with traders to suggest that they enjoy other special advantages.

GENERAL APPRAISAL OF FARM MARKETING IN ATEBUBU DISTRICT

Atebubu District has a good marketing system. It can be made better. Like any marketing system it is extremely complex, as it must be if it is to achieve a high level of distributive efficiency and at the same time protect the independence of small farmers and preserve the freedom of choice of consumers. The preceding pages have provided glimpses of the complexity of the Atebubu system and of how farmers and traders, by constant attention to changing circumstances and diligent pursuit of economic opportunities, make the system perform its primary task. That task is to assemble produce from thousands of small producers in lots of 5 tons or less, and to make them available eventually, by the piece or the cup, to consumers in retail markets that may be 100 to 300 miles away. Furthermore the system must see to it that these staple foods are available all year round at prices consumers can pay, so that people no longer

need to go through the annual fear of a "hungry gap" while waiting for a new crop. These tasks must all be performed at a cost low enough so that prices offered to farmers will induce them to grow crops for market, and prices asked of consumers will induce them to buy what is grown.

Complexity is inherent because of the large numbers at each end of the chain whose abilities to supply and whose desires to consume must be brought into balance. It is little wonder that uninformed outsiders describe the markets of West Africa as disorganized. They are in fact anything but that, yet the organization is so complex as not to be perceived easily, and it is achieved by multitudes of participants who themselves have no clear vision of the overall structure but must be guided in their actions by limited information about supplies, prices, and requirements.

Atebubu merchants and farmers perform their roles in the economic order remarkably well in the face of numerous obstacles. These include shortages and irregularity in the availability of transport for hauling crops to market, inadequacies in financial resources needed to assure farmers of a market and to smooth out price fluctuations, absence of objective measures of quantity or quality of produce, ignorance of prices in other markets and imperfect knowledge of price in home markets, meager wholesale market facilities and frequent congestion, risk of intervention by state trading organizations, and general mistrust and suspicion of traders by the public. Atebubu farmers and traders do a very good job of providing food for the people of Ghana, but it is quite clear that they will do a better job when these obstacles to the free flow of foodstuffs from farmers to consumers are removed or their impact reduced.

Part III

METHODS OF EVALUATION

In designing interventions for this experimental program, formal methods of social benefit-cost analysis are of limited value. A detailed understanding of the marketing system for food crops in Atebubu District and sound intuition based on experience elsewhere in tropical Africa are the basic underpinnings of a good design for a pilot program. However, the effects of the program should be measured quantitatively, so far as possible, using conventional benefit-cost techniques, in order to aid judgement on whether certain interventions should be replicated elsewhere.

Potential interventions can usefully be divided into four evaluatory categories to assist design of the program. The first two categories are characterized by the absence of benefits that cannot be entirely appropriated by private individuals if they were to provide the service. Category 1 pertains to prospective interventions whose costs and benefits can be estimated, however crudely, before the intervention is carried out. In contrast, Category 2 is made up of interventions whose costs can be estimated in advance, but whose benefits can only be known with reasonable assurance--if at all--after the intervention is carried out. Categories 3 and 4 are analogous to the first pair, differing only in that they pertain to interventions whose benefits cannot be completely captured by private individuals. This categorization can be summarized as follows (where the numbers refer to the definitions of categories presented above):

	<u>benefits can be captured</u>	<u>Benefits cannot be captured</u>
Benefits can be estimated in advance	1	3
Benefits cannot be estimated in advance	2	4

The decisions on Category 1 interventions can be taken independently by the design team. If the estimated benefits exceed the likely costs, if budgetary resources and foreign exchange are available, and if the organizational capacity exists, the intervention will be worthwhile although it may not be the best available. All of these conditions must also be met for interventions in Category 2, but then the final design decision is best left to the immediate participants who have more detailed knowledge of the likely benefits and hence a better sense of priorities. When the design team cannot estimate the level and distribution of benefits, it is preferable to turn the decision on implementation over to those who will bear the costs and receive the benefits. Decisions on interventions in Categories 3 and 4 will be analogous to those in the first two categories depending on whether or not the benefits can be estimated in advance.

Formal methods of benefit-cost analysis to be employed here include the following procedures. We first calculate private profitability (or changes in private profitability) resulting from the intervention, using costs and prices that actually prevail in the markets. This analysis of private profitability shows how farmers and traders perceive the effects of an intervention.

We then make two kinds of adjustments to convert costs and returns expressed in market prices into their counterparts in social prices, to permit comparison of private profitability with social profitability. First, the effects of taxes and subsidies are removed through use of c.i.f. import or f.o.b. export prices as reference points. For example, commodities like rice are evaluated in terms of what the country can receive for its exports of rice (the f.o.b. export price) instead of the actual market price. Similarly, an import like fertilizer is valued at its c.i.f. import price rather than at a subsidized (or taxed) market price.

Second, adjustments are made to correct for distortions in factor markets and in the exchange rate between Ghanaian and foreign currencies. In the calculation of social profitability, factors are valued at their social opportunity costs, or the amount of income foregone by not using them in their best alternative employment. For example, the government might lend to traders at an interest rate of 12 percent when it could have invested the capital in a development project that would yield a return of 15 percent. In this instance, the social price of capital would be 15 percent not the 12 percent actually paid by the trader.

