FOOD SECURITY AND GRAIN TRADE IN GHANA

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ABBREVIATIONS

FAO	Food and Agriculture Organization of the United Nations
GFDC	Ghana Food Distribution Corporation
GLSS	Ghana Living Standards Survey
GWC	Ghana Warehousing Corporation
IFAD	International Fund for Agricultural Development
PPMED	Policy Planning, Monitoring, and Evaluation Department (Ministry of Agriculture)

FOREWORD

This is the fifth in a series of reports on food security and nutrition in Ghana. It adds to the information in Working Papers 1, 10, 26, and 27 on Ghana by providing insight into the causes of price variability, with particular attention to seasonality. In regard to the central issues of the degree and determinants of the large and variable patterns of seasonal price increases, no evidence of uncompetitive markets was found. Instead, it appears that factors such as information asymmetries and risk, along with the limitation of physical infrastructure, contribute not only to high costs of transport and handling, but to instability in the patterns of seasonal price increases.

These findings and those in the companion documents have important implications for the scope of economic reforms in improving food security and nutrition, as well as for identifying the appropriate roles of government intervention in increasing the efficiency of markets. For example, this study shows that most storage is undertaken by farmers. This finding raises some important issues about the efficacy of the state involving itself in building and operating storage facilities. Conversely, the level of uncertainty and risk that traders face suggests that the state would be well advised to consider ways to collect and disseminate information. While these issues need further consideration, the analysis presented in this paper provides a considerable amount of information that is useful to policymakers.

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1. INTRODUCTION

The concept of political economy is never closer to an internal contradiction than when the effects of private trade on consumer welfare are being discussed. In the popular (hence political) view, traders, particularly middlemen, destabilize markets and exploit producers. On the other hand, economists, viewing markets as a sine qua non of their profession, generally see trade as providing a service to producers and consumers alike. Even among economists, however, few nonacademics know of, much less adhere to, Adam Smith's arguments in favor of hoarding or David Ricardo's defense of usury.

In Ghana, at various times, populist reaction to profiteering has led to attempts to fix prices and to regulate traders extensively (Kraus 1988). Frustration at the ineffectiveness of such regulation has led, on the one hand, to such acts as the razing of the Makola market in Accra and, on the other hand, to recent market liberalization. Ironically, the earlier periods of regulation make taking the middle ground comparatively difficult — that is, to assess objectively which aspects of Ghana's markets function smoothly and which do not — because relatively little data on market activities are available. Moreover, given the reluctance of traders the world over to reveal information to potential regulators, such information is often hard to acquire.

This paper contributes to that modest data base by discussing the results of a survey of 102 traders undertaken by a Cornell-Fudtech team between March and June 1990 in two regions of Ghana. One of these, Brong-Ahafo, is a grain-exporting region while the other, the Upper East, is, by a variety of measures, the most food-insecure region in the country. This study complements a study of market prices (Alderman and Shively 1991) and parallels an analysis of household food security in these two regions (Alderman 1992).[1] Because the survey was undertaken at a single point in time and with a small sample size, this paper places its observations in the context of other studies of marketing in Ghana and neighboring countries.

In the absence of a complete listing of traders analogous to census tracts used in sampling, it is difficult to conduct a random draw of traders. Moreover, the mobility of their profession and their reluctance to reveal trade secrets combine to bias results, especially from a small survey such as is discussed below. All these factors make this paper different from the other components in the food security study. The data presented here, as well as the review of other

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[1] Collectively these three studies provide the background for a storage modeling exercise (Sarris forthcoming), although the individual studies are also intended to discuss issues separate from price stabilization policies.

knowledge than to find definitive answers. Lest that be considered too modest an objective, it should be recognized that much of what we know about grain trade in Ghana we know from anecdote and case studies. A reappraisal of such knowledge is a prologue to further insights.

A researcher approaches most analysis with both a theoretical background and a set of stylized facts. Although these are useful starting points — it would be tedious to begin anew — some open-minded challenge is often productive. To amplify, it is generally agreed that large spatial and seasonal price margins characterize African grain and produce markets (Ahmed and Rustagi 1987). Both annual and seasonal patterns are variable, with peak and trough prices differing greatly over a period of years (Sahn and Delgado 1989). Some of the high costs reflect poor transportation networks as well as high storage losses. Additionally, traders are generally believed to have monopsony power in selected markets and to benefit from a tendency of farmers to sell grain in the immediate postharvest season and buy grain in the lean months (Ellsworth and Shapiro 1989). All of these points are valid for Ghana, at least in part; however, many are also oversimplifications, with potential misleading policy implications, which are discussed below.

The magnitude and variability of price margins in Ghana are indisputable. It is less clear what implications such variability has for household welfare and for policy. For example, different polices are called for if the main consequence of price variability on rural households is the uncertainty of the value of their marketed output than if the main consequence is the impact on consuming rural households. Further, if prices reflect production shocks that in turn influence rural incomes, policies to increase food availability need to be augmented with policies to stabilize incomes (Alderman 1992). Similarly, the impacts of market interventions by the government, if any, revolve in part on an understanding of how government policies change the marketing decisions of thousands of private agents (farmers and merchants).[2] Hence, this study focuses on the role of private trade in seasonal storage and its contribution to price formation.

2 This is illustrated in Sarris (forthcoming).

2. TRADE PATTERNS: FROM WHOM, TO WHOM, AND WHEN

There is little reason to doubt that urban consumers purchase food regularly throughout the year, relying little on home storage. There is also a fair amount of evidence that rural households in Ghana, particularly in the coastal regions, rely on markets in addition to their own production for their food supply. For example, using Ghana Living Standards Survey (GLSS) data from 1987-1988, Alderman (1992) indicates that two-thirds of rural households buy some form of maize products in any given month. By far, the majority of this is prepared products such as banku and kenkey; relatively few households buy maize grain. In the months before the harvest, however, up to a third of rural households who produced some maize in the previous year will purchase maize grain. Similar percentages are observed for rice, millet, and sorghum producers.

