IMPROVING THE COMPETITIVENESS AND MARKETABILITY OF LOCALLY-PRODUCED RICE IN GHANA

DEPARTMENT FOR INTERNATIONAL DEVELOPMENT (DFID)

CROP POST HARVEST PROGRAMME

PROJECT R6688

1. Marketing of Rice in Ghana

1.1 - Report on Irrigated Rice Marketing in Ghana - George Day and Joseph Acheampong, December 1996

Collaborators:

Natural Resources Institute (NRI)
Ghana Irrigation Development Authority (GIDA)

CONTENTS

Acknowledgements

Many thanks are due to the staff of the Ghana Irrigation Development Authority for their assistance in completing this study. In particular, Mr Ohemeng was important in facilitating arrangements for the field work and Mr Joseph Acheampong provide invaluable support in the field. Mr Glover, farmers' association manager at Dawhenya, Mr Antwi, project manager at Asutsuare and Mr Azorliade, project manager at Afife also gave important assistance.

1. Introduction

1.1 Historical Background

Irrigated rice has been grown over a number of decades in Ghana on state-sponsored government irrigation projects. Over the years these projects have received extensive state support, as the government has attempted, through various initiatives, to achieve food self-sufficiency. The emphasis on promoting domestic rice production was enhanced by the growing importance of rice in the diet of the urban population, combined with technical assistance provided by donors, such as the Chinese. In addition, the promotion of state-sponsored, input-intensive agriculture reflected the Ghanaian government's past adherence to socialist development models.

The irrigation projects have had an uneven history, reflecting Ghana's own uneven economic history. Most of the projects have required major rehabilitation efforts in order to maintain their functioning. Most recently, projects have been rehabilitated through EU-funded assistance. The projects come under the management of the Irrigation Development Authority (IDA), which is an autonomous authority under the Ministry of Food and Agriculture. IDA is responsible for managing irrigation development in Ghana, and, increasingly, seeks to transfer more of the responsibility for managing and funding irrigation operations to farmer organisations. World-wide experience suggests that this is a slow process, and Ghana has been no exception, with the process currently at different stages in different individual irrigation projects.

In addition, there is a change in emphasis in Ghanaian irrigation development. Previously, irrigation development was seen largely as a contributor towards meeting a food self-sufficiency objective with a consequent emphasis on rice production. Today, there is increasing emphasis on maximising the returns from the use of scarce irrigation resources, with a corresponding shift in thinking towards exploring the potential for production of higher value crops, principally fruit and vegetables. Similarly, IDA is currently involved in feasibility study work on a national small-scale irrigation project, which is concerned with identifying sites for smaller scale

irrigation developments. These trends suggest that there are important questions about the future role of irrigated rice development in Ghana.

1.2 Methodology

For the purposes of this study of rice marketing, the three most important rice growing schemes were visited. These are Dawhenya (approx. 15 km north east of Tema), Asutsuare (approx. 60 km north east of Tema, close to the Volta River) and Afife (close to Akatsi in the southern Volta Region).

The broad aim of the study was to identify and describe:

- the broad market flows and patterns of domestic rice marketing;
- the participants in the marketing chain;
- the marketing margins in the marketing chain;
- the actors and institutional arrangements in the marketing system.

This was accomplished by the use of semi-structured interviews of key informants, including rice farmers, rice wholesalers, rice retailers, rice millers and IDA staff. Direct observation of rice marketing, post-harvest practices, weights and measures and prices also provided important sources of information for describing the marketing system.

2. Dawhenya Irrigation Scheme

2.1 Background

Dawhenya irrigation project was first built in 1964 and provides approximately 200 hectares of irrigated land. It subsequently fell into a state of disrepair and was rehabilitated under EU funding in 1990-91. Rice is the main crop grown on the scheme, with around 190 hectares effectively cropped to rice at the present time by between 235 and 240 farmers. Since 1994, two crops per year have been grown with

the main season planting taking place during February to April with harvesting in June to August, and minor season planting in August to September with harvest in December to January. Yields reach around 5 tonnes per hectare during the main season with somewhat lower yields in the minor season. Total annual production is, therefore, around 1,600 tonnes of paddy. There is some discussion of crop diversification on the scheme, particularly during the minor season when, due to lower rainfall, pumping costs are higher. The thinking is that a less water-intensive crop could be grown.