Having made these two kinds of adjustments, we can compare social benefits with social costs and determine whether social profitability is positive. This analysis of social profitability will show whether the intervention is likely to result in increases in income for the national economy.

INTERVENTIONS EXAMINED IN THE INTERIM REPORT

Since submitting our Interim Report in July 1977, we have carefully reviewed all of our preliminary proposed interventions, and we have searched for additional ones. We have found no additional interventions that we want to include in the program. And our reexamination of earlier suggestions has resulted in a somewhat reduced program. In this section, we review the program of interventions contained in our Interim Report and explain why additional evidence has caused us to recommend inclusion of most of the interventions on the original list. We successively discuss three types of interventions, dealing with credit, market facilities, and transportation. Each type of intervention is intended to relieve a constraint on the marketing system for food crops in Atebubu District.

Expansion of Credit to Resident Wholesalers

It would be useful, on an experimental basis, to increase the supply of credit available to the resident wholesalers in the District in order to analyze the impact of their uses of this expanded credit on the marketing system. This idea has been a central focus of the Bank of Ghana's pilot program from the outset.

Commercial credit to traders in the District has already been expanded in the last two years by the rapid increase of lending by the ADs. Both group loans and individual loans have been small, and evidence points to a significant demand for additional loans. It is, of course, not surprising that potential borrowers desire more funds if they can borrow at rates of interest in the 8 to 12.5 percent range in the face of rates of inflation that are several times larger.

Present employment of traders' funds does not necessarily give a good indication of what the wholesale traders would do with additional funds if they had wider access to credit. Interviews are a notoriously unreliable way to guessing on this issue. The only good solution is to pump the expanded credit into the system and closely monitor the effects. For this purpose we recommend use of short-term (one year) loans to private wholesale traders and traders' associations in order to expand their operating funds.

Because benefits can only be estimated after this intervention is made (Category 2), the expansion of credit cannot be justified by quantitative benefit-cost analysis. Its pilot nature, however, is a sufficient justification for moving forward with it. The principal purpose of this experimental program is to analyze its impact and to determine thereby whether it should be replicated elsewhere in Ghana.

The design and administration of this expansion of credit are relatively uncomplicated. The ADS branch office in Atebubu (and new Rural Banks if they are established in the District) would make loans to resident wholesale traders, using incremental funds provided by the Bank of Ghana. These new loans would be backed by a loan guarantee fund provided to the Bank by AID. Determination of eligibility to borrow would be the responsibility of the ADS manager in Atebubu who would be subject to size limits on his loan-granting authority.

Program costs are readily identifiable and would include the administrative charges for processing loans and bad debts if any traders defaulted on their repayment obligations. (The ADS branch in Atebubu has to date experienced no defaults on traders' loans.)

Measurement of the benefits from the program is, however, more elusive. One expectation is that benefits will accrue to farmers, as economies of scale lead to lower marketing costs, especially for transportation, and to large volumes of marketing. It is also likely that traders' loans to farmers would provide greater certainty of a market and thereby increase the output of products in short supply. (This has been the experience elsewhere.) Since Atebubu District is a price taker for all commodities, it is not likely that consumers in the terminal markets would benefit much from such reductions in cost. Merchants might reap some of the gains from lower true costs of marketing, but to the extent that the expanded credit would increase further the competitiveness of an already highly competitive marketing system the gains from reduced marketing costs would be passed on to farmers. Increases in marketed output, of course, would benefit consumers as well as farmers and traders.

Because the level and distribution of benefits are uncertain, we recommend that this intervention be limited in the first year of the program to a total of £200,000 of new credit. This expansion of credit would approximately double the recent level of ADB lending to food-crop traders. We further recommend an additional increment of £200,000 of annual lending divided evenly among the second, third, and fourth years of the project. In spite of the faultless repayment record by traders in the District, it is prudent to establish a loan guarantee fund to provide for the possibility of future defaults under the program. We suggest that £80,000, 20 percent of incremental lending, be provided by the MIDAS project to set up the loan guarantee fund. Additional ADB expenses associated with this credit expansion are estimated at £16,500 (personnel, £12,000; overhead, £3,000; and contingencies, £1,500) for each of the four years of the project. Total costs of this intervention therefore amount to £146,000.

Improvements in Wholesale Market Facilities

The lack of appropriate facilities in the principal markets in Atebuba District provides a second set of constraints on the marketing of food crops in the District. We concentrate our efforts on the wholesale markets for food crops, Atebuba and Anantim.

We recommend interventions to expand or repair market facilities because such improvements should result in lower real costs of marketing and in larger volumes of produce moving through wholesale markets. Two obvious questions arise: (1) What kinds of improvements might be made? (2) Who should order the priorities among the various possible interventions? The answer to the first of these questions is quite straightforward. But a response to the second is difficult because it is enmeshed with the problem of sorting out the likely distribution

of benefits. Because this type of intervention belongs to Category 2, benefit-cost analysis in advance is precluded.