This brings up a key question: Who stores the grain that is sold in the later months of the cropping year? Although the Ghana Food Distribution Corporation (GFDC) and the Ghana Warehousing Corporation (GWC) serve some of the needs of the government's own demand for storage (for institutions and the military), they have not yet been able to provide storage to meet private demand. As indicated in Table 1, these two corporations have purchased, at the most, 20,000 tons of maize in a single year. They have never purchased more than 10,000 tons of rice and do not handle other grains.

Alderman (1992) presents data on the seasonality of sales in Brong-Ahafo and the Upper East region. These data indicate that farmers do not concentrate their sales in the immediate postharvest months, they hold grain for speculation as well as a means of smoothing their income streams.[3] This finding agrees with an earlier study by Southworth, Jones, and Pearson (1979), as well as with recent

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[3] Surveys that obtain farmers' reasons for the timing of sales (Asante, Asuming-Brempong, and Bruce 1989; Southworth, Jones, and Pearson 1979) generally indicate that farmers recognize the potential profit, although holding to have a reserve for unexpected cash needs is also reported as a reason for delayed sales.

Table 1 — Ghana: Percentage of Marketed Maize Surplus Handled by GFDC and GWC, 1985 to 1989

Year	Quantity of Maize Purchased by GFDC and GWC[a]	Total National Maize Production[b]	Marketed Surplus[c]	Proportion of Marketed Surplus Handled by GFDC and GWC
	Metric tons			Percentage
1985	19,600	395,000	197,500	9.92
1986	16,550	559,100	279,550	5.92
1987	14,850	597,700	298,850	4.97
1988	17,236	750,900	375,450	4.60
1989	11,996	714,600	375,300	3.20

[a] From GFDC and GWC records.

[b] From Policy Planning, Monitoring, and Evaluation Department (PPMED), Ministry of Agriculture, Accra.

[c] Assumed to be 50 percent of total production.

studies by the Ghana Grain Development Project.[4] The finding also parallels research undertaken in neighboring countries.[5]

Although these studies agree that farm households in West Africa do not concentrate their commodity sales in the immediate postharvest months, there is less agreement on whether households with larger surpluses are more or less likely to delay their sales. For example, Asante, Asuming-Brempong, and Bruce (1989) found that less than 12 percent of households with over six acres planted to maize held part of their 1988 harvest for 6 months or more, while half the households that produced less that six acres of maize in their sample did so. They hypothesize that this was because larger farmers were able to sell to the government, but only in the immediate postharvest period.

Conversely, the prevailing evidence from studies of African markets implies that traders do not generally hold an appreciable share of interseasonal storage (Jones 1972). Although data are insufficient to estimate fully the relative contribution to aggregate private storage that comes from farm households compared with traders in Ghana — that requires a population-weighted sample of traders — a perspective can be obtained by inquiring what storage is reported by rural traders.

In general, it appears that traders in the Cornell-Fudtech sample store mainly for pipeline supplies. At the time of interview (between March and June 1990) 70 percent of the traders in the Cornell-Fudtech survey reported that they intended their current stocks to last one week or less. Only 7 percent intended to carry stocks beyond two weeks. Similarly, over half the traders reported that their current supplies were obtained in the previous week; only 20 percent claimed to have held supplies over one month. It appears, then, that traders see their interest in rapid turnover rather than in storage and speculation.

This interest is in keeping with the cost structure of the traders. It can be shown that farm households can expect a gross return of about 6 percent a month for grain held from December to June and, hence, find it profitable — albeit risky — to hold grain (Alderman 1992). Traders, on the other hand, have an alternative use for their capital. Their opportunity cost for storing is the profits forgone by a reduction in their turnover. These costs can be calculated from the Cornell-Fudtech data.

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[4] Preliminary findings of that project show that nearly half of the maize sold by farm households is sold between March and June. Of course, even equal levels of supplies in the market across months would not mean that prices would not rise; market demand likely increases as households exhaust their own stocks.

[5] See Alderman (1992) for further references. Also note that Food and Agriculture Organization (FAO 1989) claims that no data on the timing of arrivals are available. Although a few exceptions existed even at the time of that report, the more important aspect for consideration is that the absence of such data did not prevent a claim that "there is a rush to sell in September and October."

The basis for the estimated opportunity cost of reducing turnover is calculated as the reported selling price at the time of the interview less the cost of procuring and transporting the grain. Different prices are used for retailers and wholesalers in accord with the difference in their cost structure. Also, taxes were taken as variable costs, although some traders contended that the taxes they pay did not depend on the volume of trade.[6] Finally, this calculation needs to estimate the speed of turnover. On the average traders in the sample could turn over their stock 3.67 (.29) times in a month. The median for this calculation (based on the ratio of sales in the last month over sales during the last market day) was 2.86.[7] The mean exceeds the median because the upper tail includes a few traders, generally retailers, who participated in up to 10 markets in a month.

Maize traders in the Cornell-Fudtech survey earned 5.3 (2.2) percent on the average sale. That is, on the average their sale price was 5 percent over their cost of purchase plus transport and taxes. A fair amount of variability around the mean represents both reporting error and a real probability of losing money on any given transaction even if on the average trading is a profitable activity (figure in parenthesis is the standard error of the mean). The estimated markup over costs for all reported transactions was 8.2 (1.4), which is apparently higher than for maize trade alone. Austin Associates (1990) also observed that margins were higher for crops such as groundnuts and cassava than for maize.

Using the estimated turnover and the lower figure for the markup on maize sales (as the category is more homogenous) one can estimate that traders can expect to earn about 15 to 20 percent a month on their capital. Note, however, that this is not strictly analogous to an interest rate or similar measures of the opportunity of capital because the figure also includes the return for the traders' labor and management.