The scheme is the first of the IDA schemes to be handed over to a Farmers' Association to be managed - though there is still considerable IDA support to the scheme. Effectively, the scheme is managed jointly by IDA and by the Farmers' Association, which has now employed a professional manager. The farmers on the scheme are charged an irrigation charge of C164,400 per hectare per season, which is designed to cover the running costs and electricity bills of the scheme. However, there are a number of facilities for which the farmers do not pay any charge including the provision of drying floor facilities and storage warehouses.

The farmers' association provides inputs to the farmers for production of rice including fertilisers, seed, herbicides etc. This production credit appears to be a continuation of a now defunct revolving fund credit arrangement, which was previously provided through the Agricultural Development Bank. Farmers then repay the association in kind in the form of paddy at an agreed price per bag, which is currently C40,500 per maxibag (84 kg)[1]. In addition the farmers pay an interest charge of 18% of their outstanding input costs and a 7% charge for the administrative costs of the farmers' association. The farmers' association sells most of the paddy to the Ghana National Procurement Agency (GNPA). GNPA is a parastatal, which formerly controlled the importation of a number of important commodities including wheat, rice, sugar and rubber tyres. GNPA is now operating on more commercial lines, and is not currently loss making, but nonetheless remains an important player in

[1] Maxibags are jute sacks used for paddy (and other grains) in Ghana. They are usually assumed to contain around 84kg. However, weighing trials and other evidence suggests that their weight is likely to be somewhat higher, possibly I the range 86-90kg, depending on packing practices.

the rice market. The paddy marketed through the farmers' association to GNPA is taken to a private rice mill in Pokoasi (north of Accra) for milling. GNPA then bag and sell the rice under their own brand.

The arrangement for marketing rice in this manner through the GNPA dates from 1994, and to some extent reflects a parastatal rather than a pure commercial motivation. The basic arrangement was that the GNPA would purchase as much rice as would be available at a negotiated price. GNPA provides an advance to the farmers' association that is then used to finance input supply to farmers and to make purchases of paddy from the farmers.

Farmers at the Dawhenya scheme are free to sell all their paddy through the arrangement organised through the association and GNPA, or they may retain the paddy which is surplus (i.e. above and beyond the amount needed to repay the production credit advanced) for sale through their own arrangements. The GNPA marketing arrangement currently provides a price of C40,500 per maxibag of paddy (each maxibag weighs approximately 84 kg). In addition farmers sell some of their crop to itinerant market traders who purchase paddy from the scheme.

2.2 Varieties at Dawhenya

All rice varieties cultivated at Dawhenya are improved varieties of white rice. The main varieties currently grown are ITTA 222, CIAT 19970 and Bouake 189. GRUG 7 is another important variety at Dawhenya, but is now gradually being phased out as yields are reportedly declining. The supply of seed to the scheme is organised by the farmers' association, with seed sourced from the University of Legon farms at Kpong and multiplied on the scheme. Dawhenya appears to have the most organised arrangements regarding the supply of improved seed to farmers.

The CIAT variety appears to be the most recently introduced variety, but also the most popular among buyers. GNPA, for example, are offering a higher price of C42,500 per maxibag for supplies of CIAT paddy with the aim of encouraging its production,

based on their assessment of the quality characteristics of the available varieties. The yield from CIAT is also reportedly higher than other varieties, but it is a longer duration variety, taking 5 to 6 months to mature in place of 4 months for other varieties. It also reportedly requires higher applications of fertiliser and other inputs.

2.3 Post-Harvest Practices

Farmers employ teams of casual labour to perform the functions of cutting the crop, stacking in the field, threshing, field edge transport, drying and packing. The crop is cut, stacked on the panicle in the field and threshed by teams of male casual labourers. The post-harvest costs are shown in Table 1 below. These costs can be paid either directly by the farmer or can be paid by the farmers' association and treated as part of the input cost account which must be settled by the farmer to the association in the form of paddy.