A wide range of interventions to improve market facilities and services can be considered:

service station, spare parts depot, and motor repair shop (see the following section);

public warehouses in which farmers and traders can store their produce safely and in which stored produce can be pledged as collateral for bank loans;

loading docks, handling facilities, and lorry park;

banking facilities;

covered stalls with locked stores;

market hygiene including insect control, drainage, and supplies of fresh water;

information about conditions of roads and availability of produce in the market's supply area;

telegraphic and telephone services;

packaging materials (bags, boxes, twine, wire);

a canteen where traders and transporters can meet and conduct business;

overnight accommodations for traders and transporters;

containers (boxes, flats, crates) that would facilitate loading and unloading and reduce damage;

a forklift truck to load lorries and move crops during the busy season; and

market broadcast of information about prices and supplies each market day. Any of these services could improve marketing efficiency. The problem is to decide which ones would be most beneficial when budgetary or managerial constraints preclude all from being done concurrently.

In our opinion, the people best qualified to decide whether or when any of the listed improvements (except one, the service station, to be discussed below) should be carried out are the traders themselves. While other interested parties--national and local government officials, foreign aid donors, and economic consultants--can identify the costs of these interventions, they cannot make very good guesses about the benefits that might follow. We therefore recommend that Market councils be established in Atebubu and Anantim, first, to decide on improvements and, second, to oversee the orderly conduct of market activities. Each Council would be made up of resident wholesale traders and based on existing traders' associations.

With respect to market conduct, each Council would be held responsible for the ethical and orderly behavior of its members in much the same manner as that of the existing traders' associations. In particular, it would be charged with assuring that market agents who conduct transactions on behalf of others or who assist in conducting such transactions represent their clients fairly and with full concern for their interests and make their services available to any person who wishes to employ them. Each Council or its representatives would also resolve disputes over terms of contracts, quality of products, and accuracy of measure.

Each Market Council would work out a modus operandi with the District Council regarding the collection of market fees and tolls and the effective level of taxes on marketing activities. The Market Councils would assume responsibility for the maintenance and improvement of market facilities and would thus receive a specified budgetary vote from the District Council for this purpose. For its part the District Council would continue to collect market fees and tolls and to use a major portion of these revenues for purposes not related to market improvement, but it would agree to transfer

a specified amount of funds to the Market Councils and to make decisions on improving market facilities in Atebubu and Amantin jointly with the Market Councils. Loans to the Market Councils would finance the improvements in market facilities and would be amortized by the Market Council's automatic budgetary vote from the District Council.

This intervention might well be more difficult to design and administer than the expansion of credit described above. One highly trained Ghanaian administrator would be hired to work with the Market Councils in Atebubu and in Amantin. This person would help them plan their requests, coordinate these plans with those of the District Council, and provide liaison with officials of the Bank of Ghana, Ministry of Agriculture, and AID. This administrator would therefore need to have skills in both planning and executing projects. Annual project costs associated with administration would total about £15,800 (salary, £7,500; transport, £3,500; secretary, £2,400; supplies and contingencies, £2,400) for each of the four years of the program.

We recommend that a grant of £82,700 be provided by the MIDAS project for the initial improvements in market facilities. Any incremental revenues--both local taxes and association fees--resulting directly from market improvements should be reserved for further improvements. While the decisions on using the grant funds should be made jointly by the Market Councils and the District Council we list below some of the kinds of things that have been under discussion in the District and that might rank high on a list of specific improvements:

1. establishment of a new wholesale market facility for yams in Atebubu, located on the now vacant site of the former cattle market (about £33,000 would be needed for construction of a quarter-mile access road, clearing, levelling, and gravelling of the principal market area, installation of a

water supply, and construction of a modest (20 feet by 30 feet) building to serve as headquarters for the yam traders' association);

2. Improvement of the facilities for wholesale grain traders at the Atebubu market (approximately £25,000 would be required for construction of new storage sheds and for gravelling part of the area currently used by yam wholesalers);

3. Improvements in the Anantia wholesale market (perhaps £26,000 would enable construction of new storage sheds and gravelling of the main access road).

Reduction of the Costs of Transportation

Within the category of interventions in transportation, we have narrowed the scope of recommendations in comparison with those in our Interim Report because new evidence has convinced us that less is needed. We distinguish among vehicles, roads and tracks, and water transport in successive parts of this section, and we focus on the movement of commodities from farms to District wholesale markets.

There is some debate whether the farm-to-market difficulties are more the result of inadequate roads and tracks or of a shortage of vehicles for haulage. There is a trade-off in land transport between spending scarce resources on better roads or on more vehicles. We emphasize the latter because the former is the province of other donor-assisted efforts. While our suggested interventions are concerned only with vehicles, we feel it appropriate for the government of Ghana to undertake complementary interventions in both of these areas. The likely results of attempts to improve water transportation within the District are more speculative, but we feel the idea deserves serious attention.

Vehicles.--Tractors and trucks play predominant roles in the marketing of food crops in Atebubu District. Tractors with carts haul most produce from farm to markets. Indeed, only tractors are used typically to ply the tracks, and hence most crops which are not located near motorable roads are hauled by tractors.