An alternative approach to this estimate is to include costs such as rent, bags, pesticides, and hired labor in the cost structure. As mentioned above, these may, in fact, be fixed costs and hence not appropriate in this estimate of the incentive for rapid turnover. Indeed, if there are several fixed costs, the incentive for rapid turnover is greater, as unit costs would decline with volume. Finally, note that using these costs reduces the estimate of the percentage return in two ways: it increases the denominator while it decreases the numerator in the calculations. Nevertheless, this alternative approach yielded a ratio of total profits from sales over total monthly costs of 9.25 (3.1). Although this approach is no less variable than the former approach — and also includes a number of reported monthly losses — it still implies that traders have

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[6] Any fixed cost that is reported as variable would reduce the estimated gross profit per unit and, hence, lead to an underestimate of the opportunity cost of reduced turnover.

[7] An alternative estimate — based on reported stocks and the number of days the trader said they would last — gave a larger and more variable turnover rate. Moreover, this alternative could not be used for those retailers who purchased at the beginning of the market day and sought to clear all stocks by the close.

little incentive to tie up their capital. Although the available data can only be used to give an order of magnitude estimate, these rates indicate the range of opportunity costs for working capital.

Given the advantage of rapid turnover, it is not surprising that comparatively few traders in the Cornell-Fudtech study claim to own storage facilities. The average value of storage facilities owned was 23,971 cedis. This mean value masks a wide dispersion; the standard error of the mean was 6,591 cedis. This reflects the fact that only 20 percent of the traders owned structures, virtually all simple rooms or sheds and over 60 percent of them at least 10 years old. The average current value of the sheds (excluding zero values) was reported to be 124,650 cedis (23,754). Other traders rented rooms or depots (31 percent) or used a portion of their homes and yards for storage.

The average farmer in the same regions as the sampled traders owned storage facilities that were no more or less sophisticated than what traders owned. The average value of these structures reported by the over 80 percent of survey households (including those with no production) reporting storage structures was 26,570 cedis (2,667).[8] The maximum storage capacity claimed by the households averaged 4,937 (254) kilos of grain. By comparison, those traders who did not store in open areas claimed that they could store 19,574 (4,641) kilos if their structures were filled.

Often in Ghana the chain of traders involves several links, so that three or four merchants may be involved in the bulking of commodities in the steps up to retail sales. It is possible, then, that a predominantly secondary and tertiary sample would find a low level of storage because such traders may have storage patterns different from other traders. Of the sampled traders who reported operating in the immediate postharvest months, however, 54.6 percent obtained the majority of their goods directly from farmers or from their own production.[9] This number had declined slightly to 46.6 percent in the period from April to June 1990. The alternative was from other traders, as no respondent obtained supplies from government warehouses. Only half of the traders reported using the same sources in both seasons.

To a degree, trader operations are seasonal. Nearly 10 percent of all those interviewed claimed not to have participated in trade in the early season. The comparable number of traders who were active in the immediate postharvest season but who had ceased operations in the lean season is not available as those traders would be unlikely to appear in the sample.

The data collected by the Cornell-Fudtech survey concentrated on itinerant traders based on a random sample of census tracts in regions with small urban populations. It is quite possible that those traders who concentrate on Accra

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8 The total sample size was 600. For more details on the survey, see Alderman (1992).

9 Less than 4 percent of the traders rely primarily on their own output for supplies.

and other major urban centers operate on a scale different from those who sell their crops in Brong-Ahafo and the Upper East and may have a capacity for interseasonal storage. Even if this is the case, on the aggregate the markets in the largest urban centers do not constitute the majority of total grain trade. Traders, therefore, are unlikely to be in a position to manipulate interseasonal price rises by cornering supplies, nor are their costs of storage likely to be the main explanation for such price increases. Thus a trader-oriented strategy to reduce seasonal price rises — either by regulation or by concentrating on their infrastructure — may fail to address directly the constraints of the many farmers whose individually small storage capacities collectively account for much of the storage currently held in the country.

3. MARKETING MARGINS

As mentioned in the introduction, several stylized facts are repeated in various studies on Ghana without the empirical basis being delineated. These facts are sufficiently entrenched that to repeat them leaves the researcher open to the charge that his or her observations are trivial; to challenge them invites the criticism that the data deny what is known and, therefore, are not worth considering. For example, the large seasonal price spread in Ghana is variously explained by storage losses, transport costs, interest charges, postharvest distress sales, and trader collusion. These views are so firmly established that the empirical foundations are rarely questioned. Even if each point is partially valid, however, there is a need to go beyond anecdote to establish the relative magnitude of each contributor. It is worthwhile, then, to reconsider these stylized facts, if only to indicate that even if they are basically valid, the frequent unquestioned repetition of them obscures legitimate areas for inquiry and clarification.

Even the magnitude of the price rise, which has been deemed "undisputable" above, deserves scrutiny. It has been documented often that the seasonal price spread for commodities is comparatively high in Ghana (Asante, Asuming-Brempong, and Bruce 1989; Austin Associates 1990; FAO 1989). Table 2 is a member of this tribe, differing mainly in that the estimates are based on a number of individual markets rather than on a national average. Consequently, the price movements in this table are generally larger than indicated with national or regional average prices. Nevertheless, the table indicates nothing that differs qualitatively from other research.

Table 2 also reports a form of averaging that is not generally used because it is misleading. If the difference between the highest average monthly price and the lowest average price is the basis for the price movement estimates, the seasonal increase appears much smaller. For example, the difference between the average June price and the average September price is used to indicate maize price movements. In many years, and in many markets, the high and low months will, of course, differ from these months. Although the calculation in the last column underreports price movement, the table presents the calculation to illustrate the gap between one form of expected price movements and realized price movements, that is, to illustrate the variability.[10]

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[10] Another indication of the price movement is to consider the standard deviation of seasonal price movement in any given market. For example, in Techiman — a market that is more volatile than many in Ghana — the average nominal December to June price increase was 13.2 percent a month in the 1980s. The standard deviation of that increase was 9.1. The probability of a negative rise, then, is fairly high.