Table 1: Typical harvest and post-harvest costs borne by farmers

Operation	Cost to Farmer (per ha., unless specified)
Crop cutting	C70,000
Threshing	C70,000
Drying, field edge to roadside transport and packing	2 bags (i.e. equivalent to C81,000)
Transport (roadside to drying floor)	C300/bag

Threshing is carried out by placing tarpaulins on the field, placing stones on top of the tarpaulin and beating the panicles against the stones. Farmers reported that threshing boxes were formerly used at Dawhenya, but this practice was stopped when the farmers realised that much of the grain was being lost through scattering outside the threshing box, during panicle beating. Threshing reportedly takes two to three days per hectare for a team of 6 labourers.

The threshed paddy is gathered and bagged in the field by women packers. The sacks of paddy are then carried to the roadside and loaded onto trailers pulled by tractors or 'power-tillers' (small two-wheeler tractors) for carting to the drying floors. The

Dawhenya scheme has extensive concrete drying floors located at a central point along with the scheme offices, storage warehouse and a privately run mill.

Paddy is sun-dried on the drying floors by hired female labour. Following drying the paddy is winnowed by pouring from bowls held overhead and allowing chaff to be removed by the wind, and then bagged. It is then weighed by the farmers' association, and that portion which is required to cover input costs is deducted by the association with the remainder returned to the farmer for their own disposal. The paddy owned by the farmers' association is placed in the central storage warehouse located at the scheme, prior to its sale to GNPA. The farmers' association ensures that paddy is dried to around 11 - 12% moisture content before storage, and has a moisture meter for this purpose. There do not appear to be any major problems with storage losses.

2.4 Farm-gate Sales

For all of the Dawhenya farmers, as in the other irrigation schemes, rice is grown overwhelmingly as a cash crop with a very small proportion of the crop kept for home consumption. Many of the Dawhenya farmers sell their entire crop through the farmers' association. That is, they repay their input costs to the farmers' association in the form of paddy at an agreed rate per bag, with the surplus paddy paid out to them in cash at the same rate per bag by the farmers' association. This arrangement provides the advantage of quick realisation of the value of the crop from the farmer's perspective - although this is to some extent dependent on the cash-flow situation of the farmers' association, which in turn reflects purchasing advances made by GNPA. There is also a perception among farmers that the GNPA market provides a more reliable customer, with some farmers citing instances where they never received payment from some market women for paddy supplied on credit.

Farm-gate price levels appear to be determined primarily by the price level negotiated with GNPA by the farmers' association. At the present time the agreed rate is C40,500 per bag. It appears that some market traders are paying a slightly higher

price of C42,000 per bag, but they too wish to pay the same price as GNPA and are putting pressure on farmers for a lower price. Some market traders may be willing to pay slightly higher prices in order to attract supplies.

There is little evidence of farmers storing their crop for subsequent sale later in the marketing year to take advantage of any price increases. Farmers generally report selling their entire crop immediately after harvest - even that portion which is sold to market women. This is despite the fact that there is widespread awareness of a seasonality in rice prices - with prices generally perceived to be higher in the period after Christmas, when the availability of other staple foodstuffs is declining. Any storage that does take place is in small quantities at home. However, the farmers' association at the present time is storing the crop in the hope of higher prices later in the season. This partly reflects an impasse that has been reached with GNPA over the price to be paid for the current crop, with GNPA wanting to lower the price below the current agreed level of C40,500. It appears that at the time of the study GNPA were holding off from buying the Dawhenya crop due to this price dispute, resulting in the farmers' association holding around 1,400 bags of paddy in stock in the project warehouse.

In addition, significant sales take place through market women traders who visit the scheme in order source paddy. These traders are mostly wholesalers either from Dawhenya town or the Ashaiman/Tema area - they are described more fully below. Market women may buy directly from farmers or from the farmers' association. They appear to be a good market for the Dawhenya farmers providing an integrated credit and marketing service. However, the farmers are generally happier with the marketing arrangement which has been operational over the past two years with GNPA, because this provides a straightforward market outlet, and removes the dependence of the farmers on irregular demands placed by market women.