Recent evidence suggests that the supply of useable vehicles--tractors, trucks, and boats--in the District remains a problem in large part because of the scarcity of spare parts and mechanics' services. (See pp. 11-14 above.) To increase the availability of equipment for hauling food crops, we recommend establishment of one of the market facilities listed above, a service center for tractors and boat motors. In the future the center might be extended to service small trucks. To expand haulage in the private sector, the pilot project could provide access to spare parts for existing and new equipment and to competent mechanics' services. These facilities could be made available at market prices to farmers and farmers' groups, existing tractor (and boat) owners, traders, and other interested parties. While current and new tractor owners should be encouraged to hire out their tractors for use in activities of highest productivity, whether in agricultural marketing or production, it is likely that most tractor hours would continue to be devoted to haulage. Organizationally, the dispensing of the spare parts and mechanics' services would be carried out by setting up a new service center in Atebubu managed by a private Ghanaian mechanic who would lease the facility from the MIDAs project.

The total project costs of the service center are estimated at £39,650 in private market prices. These costs include: building, £25,000; equipment, £10,000; spare parts, £40,500; mechanic's salary, £6,000; and

contingencies, £8,100. With respect to the project budget, all of these costs occur only in the first year. Thereafter, the revenues (and foreign exchange savings) generated by the project will be sufficient to offset costs. The original project funds, recouped after all capital items are fully depreciated, could be used to expand equipment and spare parts inventory of the service center, to carry out other market improvements, or to replicate the intervention in another district.

Since this intervention falls into Category 1, we can carry out benefit-cost analysis in this report. (Details of the benefit-cost analysis of the service center are presented in Appendix 2 and underlying assumptions are spelled out in the footnotes to Table 2-1. The project is assumed to have a five-year life, and all costs and benefits are estimated on an annualized basis. For example, the costs of the building and equipment, which are capital items, are spread over five years through use of a five-year, 15 percent capital recovery factor. Total annualized costs are £62,634 in private market prices.

The benefits expected from the service center can be approximated by estimating the reduced costs of transportation that should result from the longer life of tractors receiving regular mechanics' services and spare parts. If 30 tractors worth £15,000 each (a minimum cost for new tractors) were to receive regular maintenance which resulted in an extension of their average service lives from a total of three years to a total of five years, the reduced transportation costs and hence the benefits of the intervention would be £62,850 (£2,095 per tractor times 30 tractors) per annum, measured in prevailing market prices.

When annualized benefits of £62,850 are compared with annualized costs of £62,634, private profitability (at private market prices) is only £216 per year, and the present value of this £216 per year for five years discounted at 15 percent is a modest £724. On this accounting, the project appears to be very marginal, approximately breaking even on the basis of costs and returns actually prevailing in Atebubu. When benefits and costs are adjusted for taxes and subsidies and for the shadow price of foreign exchange, however, social profitability on an annual basis becomes £74,259, and the five-year stream of returns has a present value, discounted at 15 percent, of £248,928. On the basis of social accounting, therefore, the project is extremely profitable. Since the marketing system is highly competitive, in large part these benefits can be expected to be passed on to producers of commodities being hauled.

Roads and Tracks.--Information on the length and location of the main roads in Atebubu District is contained in Table 2 (p. 9a). Although roads are not in the province of this program, we suggest the following order of priorities for action on roads to complement the interventions we are recommending.

Top priority should be placed on the completion of new feeder roads that are currently under construction in the district. At the present time four projects, totalling 70 miles, are underway, but all are facing difficulties and experiencing delays. As noted above (p. 10), there is a critical need to complete these partially finished roads.

Second priority should be given to the maintenance of the 271 miles of roads listed in Table 2. The level of maintenance of the main roads in Atebubu District can be expected to improve if the Ghana Highway Authority extends its activities to include all roads listed in Table 2 under projects

assisted by the World Bank and the Canadian aid program. However, other lesser roads and tracks receive little or no routine maintenance. It is unclear whether the GHA, the District Council, or local communities should have future responsibility for maintaining tracks in the District.

Third and lowest priority should be accorded to the construction of new feeder roads. It does not seem sensible to begin any new road projects until the existing projects have been completed. We have not found any evidence that strongly supports the construction of new feeder roads in Atebubu District.

Water Transport.--The creation of the Volta Lake has interrupted north-south traffic through Atebubu District and thereby threatened the importance of the markets at Atebubu, Anantim, and Yeji and the services available in them. The lake also has created opportunities for improved marketing of food crops in the parts of the District that border the lake and the potential for long distance movement of commodities.

Lake transport of food crops within the District can be thought of as a part of the farm-to-market transportation link. A considerable amount of fish and food crops is already brought to Yeji by motorized boats that follow regular routes. As a first step in a pilot program to expand water transport facilities, we recommend that the service center in Atebubu provide spare parts and mechanical repair services for the approximately 50 Mercury boat motors currently in use in the District on the Volta Lake.

MONITORING AND EVALUATION

One purpose of the proposed interventions is to permit analysis of their impact and to determine whether they should be replicated elsewhere in Ghana. The monitoring and evaluation program should be designed to assist in undertaking such analysis.

Monitoring will begin at the onset of the program. It is anticipated that a Ghanaian university department, firm, or government agency will handle the monitoring program. The monitoring team will be resident in the Atebubu District during the project.