Table 2 — Ghana: Price Rise from Annual Low Prices to Highest Monthly Prices, 1980-1990

Commodity	Median over Markets and Years[a]	Mean over Markets and Years[a]	Using Monthly Averages[b]
Maize (wholesale)	1.14	1.26	0.49
Maize (retail)	1.05	1.27	0.50
Millet (wholesale)	0.73	0.88	0.34
Sorghum (wholesale)	0.76	0.91	0.53
Rice (wholesale)	0.65	0.84	0.20
Yam (wholesale)	1.03	1.29	0.40
Cassava (wholesale)	0.60	0.87	0.19

[a] Calculated as $(P_H - P_L)/P_L$.

[b] Calculated as $(\bar{P}_H - \bar{P}_L)/\bar{P}_L$ where the bar denotes monthly average real price.

Several interesting features can, however, be noted beyond the fact that these increases are large.[11] First, a brief perusal of the ratio of high-to-low prices indicates that these differences vary greatly by crop, with maize price increases being substantially greater than the increases for millet or sorghum, despite the fact that maize is harvested in two periods. Seasonal prices of rice are generally lower than for the other grains, although this difference, to a degree, depends on whether the northern markets are aggregated with the coastal, import-dominated markets. (The price movement for rice in Table 2 is larger than observed on other published reports for this reason.) Second, although prices for crops such as cassava, which has no pronounced seasonal production pattern, do not rise as markedly as prices for other crops, the proportional increase is large relative to price movements for grains in non-African developing countries. Third, although the rank ordering of the sizes of proportional price increases is consistent with differences in storage losses of the various crops, seasonal increases are larger than reasonable estimates of the physical and financial costs of storage. Taking, for example, 20 percent as an upper bound for storage losses for maize (FAO 1989)[12] and the *seasonal* opportunity cost of capital as 25 percent, the seasonal cost of holding stocks would be 56 percent.[13] That is, even these unlikely high assumptions of costs do not account for the historic pattern for maize.

Sarris (forthcoming) has taken this argument further with a simple, but important, illustration. He indicates that when a harvest exceeds trend, the decrease in lean season prices is significantly less than the decrease in the harvest season price. That is, he regresses $(P_2-P_1)/P_1$ on the deviation from trend production where the subscripts 1 and 2 denote the harvest and postharvest season, respectively. The coefficient of the deviation from trend was negative for all three crop aggregations that Sarris explored.

If the seasonal pattern were a cost markup only, then the level of the harvest would not affect the price increase as it should not affect the components of the cost. That is, losses and interest rates are independent of yields. Similarly, if the driving force behind seasonal price movements were the inability of households to store grain — either because of a lack of physical capacity or a pressing need for cash — one might see more grain sold in the early season, hence a *greater* decline in the early season price during bountiful years

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[11] A side issue is the fact that often this magnitude is exaggerated; few of the many studies that present the average price rise do so in real terms, although failure to account for inflation will attribute that portion of price increases, which is the macroeconomic consequence of fiscal policies, to market imperfection.

[12] The most probable value for this figure is, of course, lower than the upper bound.

[13] This calculation is 1.25/.8. If one needs to make 25 percent on maize purchased at 100 cedis but loses 20 percent before making the sale, one needs to sell the remaining amount for 156 cedis per unit.

relative to normal years. With this particular motive for sales, storage would not increase. This pattern would result in a positive coefficient on the deviation from trend variable.[14]

Sarris argues, on the other hand, that the pattern of more rapidly declining lean season prices observed when harvests increase reflects a shift of stocks normally sold in the early season to the later season. This shift of stock would be proportionally greater relative to overall supplies in the postharvest period and would, therefore, lead to a larger decrease in prices in that season when the deviation from trend was positive. Thus, seasonal patterns are behavioral as well as mechanical.

Before returning to the discussion of stocking behavior, a further look at the costs of marketing is worthwhile. In addition to costs attributable to local monopolies (if any), principal elements of marketing costs are storage losses, opportunity costs of capital, and transport charges. Storage losses discussed elsewhere in this report and in companion studies, are not sufficiently high to account for the seasonal price increases observed in Ghana. Although transport costs are believed to be high, high cost would not directly contribute to seasonal increase unless the costs vary over seasons.

In principle, such costs of transport could be indicated by looking at the difference in the price in consuming centers compared with producing centers. Asante, Asuming-Brempong, and Bruce (1989) reported such a table for 1984 to 1988, which is reproduced in Table 3. It should not be surprising that, in general, the farther the producing center is from the consuming center for maize, the greater is the price spread. For a number of months, however, the spread is negative as it is *on the average* for maize in the Accra region. As has been observed in several points in this paper, Southworth, Jones, and Pearson (1979) reported a similar phenomenon. Reporting error can, of course, account for some of these anomalies. More important, the data likely reflect seasonal market separation. This separation is most plausible for rice, which is, in fact, segregated into two markets in Ghana (Alderman and Shively 1991). However, despite generally integrated markets, at times or over seasons market channels may diverge, with some cities being supplied by local traders and others by long-distance trade from surplus regions.

Austin Associates (1990) present a similar table covering 1982 to 1986 (excluding 1984). Their table differs from the one reproduced here — for example, rice margins are negative on average for all Ashanti price spreads — but the basic impression is similar. In particular, although Austin Associates exclude 1984 and, thereby, apparently reduce variance, the variability of margins

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[14] One might argue that the abundant harvest would remove the cash constraint that prompts distress sales, but the general view of such sales is that they reflect debts incurred in earlier years (or seasons), not the current season. In any case, the abundant harvest can only relieve the need for cash if it is sold, which is the basis for the discussion. Moreover, if sales were motivated by a need for a target amount of cash, sales might increase as unit prices fell.