A total of \$161,000 has been budgeted for monitoring and evaluation (see Table 29, p. 68a for details). The monitoring group will collect the data necessary for evaluating the interventions. They will interpret the data along with a team of marketing experts who will be responsible for the evaluation. These experts will visit the District once annually during the life of the project. The evaluators will review the extent to which the program is achieving its objectives and suggest modifications. The evaluation team should be selected early so that it can assist in the design and implementation of the monitoring program.

Monitoring of the service center will be the least complicated task. The objective of the service center is to extend the service life of tractors operating in the District. Since the service center falls in Category 1, benefit-cost analysis has already been undertaken. Evaluation entails comparing the center's actual performance with the assumptions used in the benefit-cost analysis. On the cost side the monitoring team should scrutinize the service center's records to determine the type of services dispensed, revenue generated, and costs of operation. On the benefit side the team will need to collect information on the impact of the service center on vehicle life. Among other things this will involve collecting data that will give some notion of the level of maintenance achieved in the District. An easy measure of this may be recording the sales of lubricating oil.

Effects of the service center on downtime of tractors can be determined through annual surveys of tractor owners in the District. In addition, such surveys could determine the current life of the fleet and changes in the

age of the fleet. Continued recording of the transport rates will also be necessary.

For the credit intervention, the monitoring team should focus on how traders use additional credit. They should also consider administration of the credit program which involves working closely with ADB personnel. Funds for three additional ADB loan officers have been included in the budget to help handle the extra record-keeping required by the monitoring program.

Traders will use credit in one of several different ways including expanding the volume of purchases, investing in transport, investing in storage facilities, holding stocks, lending to farmers, or using the funds for purposes not related to marketing. Information on the proportion of new credit going to each of these uses is required. If traders use the credit for holding stocks, information on amounts held, length of storage, and cost incurred would be beneficial. Also, any credit flowing through traders to farmers should be examined. Besides data on the proportion going to farmers, information is needed on how the farmers use the additional credit. To ensure that traders cooperate in the data collection loan agreements will have to stipulate that traders must provide information on the use of the loans to the monitoring team.

Design of monitoring program for the interventions to improve market facilities will, of course, have to await formation of the Market Councils and the Councils' decisions on how to use the grants made available under the program. The monitoring team should maintain close communication with the evaluation team so that the monitoring program can be designed and implemented quickly when decisions on the specific form of these interventions are made.

An underlying assumption concerning the market improvement grants is that wherever possible fees will be charged to users of improved facilities. One monitoring activity would be to measure the rates and amounts of fees collected. Other indices of use of the facilities will also have to be identified and measured. For instance, changes in volumes marketed might be monitored by continuing the commodity flow analysis. Changes in market attendance and commodity flows through the improved market facilities might also be measured through periodic market surveys. Turn-around time (loading, unloading, market storage, or waiting for transport) is also likely to be affected by market improvements and attempts should be made to measure these effects.

The information required from the monitoring team will build on data already collected by the design team. Collection of checkpoint data on commodities leaving the District and market prices in Amantin and Atebubu should continue. Additional surveys of transport owners, traders, and farmers will have to be undertaken. Ideally these surveys should be designed by both the monitoring and evaluation teams. Data will also be required from service center records, the ADB, and the project administrator. It is crucial that the monitoring team work closely with all three organizations. A partial list of the types of questions that will need to be answered for the evaluation and of the types of information required to answer these questions is presented in Table 28. The list has been completed only for the service center and credit interventions.

**Table 28.--A Partial List of Questions That Will Arise
in Evaluating the Program and the Types of Information
Required for Their Answer**

Question	Required Information
<u>Service center</u>	
What are service center operating costs?	Types of repairs undertaken; types and values of spare parts; number of tractors serviced; labor, depreciation, and other costs.
What are service center investment costs?	Actual expenditures on building, equipment, and spare parts inventory.
What are the benefits of the service center (in terms of increased vehicle life)?	Records of fleet; size, current life, and changes in fleet age; records of service life, including down-time for repairs, type of repairs and maintenance undertaken and owner evaluation of service center performance for each tractor receiving regular service from the center; records of down-time for all tractors in the district; changes in transport charges.
<u>Expansion of credit</u>	
How is the program administered?	Total amount loaned under program; number of loans; size of loans.
What are the background characteristics of borrowers?	Rates of repayments and reasons for default; ethnic groups; commodities handled; volume handled; sources of supply; sources of outlet; uses of working capital.
How did the borrower use the additional credit?	Proportion used: in investment in transport; in investment in storage facilities; to increase volume handled; to hold stocks; to lend to farmers; to increase number of agents; for uses other than marketing of agricultural commodities.
What were some of the effects on traders of the additional credit?	Changes in volume handled by traders receiving loans; changes in supply sources or outlets; changes in uses of working capital (particularly for loans to farmers or holding stocks).

SUMMARY OF THE PROPOSED PROGRAM
OF INTERVENTIONS

Table 29 contains a summary of the interventions we have proposed, classified by evaluatory category. The only interventions that would come under Category 1 deal with transportation, the expansion of service facilities for tractors and boat motors. Category 2 applies to the improvement of market facilities through new Market Councils and the expansion of loans to wholesale traders. In neither of these actions would it be sensible to attempt to estimate benefits or to establish priorities. Instead, both experimental interventions should be closely monitored to permit analysis of their effects. No recommended interventions belong to Category 3 or 4, and therefore these two categories are not shown in the table. If roads or tracks--interventions involving government investment in transport infrastructure--had been included in the program, they would have fallen into Category 4. The effects of projects in these areas would not be known with reasonable accuracy in advance and so their analysis is akin to that of the second category.

We feel that the objectives of the project, as originally established by the Bank of Ghana, the Ministry of Agriculture, and AID, can be largely served by the realization of the proposed interventions. The interventions can be expected to reduce the real costs of marketing by lessening the time and effort that traders need to spend in assembling and selling produce, increasing farmers' assurance of the existence of buyers at remunerative prices, and reducing the farm-to-market costs of transportation. Lower marketing costs in turn should result in higher returns to farmers and larger volumes of marketings. Bargaining parity in the market would be brought about by the services of ethical brokers.

Table 29.--Summary Table of Proposed Interventions,
Classified by Evaluatory Category

Proposed Intervention / Evaluatory category	Category 1 (costs and benefits estimable <u>ex ante</u>)	Category 2 (costs estimable <u>ex ante</u> ; benefits estimable <u>ex post</u>)
I. Credit (expansion of loans to resident wholesale traders)		X
II. Market Facilities (creation of Market Councils, provision of grant and of revenue base)		X
III. Transportation (expansion of service facilities for tractors and boat motors)	X	

The kinds of changes needed to reduce marketing costs and to relieve small farmers from any bargaining disadvantage require specialized and immediate knowledge of agricultural marketing and transport. It would be difficult for an already overburdened district administration to undertake these tasks, and technical requirements make these tasks ill suited for administration by town councils. But if the other new activities are to be undertaken by non-governmental specialists, incentives must be provided. The incentive for the Market Councils to assume these added responsibilities would be the possibility of increasing the volume of trade passing through the District's wholesale markets by making them more attractive to commodity traders. The order in which these facilities would be provided should be left to those most concerned with their use.

Anticipated costs for the entire program of interventions are presented in Table 30 and Appendix J. The costs of the interventions, which have been discussed in detail in the previous sections, amount to about £382,000 or \$332,000. The total budget, including monitoring and evaluation, is £543,000 or \$472,000.

SUMMARY OF PROJECT DESIGN

We recommend a 4-year program of interventions, costing £543,000 (\$472,000), which deals with credit, market facilities, and transportation. Each intervention is intended to relieve a constraint on the marketing system for food crops in Atebubu District. The entire program is experimental and should be evaluated carefully to determine whether parts of it should be replicated elsewhere.

The annual supply of credit available to resident wholesale traders in the District should be increased by £400,000. The main purpose of this expansion is to analyze the impact of traders' uses of additional credit on the marketing system. Total costs of this intervention are estimated at £146,000.

Table 39.--Project Budget
(credits or as indicated)

	Year one	Year two	Year three	Year four	Total costs
Credit expansion	56,500	29,834	29,833	29,833	146,000
Additional ADB expenses	16,500	16,500	16,500	16,500	66,000
Loan guarantee fund ^a	40,000	13,334	13,333	13,333	80,000
Market improvements	98,560	15,840	15,840	15,840	146,080
Facilities	82,720				82,720
Administration	15,840	15,840	15,840	15,840	63,360
Service center ^b	89,650				89,650
Total intervention budget	244,710	45,674	45,673	45,673	381,730
Monitoring:	11,500	11,500	11,500	11,500	46,000
Evaluation	28,750	28,750	28,750	28,750	115,000
Total project budget	284,960	85,924	85,923	85,923	542,730
Total U.S. dollar commitment	\$247,791	\$74,716	\$74,716	\$74,716	\$471,939

^aAssumes loan expansion of £200,000 in the first year, and an additional expansion of £200,000 in the next three years of the project at a rate of £66,667 a year. Guarantee fund is set at 20 percent of projected loan totals.

^bProject charged with service center development costs and first year's operating expenses. Subsequent years operating expense will be paid out of revenue generated by service center operations.

Market Councils should be established in Atebubu and Amantin to decide jointly with the District Council on improvements in wholesale market facilities and to oversee the orderly conduct of market activities. A grant of £82,700 should be made available for improvements in market facilities, including annual administration costs of £15,600, total costs of this intervention amount to £145,900.

A service center for tractors and boat motors should be established in Atebubu to provide access to spare parts and to competent mechanics' services. Total project costs of the center are estimated at almost £90,000. The results of benefit-cost analysis show that this intervention has only marginal private profitability but very high social profitability.

An intensive system of monitoring and evaluation is an essential part of this pilot program. We propose continuous on-the-spot monitoring and an annual in-depth evaluation, review, and redesign of the program with a total budget of £161,000.

The interventions can be expected to reduce the real costs of marketing by lessening the time and effort that traders need to spend in assembling and selling produce, increasing farmers' assurance of the existence of buyers at remunerative prices, and reducing the farm-to-market costs of transportation. Lower marketing costs in turn should result in higher returns to farmers and larger volumes of marketings.