Table 3 —Ghana: Percentage Differences of Monthly Wholesale Prices Between Major Urban Consuming and Rural Producing Areas, 1984 to 1988

	Producing Region											
	Consuming Market Accra Urban						Consuming Market Ashanti Region					
Product	Accra Region	Ashanti Region	Eastern Region	Brong-Ahafo Region	Upper East Region	North-ern Region	Accra Region	Ashanti Region	Eastern Region	Brong-Ahafo Region	Upper East Region	North-ern Region
	Percentage											
Maize												
Mean	-1.42	21.79	11.99	47.54	6.92	53.37	-13.36	10.90	-2.20	28.85	-2.98	35.94
Min. value	-21.15	-0.48	-30.76	7.43	-35.40	-25.70	-36.77	-16.12	-11.58	-55.65	-15.98	-25.25
Max. value	30.63	30.63	56.41	275.16	90.34	153.22	25.34	50.20	112.05	68.77	139.67	33.98
Std. dev.	8.98	13.27	16.54	41.19	30.66	33.40	15.12	12.01	29.30	30.70	34.58	9.30
Rice												
Mean	-6.26	11.55	-0.76	23.74	10.73	21.01	4.44	4.49	-1.50	17.81	4.14	16.83
Min. value	-22.09	-15.39	-38.76	-45.53	-26.23	-52.51	-55.81	-67.16	-52.58	-49.74	-52.50	-47.11
Max. value	15.94	78.53	153.39	209.45	157.65	129.77	141.91	43.79	229.00	197.32	99.37	141.90
Std. dev.	14.39	17.39	40.19	46.43	40.24	25.14	48.12	28.52	50.44	36.66	38.02	29.33
Yam												
Mean	-3.70	40.39	38.16	73.77	30.19	136.06	-19.95	23.00	8.20	36.28	3.53	68.60
Min. value	-43.35	-56.36	-31.47	-11.91	-45.60	-32.14	-44.55	-190.81	-75.56	-75.34	-61.08	-43.36
Max. value	19.12	67.48	471.02	353.83	122.20	1,125.00	13.54	64.14	493.01	196.27	68.43	163.00
Std. dev.	17.71	21.13	86.40	67.35	33.68	162.22	16.88	38.52	87.65	53.54	29.79	56.90
Cassava												
Mean	13.79	30.43	28.84	142.60	—	-3.88	-13.14	18.96	-8.54	73.84	—	-45.30
Min. value	-86.61	-579.28	-24.87	-38.95	—	-47.69	-67.49	-123.90	-52.36	-35.53	—	-69.18
Max. value	70.57	76.28	96.85	389.08	—	17.65	47.22	64.40	121.57	385.97	—	-21.41
Std. dev.	22.51	87.86	32.50	97.94	—	24.00	28.57	33.97	28.73	74.88	—	17.51

Source: Adapted from Asante, Asuming-Brempong, and Bruce (1989).

Note: — denotes data not available to allow computation.

is still such that negative margins are common.[15] Variability of margins, like seasonal price volatility, adds to the traders' risk and affects their level of operation. This variability is discussed further below.

The data on margins presented here must be viewed with caution because, recording errors aside, they do not necessarily pertain to actual channels in which grain moves. The averages are, nevertheless, informative. Flows should go from higher to lower margins. For example, maize would flow from the Northern Region to Ashanti, and from Brong-Ahafo as well as the Northern Region into the Upper East. Of interest is the fact that the spread between a producing region of maize or cassava and its urban catchment is comparatively small. As is indicated below, margins of this magnitude are consistent with transport costs derived from other sources.

For example, traders in the Cornell-Fudtech survey reported that on the average it cost 80.7 cedis (7.6) to move one ton of grain one kilometer in the harvest season and 99.4 (8.7) in the lean season. The standard deviations of these costs are listed in parentheses and indicate that these differences are not statistically significant in this small sample (t=1.62 two-tailed test). Although the average cost for transport per ton-kilometer from the sample seems high relative to some other studies (Austin Associates 1990), the results here match with data from Policy Planning, Monitoring, and Evaluation Department (PPMED) market movement information collected in the two regions during the months of the survey. In terms of a percentage of final sales prices, traders who purchased their grain from farmers reported transport costs of 12.2 percent (1.3) in the harvest season and 6.6 percent (0.6) in the lean season. The apparent drop in the proportional costs of storage reflects the increase of sales price (the denominator) rather than an increase in unit costs. Taxes represented an additional 3.9 (0.3) and 2.4 (0.2) percent for the harvest and lean season, respectively. These markups, then, although not excessive, exceed the average markup *over* costs discussed above and account for most of the wholesale price spread. A similar view is expressed by Austin Associates, who venture that most of the margins from the farm gate are explained by costs that the traders must themselves pay for services and taxes.

As a digression, although these proportional costs are in keeping with the margins for interregional trade in Table 3 and similar exercises, they are less than the costs that are often used to calculate farm-gate prices and, hence, to estimate comparative advantage at the farm-gate level. The transport margins reported by traders are, however, in keeping with information given by farm households in the survey. For example, Brong-Ahafo farmers reported receiving a price that was between 88 and 97 percent of the PPMED price for Techiman

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15 Austin Associates (1990) also report regressions of marketing margins on producer prices. At face value these could indicate the percentage retail-farm price spread. The study, however, reports some price spreads as statistically significant, apparently failing to note that they are significantly *negative*. As noted in Alderman and Shively (1991) given that the bush weight for bags varies greatly, retail prices often are less than corresponding wholesale prices in the same market.

(Alderman 1992). Similarly, sorghum prices were 85 percent of the PPMED prices. The transport margins discussed here do not include the cost of headloading commodities to markets or roads. Although this can be appreciable, the cost can generally be considered a fee paid by the farmers to themselves. The disincentive to production that this entails depends on the opportunity cost of time during the months of sales. It is not suggested, on the basis of this single and small survey, that estimates of domestic resource costs and similar calculations be revised. It is, however, suggested that the question of farm-gate price be kept open.