APPENDIX I

Names and Numbers of Villages in Farm Survey

101	Akokoa	306	Jasipo
102	Yabreso	307	Ntrubuso
103	Abamba	308	Kyeane Akura
104	Kumfia	309	Bungyi
105	Anantia	310	Apaso
106	Lallai	311	Premoase
201	Ehia Ma Nkyene	401	Prang
202	Boanyo	402	Agyeragya
203	Watro	403	Abease
204	New Konkrompe	404	Kokofukrom
205	Atebubu	405	Cherenho
206	Nwowa	406	Prambo
207	Ajona	407	Kajai
208	Fiano	408	Kachawura
209	Bakyaso	409	Yeji
210	Trothe	410	Kapua
		411	Nyakrom Nkwanta
301	Bantama		
302	Strafo Zongo		
303	Kwame Danso		
304	Akyeremede		
305	Dankurum		

APPENDIX 2

Benefit-Cost Analysis of the Service Center

Table 2-1 contains the details of private and social benefit-cost analyses for the proposed service center. Assumptions underlying the calculation are presented in footnotes to the table.

The calculation of private profitability is discussed in part III of the main text (pp. 60-62). On an annualized basis, private costs are £62,634, private benefits, £62,050, and thus private profitability is £216, resulting in a present value of £724 for a 5-year stream discounted at 15 percent.

As noted in the opening section of part III (pp. 51-52), two kinds of adjustments are required to convert private costs and benefits into their social analogues. The first adjustment takes into account transfers to or from the government (taxes or subsidies). Because such transfers do not involve the use of scarce resources, they should not be included in the calculation of social costs. Total annualized taxes are £18,515, and their exclusion reduces annualized total costs to £44,119. Adjusted private profitability, still measured at private market prices but now excluding taxes, increases by the amount of the taxes to £18,731 per year. The present value of this level of adjusted private profits, discounted at 15 percent over 5 years is £62,789. On the basis of this analysis, the service center is highly profitable. In effect, exclusion of the nearly 30 percent of costs in private terms which are actually transfers to government results in a marked increase in profitability of the project.

The second kind of adjustment is concerned with the appropriate evaluation of scarce domestic resources--labor, capital, and land--and of foreign exchange. For purposes of simplification, we will not make any adjustments for possible imperfections in the labor and capital markets. Primary factor costs are

Table 2-1.--Benefit-Cost Analysis of Service Center

(cedis)

	Tradable costs	Nontradable labor costs	Nontradable capital costs	Taxes	Total	Annualized benefits ^a	Annualized profits	Discounted present value of profits ^b
Annualized costs (at private market prices)								
Building ^d	1,499	1,932	2,073	1,954	7,458			
Equipment	2,008	136	136	703	2,983			
Spare parts ^e	22,275	2,025	2,025	14,175	40,500			
Mechanic		6,000			6,000			
Contingency	2,578	1,009	423	1,683	5,693			
Total	28,360	11,102	4,657	18,515	62,634			
Private profitability (at private market prices)	28,360	11,102	4,657	18,515	62,634	62,850	216	724
Adjusted private profitability (at private market prices adjusted for taxes and subsidies)	28,360	11,102	4,657	--	44,119	62,850	18,731	62,789
Social profitability (tradable costs and benefits evaluated at the shadow price of foreign exchange) ^f	74,020 ^g	11,102	4,657	--	89,779	164,038 ^h	74,259	248,928

^aThe annualized benefits are derived by assuming: (1) Without the project the annual value of tractor services equals the return from the services and there are no quasi-rents; (2) as a result of the project, use of tractor repair services will increase tractor life from a total of three years to a total of five years; (3) With the project the tractor owners use repair services throughout the lifetime of the tractor; (4) Because the project allows the expansion of tractor life, quasi-rents are generated and equal the willingness of tractor owners to pay for repair services; (5) 30 tractors will be serviced under the project and thereby have their working lives extended for 2 years each. To calculate annualized benefits the difference between the 3-year, 15 percent capital recovery factor and the 5-year, 15 percent capital recovery factor is multiplied by the value of a new tractor, ₡15,000. This per unit figure is then multiplied by 30 to find total annualized benefits:

Table 2-1 (continued)

[3-year, 15 percent c.r.f. - 5-year, 15 percent c.r.f.] x value of new tractor = per unit annualized benefits

[0.437977 - 0.298316] 15,000 = 2,095

2,095 x 30 tractors = €62,850, total annualized benefits

^b Discounted present value over 5-year life of project is calculated at 15 percent discount rate.

^c Building cost of £25,000 is annualized using a capital recovery factor calculated at 15 percent for 5 years. Costs were broken into tradable, nontradable labor and capital, and taxes using figures from work done by John Page ("Development Policy and Economic Performances in Some Ghanaian Export Industries: An Analysis of Firm Level Data from Ghana's Timber and Wood Product Sector," unpublished Ph.D. dissertation, Nuffield College, Oxford, 1975). The breakdown is 0.201 tradable, 0.537 nontradable, and 0.262 taxes. Page's figures are also used to break down nontradable costs further into labor (0.259) and domestic capital (0.278).

^d Costs are based on estimated equipment requirements. Taxes are estimated at 35 percent of c.i.f. price. Handling and transportation are estimated at 10 percent of c.i.f. plus tax price and divided equally between nontradable labor and capital. Costs are annualized using the same capital recovery factor and estimated life as for the building.