Returning to the PPMED data, one can see one reason for diverse reported transport costs. Such PPMED data on commodity movements into and out of the regions studied during any given month, as well as the size of the load and the costs per shipment are the basis for the regressions reported in Table 4. As the table clearly illustrates, the cost per ton-kilometer is a function of distance, which is shown by the statistically significant negative coefficient on the average kilometer of the commodity shipment. Similarly, the significance of the positive quadratic term for kilometers indicates that although costs decline as the distance increases, this decline levels off. The shipping costs decline only slightly with the size of the purchase. This pattern is not statistically significant, however, except with maize and then only when a quadratic term is included.[16] The difference between Brong-Ahafo transport costs and those costs in the Upper East is curious (especially in light of the fact that these market movements included grain entering and exiting a region). However, the difference is significant for all but one commodity.

Table 5 indicates a similar regression based on the Cornell-Fudtech survey. Because of the small sample, those regressions aggregate commodities. This aggregation, however, also allows for a test of whether the average cost varied by commodity. Although the general pattern in the Cornell-Fudtech data is the same as the PPMED data, these regressions also indicate that the average transport costs for sorghum and millet are lower than for maize, even when distance is considered. The results in Table 5 also include a logarithmic version of the regressions. As indicated, a doubling of the distance transported would lead to only a 30 percent increase of transport costs. As with the PPMED data there is no apparent reduction for volume of trade. Although reduced costs per kilometer might reflect different vehicles (some data, but little variance, exist on the type of vehicle in the PPMED data examined), they also may reflect the fact that transport costs include handling. Unlike fuel, handling is not proportional to distance. Such costs would cascade among intermediate links in a three-to-five-trader chain to the final consumer.

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[16] These data clearly represent a valuable resource for the Ministry of Agriculture. Once the data are entered for a number of regions, differences in regional costs can be determined. Similarly, it would be easy to determine whether either seasonal or long-run price movements reflect, in part, changes in costs. As always, care must be taken to standardize data collection across market centers. Not only should data be in terms of the same units, but care should be taken to be consistent in terms of per-load or per-bag reporting of transport costs.

Table 4 —Ghana: Regressions Explaining Transport Cost

	Maize	Maize	Rice	Millet	Sorghum	Cowpeas	Yams	Maize	Rice	Millet	Sorghum	Cowpeas	Yams
Intercept	159.4 (33.8)	161.2 (32.3)	156.1 (19.8)	124.2 (20.1)	122.5 (15.5)	100.3 (11.70)	251.00 (8.35)	169.26 (34.30)	191.70 (15.75)	156.77 (9.56)	206.05 (8.91)	101.36 (9.19)	220.75 (10.79)
Kilometers	-0.740 (12.95)	-0.730 (12.70)	-0.927 (6.63)	-0.597 (8.59)	-0.732 (6.43)	-0.274 (5.51)	-1.66 (5.29)	-0.791 (9.78)	-1.126 (8.00)	-0.702 (8.32)	-0.848 (7.63)	-0.277 (5.31)	-1.358 (5.77)
Kilometers squared	0.0009 (8.87)	0.00090 (8.81)	0.0012 (5.04)	0.0007 (5.96)	0.00009 (4.89)	0.0002 (3.70)	0.0025 (3.78)	0.0009 (9.79)	0.069 (0.98)	0.0008 (6.40)	0.0011 (5.97)	0.0002 (3.54)	0.0021 (4.56)
Bags	-0.046 (1.49)	-0.130 (2.05)	-0.020 (0.287)	0.039 (1.383)	0.016 (0.20)	-0.007 (0.20)	-0.003 (0.23)	0.013 (0.40)	-43.01 (3.66)	-0.025 (0.87)	0.070 (0.87)	-0.006 (0.173)	0.0027 (0.52)
Bags squared	—	0.0001 (1.52)	—	—	—	—	—	—	—	—	—	—	—
Upper East	—	—	—	—	—	—	—	-42.89 (5.47)	-43.01 (3.66)	-29.28 (2.14)	-82.83 (3.81)	-1.84 (0.16)	-111.02 (0.00)
Mean of dependent variable	95.2	95.2	108.0	73.5	81.0	52.1	124.83	95.2	108.0	73.5	81.0	52.1	—
R^2	0.391	0.391	0.495	0.459	0.363	0.476	0.314	0.421	0.570	0.477	0.444	0.648	0.321
N	575	575	81	131	105	32	87[a]	575	81	131	105	32	124

Source: Estimates from PPMED data.

[a] Brong-Ahafo only.

Note: t-statistics are in parentheses.

Table 5 — Ghana: Transport Cost Regressions Using Cornell-Fudtech Survey Data

	Cost Per Ton		Logarithm of Costs	
	Harvest	**Lean**	**Harvest**	**Lean**
Intercept	159.00	190.89	0.172	0.554
	(11.61)	(14.22)	(0.75)	(2.67)
Distance	-0.952	-1.083	0.310[a]	0.271[a]
	(6.05)	(6.54)	(6.11)	(5.75)
Distance squared	0.0013	0.0014	—	—
	(4.56)	(4.80)		
Quantity in bags	-0.0004	-0.0104	-0.00004	-0.00008
	(0.14)	(0.34)	(0.211)	(0.42)
Sorghum/millet	-14.78	-32.13	-0.207	-0.343
	(1.04)	(1.93)	(1.88)	(3.15)
R	0.407	0.422	0.350	0.291
N	95	103	95	103

Source: Estimates from Cornell-Fudtech survey data.

[a] Logarithm of distance.

Note: t-statistics are in parentheses.

Besides high costs of storage and movement, it is commonly held that traders manipulated prices by monopsony buying at harvest time and by cartels led by market queens. The former market structure would hurt producers while the latter would affect the consumer price. Both structures would increase merchants' profits. This study does not have data that either support or refute this position. The prevailing opinion is largely impressionistic, however, and worth considering. As discussed in Alderman and Shively (1991) as well as in Asante, Asuming-Brempong, and Bruce (1989), markets in Ghana in the late 1980s are largely integrated.[17] An exception is rice, which appears to be divided into two separate markets depending on whether the commodity is imported or local. It is hard to see how such integration could exist if each market were, in fact, a cartel. Although the author does not doubt that market queens may influence local conditions, he is unaware of any study that quantifies the extent of this influence. Indeed, because prices in Ghanaian markets are not posted and are generally determined by private negotiation between purchasers and traders, no mechanism by which price collusion can be directly enforced has been proposed in the literature.

A market queen may restrict entry and, thereby, the volume of trade in the market. This is, however, somewhat different than direct price setting. Moreover, if she is able to monitor only the number of traders and not their volume, restrictions of entry may fail to affect market-clearing conditions. Note that under such circumstances the market queen still has an incentive to restrict entry because reducing the number of traders admitted raises the average share of total profits for any included agent, a portion of which may be extracted as rent or fee for inclusion. The fact that market queens have local influence, then, is insufficient to indicate the welfare effects of such a position.

Are traders able to extract monopsony profits from farmers? One means might be through a creditor-debtor relationship. A number of traders (21 percent) appear to have some surplus capital, which is lent to others. The average amount of these loans in the last year was 48,333 cedis, of which 12,286 cedis were still outstanding. The scale of these loans is small compared with daily capital requirements for trade, but high relative to farmers' use of credit. The trader survey did not obtain the interest charged to farmers, and the household survey revealed too few loans from traders to accurately estimate the cost of such transactions from the Cornell-Fudtech data. However, given the amount of low- or zero-interest loans farmers received from friends and relatives in the household survey (Alderman 1992), as well as the fact that the 1979 study of Southworth, Jones, and Pearson indicated that the overwhelming majority of loans given by traders in Brong-Ahafo were without explicit interest charges, the prudent assumption would be that traders do not have many opportunities to earn interest from credit transactions.

The traders may, however, still use tied transactions to keep farmers at a bargaining disadvantage. Such a concern recurs regularly in the literature.

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[17] The International Fund for Agricultural Development (IFAD) presents data that show poor market integration, but those data stem from 1977-1978.

Again, Southworth, Jones, and Pearson (1979) provide one of the few empirical estimates of how widespread such practices have been; a quarter of the farmers in their sample sold to the trader who provided loans. This raises the question: Why were far fewer loans to farmers — never mind fewer tied loans — found in the Cornell-Fudtech survey? One can speculate that there has been a change in credit practices in the past decade, perhaps reflecting a credit shortage, but there is no evidence to either support or refute this. Alternatively, because long-distance traders serving the main urban centers predominated in the Southworth study, the scale of transactions may have encouraged credit provision to ensure supply. If so, such credit would be a cost of operation paid by the trader rather than a means of exploiting farmers.

To a large degree this is plausible. Neither the farmers in the Southworth study nor those in the more recent Asante survey reported that they had difficulty finding buyers. Nor did either study find that farmers relied on traders to inform them what prices prevailed. Similarly, although the Cornell-Fudtech survey found that 45 percent of maize sales by farmers were to traders from the village, 23 percent were to traders who came from outside the region. The remainder were to traders from elsewhere in the region; few farmers sold to the government.[18] When farmers have information on market prices and a choice of traders to whom to sell (as well as the option of waiting to sell), monopsony purchasing cannot be the norm.

One further point on credit is worth mentioning as it affects scales of operation. Most traders in the Cornell-Fudtech sample rely on their own funds for financing their activities. Only 7 percent of the traders reported that they received credit for their operations. This agrees with the observations of Asante, Asuming-Brempong, and Bruce (1989). On the other hand, there is evidence from other regions that a moderate share of total rural credit is used for trading operation. For example, Abt Associates (1990) reports that 36 percent of the volume of loans from the Asesewa Rural Bank in 1987 went to trading activities and another 6 percent for transport. These loans were on average larger than those for agriculture; only 18 percent of the number of loans went to traders. The average loan from that bank to traders was over 160,000 cedis.

Although the Cornell-Fudtech sample reported only four bank loans, these loans averaged 153,000 cedis. That is, they were in the same order of magnitude as the loans reported by the Abt study. Besides such loans and self-financing, one other source of operational capital is available to traders. Roughly a quarter (23 percent) of traders reported that they paid their suppliers after their grain was sold. This implies that the suppliers finance the traders' operations. Also, the suppliers may share some of the risk because sales that are not finalized at the time the grain is removed are subject to renegotiation if market prices fall (Southworth, Jones, and Pearson 1979). Farmer financing of trade shifts some of the cost to these households, although the opportunity cost of the grain stocks in such a transaction may not compare with the opportunity cost of liquid capital. Moreover, as it is unlikely that grain sold

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18 On the other hand, 25 percent of the traders who handled maize sold it to the government. The volume, however, was low, never exceeding 300 bags.

under such an arrangement can be held for an appreciable period of time without sharing profits with suppliers, this type of trading probably depends on rapid turnover, as discussed above.

4. DISCUSSION

The choice of heading for this section is deliberate; the paper makes a number of observations that can prompt further discussion, but by itself cannot venture a conclusion about the high seasonal price rises in Ghana nor about the variability of such increases. The paper presents evidence that spatial markups are predominately real costs of transport and handling. Survey evidence does not support the conclusion that monopsony purchases or tied transactions are widespread. This is not to say that transport costs could not be reduced with improved systems and volume transactions that shorten the chain of intermediaries. The former issue, however, is a technical issue of physical infrastructure. The latter may similarly reflect physical constraints that reduce optimal scales of operation, but may also reflect limitations on working capital. Nevertheless, it implies that cost reductions can be achieved only with the comparatively long-term strategy of supporting trader operations rather than by quick solutions through regulating or replacing market intermediaries.