^e Breakdown is 55 percent tradable, 35 percent tax, and 10 percent transportation and handling which is divided equally between nontradable labor and capital.

^f As an approximation of the scarcity value of foreign exchange, a shadow price of 3 has been chosen. This figure was derived by adjusting the shadow price of foreign exchange, 1.60, calculated for 1972 in a World Bank study (S.R. Pearson, G.C. Nelson and J.D. Stryker, "Incentives and Comparative Advantage in Ghanaian Industry and Agriculture," World Bank, 1977, mimeo.). Between 1972 and 1976, differential rates of inflation for local goods (over 180 percent) and imported goods (about 60 percent) have led to changes in the scarcity value of foreign exchange. These differential rates have been used in adjusting the 1972 shadow price to arrive at the present figure.

^g Tradable costs (28,360) are multiplied by the ratio of the shadow price of foreign exchange to the official exchange rate, 2.61.

^h Total annualized benefits are multiplied by the ratio of the shadow price of foreign exchange to the official exchange rate, 2.61.

less than 25 percent of total annualized costs in this analysis. Social profitability will be understated to the extent that the market wages overstate the opportunity costs of labor. The direction of bias imparted by ignoring imperfections in the capital market is unknown since the shadow price of capital could either exceed or be less than the market rate of interest. But this bias is likely to be small since nontradable capital costs are less than 8 percent of total annualized costs.

The calculation of social profitability, however, clearly requires an adjustment to reflect better the scarcity value of foreign exchange. We have somewhat arbitrarily selected a value of £3.00/\$1.00 to approximate the shadow price of foreign exchange; some justification for this choice, which is probably conservative, is given in footnote 4 to Table 2-1. (Whether this estimate is too high or too low will have an important effect on the level of social profitability, but, as shown in the previous paragraph, the project is highly profitable even at the official exchange rate.) The benefits of the project, which save foreign exchange because the need to import new tractors is delayed, and the tradable costs are both multiplied by 2.61 ($3.00 \div 1.15$, the ratio of the shadow price of foreign exchange to the official exchange rate) in an attempt to reflect the opportunity cost of foreign exchange to the economy. Because the benefits greatly exceed the tradable costs, profitability is significantly enhanced by this adjustment. The annualized amount of social profits is £74,259, and the present value of this amount discounted at 15 percent over 5 years is £248,948.

APPENDIX 1

Project Budget
(credits or as indicated)

	Year one	Year two	Year three	Year four	Total costs
Credit expansion	56,500	29,834	29,833	29,833	146,000
Additional ADB expenses	16,500	16,500	16,500	16,500	66,000
Personnel ^d	12,000	12,000	12,000	12,000	48,000
Overhead	3,000	3,000	3,000	3,000	12,000
Contingency	1,500	1,500	1,500	1,500	6,000
Loan guarantee fund ^b	40,000	13,334	13,333	13,333	80,000
Market Improvements	98,560	15,840	15,840	15,840	146,080
Facilities	82,720				82,720
Administration	15,840	15,840	15,840	15,840	63,360
Salary	7,500	7,500	7,500	7,500	30,000
Transport	3,500	3,500	3,500	3,500	14,000
Secretary	2,400	2,400	2,400	2,400	9,600
Supplies	1,000	1,000	1,000	1,000	4,000
Contingency	1,440	1,440	1,440	1,440	5,760
Service center ^c	89,650				89,650
building ^d	25,000				25,000
Equipment ^e	10,000				10,000
Spare parts ^f	40,500				40,500
Mechanics	6,000				6,000
Contingency	8,150				8,150
Total intervention budget	244,710	45,674	45,673	45,673	381,730
Monitoring:	11,500	11,500	11,500	11,500	46,000
Supervisor	2,400	2,400	2,400	2,400	9,600
Monitor	4,200	4,200	4,200	4,200	16,800
Overhead	1,150	1,150	1,150	1,150	4,600
Survey expenses	2,600	2,600	2,600	2,600	10,400
Contingency	1,150	1,150	1,150	1,150	4,600
Evaluation	28,750	28,750	28,750	28,750	115,000
Salary and per di-	21,850	21,850	21,850	21,850	87,400
International and local travel	5,750	5,750	5,750	5,750	23,000
Computation and secretarial expenses	1,150	1,150	1,150	1,150	4,600
Total project budget	284,960	85,924	85,923	85,923	542,730
Total U.S. dollar commitment	\$247,391	\$74,716	\$74,716	\$74,716	\$471,939

Appendix 3 (continued)

^aThree additional farm officers at £4,000 per annum.

^bAssumes loan expansion of £200,000 in the first year, and an additional expansion of £200,000 in the next three years of the project at a rate of £66,667 a year. Guaranteed fund is set at 20 percent of projected loan totals.

^cProject started with service center development costs and first year's operating expenses. Subsequent years operating expense will be paid out of revenue generated by service center operations.

^dService center building is a 30 foot by 60 foot building to accommodate three stalls for repairing vehicles.

^eBasic tools and machinery required for maintenance program.

^fNine percent of the value of 30 new tractors at £15,000 each.

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