The study also argues that traders generally work on turnover; principal agents for storage, at least outside the main urban centers, are farm households. Upgrading storage capacity, then, involves influencing a larger number of actors than if storage were mainly in traders' warehouses. As indicated in this and companion studies (Alderman 1992, Sarris forthcoming) the government could replace a portion of this household-level storage, but at considerable cost and with little gain to consumers.

The question of why seasonal prices fluctuate as they do is not answered in this study. It is argued that behavioral considerations are at the crux of the issue. At reasonable levels, storage and interest costs cannot account for either the level or the variability of seasonal price rises. Beyond this, one can venture some hypotheses, but at this point the data on the formation of price expectations that is central to understanding storage behavior are lacking.

Most existing models of storage behavior illustrate that traders generally process market information and adapt their response accordingly. Such being the case, they respond to government behavior in a manner that may partially negate the policy impact. For example, in several countries traders respond to increased government storage and the attending change in interseasonal price movements by changing their storage. The Cornell-Fudtech project has modeled farmers' responses in the companion paper on government interventions (Sarris forthcoming). There is, nevertheless, a pressing need to understand whether farm-level storage behavior differs from the trade models and to ascertain whether it does, in fact, adapt to changes in government policy.

There may be, for example, differences from the prevailing models of price expectation and storage behavior if farm households acquire information in a different manner or if they bear risk differently than professional traders. The issue of risk is particularly important. Stocks are a fair proportion of a farm households' capital portfolio. The level of market risks, as well as the ability to bear risks, may correlate with income. Hence, the poor and middle-income farmers who are hypothesized to hold collectively the bulk of grain stocks in Ghana are likely to be particularly sensitive to risks. In a risk-free environment, storage and trade would be expected to equate the price of a commodity in different periods with seasonal differences reflecting capital and physical costs as discussed above. In a risky environment, however, this equations includes a risk premium. The variability of production and of market prices, then, would discourage storage and, hence, contribute to the level of interseasonal price increase.

Finally, traders may overreact to new information (Ravallion 1985), thereby exacerbating price rises. This is error, not collusion, but the welfare impact is similar. Given sharp movements in prices in Ghana that are not easily explained by changes in supply or by accurate changes in supply forecasts — for example, the pronounced increase in maize prices in May and June of 1990 — hyperresponsiveness in price expectations in Ghana may well be the case.

The study points to information flows and to the riskiness of markets more than to technical features or collusion as the cause of seasonal price patterns. This is less comforting to policy planners because the solution is less obvious than it would be if, say, the majority of seasonal patterns due to storage losses. Fortunately, an either-or choice is unnecessary. Technical solutions — where they are identified and are cost effective — will help reduce risk and therefore affect the behavioral aspects of seasonal price increases. Nevertheless, to fail to understand the role of risk-adverse and credit-constrained households in price formation is to oversell the ease of stabilization policies.

REFERENCES

Abt Associates. 1990. Rural-Urban Linkages in Ghana. Report to USAID. Cambridge. Photocopy.

Ahmed, Raisuddin, and Narendra Rustagi. "Marketing and Price Incentives in African and Asian Countries: A Comparison." In *Agricultural Marketing Strategy and Pricing Policy*. Dieter Elz, ed. Washington, DC: World Bank.

Alderman, Harold. 1992. *Incomes and Food Security in Ghana.* Working Paper No. 26. Ithaca, NY: CFNPP.

Alderman, Harold, and Gerald Shively. 1991. *Prices and Markets in Ghana.* Working Paper No. 10. Ithaca, NY: CFNPP.

Asante, E., S. Asuming-Brempong, and P. Bruce. 1989. Ghana: Grain Marketing Study. Washington, DC: World Bank. Photocopy.

Austin Associates, Inc. 1990. Agricultural Marketing in Ghana: Status and Recommendations for Improvement. Report to USAID. Photocopy.

Ellsworth, Lynn, and Kenneth Shapiro. 1989. "Seasonality in Burkina Faso Grain Marketing: Farmer Strategies and Government Policy." In *Seasonal Variability in Third World Agriculture: The Consequences for Food Security*. David Sahn, ed. Baltimore: Johns Hopkins University Press.

Food and Agriculture Organization. 1989. Marketing and Storage of Stable Food Crops Strategy Study. Rome: FAO. Photocopy.

Fudtech Consult Ltd. 1990. Ghana: Public Grain Storage Operations. Accra. Photocopy.

International Fund for Agricultural Development. 1988. Report of the Special Programming Mission. Accra: IFAD. Photocopy.

Kraus, Jon. 1988. "The Political Economy of Food in Ghana." In *Coping with Africa's Food Crises*. Naomi Chazan and Timothy Shaw, eds. Boulder, CO: Lynne Reinner Publishers.

Jones, William. 1972. *Marketing Staple Food Crops in Tropical Africa*. Ithaca, NY: Cornell University Press.

Ravallion, Martin. 1985. *Markets and Famines*. Oxford: Oxford University Press.

Ricardo, David. 1981. *The Works and Correspondence of David Ricardo*. Piero Sraffa, ed. Cambridge: Cambridge University Press.

Sahn, David, and Christopher Delgado. 1989. "The Nature and Implications for Market Interventions of Seasonal Food Price Variability." In *Seasonal Variability in Third World Agriculture: The Consequences for Food Security*. David Sahn, ed. Baltimore: Johns Hopkins University Press.

Sarris, A. Forthcoming. *Options for Public Intervention to Enhance Food Security in Ghana.* Monograph. Washington, DC: CFNPP.

Smith, Adam. 1937. *An Inquiry into the Nature and Causes of the Wealth of Nations*. Edwin Cannan, ed. New York: Random House.

Southworth, Roy, William Jones, and Scott Pearson. 1979. "Food Crop Marketing in Atebubu District, Ghana." *Food Research Institute Studies* 17(2): 157-195.