Farmers may grow a number of different varieties but varieties are kept separate when it comes to marketing. Similarly, market women are closely aware of the importance of variety difference in determining some of the quality properties of the final product.

A number of farmers have credit links to market traders. The traders provide production credit in the form of cash or inputs, which is then repaid in paddy immediately following the harvest by the farmer. The repayment is made without any direct interest payments, but at the 'going rate' price i.e. the GNPA price less around C2,000 per maxibag for the provision of the credit service. Some farmers also deal with the same trader from year to year, this relationship normally being cemented by the provision of credit on both sides. Other farmers report approaching market women to request credit, and will deal with the one who is able to advance funds. Market traders provide production credit to farmers, farmers provide an assured source of paddy to traders at a discounted price sometimes also with a number of weeks credit, allowing traders to sell rice before payment to farmers is made.

2.5 Milling

All paddy grown at Dawhenya is marketed by the farmers in paddy form. Thus, the primary buyer owns the paddy at the time it is milled. If the paddy is bought by GNPA it is transported to a mill located at Pokoasi, some 30-40 kms away to the north of Accra. This arrangement does involve extra transport costs, because the paddy must travel from the Dawhenya scheme to Pokoasi for milling before being returned to GNPA in Accra for distribution.

If the paddy is purchased by market women it is generally milled either directly on site at the private mill at Dawhenya, or at mills in Ashaiman or Accra. Ashaiman appears to be the primary milling centre for the entire trade in irrigated rice. There are four rice mills in Ashaiman, and each appears to provide a focal point for the businesses of a number of market women (around 20 to 50 at each mill). Market women appear to be attached to particular mills that they use on a regular basis for milling, drying, storage, assembly and as a central point for sales or the despatch of deliveries.

Kanawu Rice Mill

Kanawu rice mill is one of the four mills located at Ashaiman. The business was started in 1972, and the current Satake-type rice-milling machine was purchased in 1982. The business also comprises corn milling (both dry and wet) and cassava grating (for gari manufacture) using other milling equipment. The rice mill is used on a regular basis by around 20 market women, and the rice milling business is highly seasonal depending on the turnover of the market women. During the busiest period of the year, in February/March time (i.e. the so-called 'lean season' when standard staples are in less plentiful supply) around 50 to 60 maxibags of paddy are milled per day. During less busy periods of the year the average milling throughput is around 15 - 20 maxibags per day. At the time of the interview, no milling had been conducted over the previous four days. The miller has also observed that rice milling business has declined over the past few years, attributing this to the GNPA procurement of Dawhenya rice, which has diverted much of the milling of Dawhenya rice at least to Pokoasi.

The miller gave the following indicative information on costs and revenues.

Recurrent Costs

Item	Monthly Cost (Cedis)
Electricity costs	80,000
8 Labourers (@ C40, 000/month plus Cl,000 per day 'chop money')	480,000
Rice mill maintenance (spare parts etc.)	40,000
Total rice mill running costs, excluding depreciation (50% of labour and electricity costs attributable to the rice milling business)	320,000

Revenues

Item	Monthly Cost (Cedis)
Milling charges @ C1,000 per maxibag paddy (assuming that 500 bags per month are milled - equivalent to an average over the year of 25 bags for 20 working days each month)	500,000
Sales of rice bran @ C3,000/50 kg bag (50 kg bran produced per 5 x 84 kg bags paddy milled)	300,000
Total revenues	800,000

Interviews with other rice millers suggested different cost information, particularly with regard to maintenance and spare part costs.

2.6 Traders and Wholesalers

GNPA is a parastatal that formerly controlled the importation of a number of important commodities including wheat, rice, sugar and rubber tyres. It is now operating on more commercial lines, and appears from its annual report to be making a profit. The detailed nature of rice marketing by GNPA was not studied closely, due to time availability. However, the broad nature of GNPA's involvement in the rice market is known. Given GNPA's history as a government import procurement agency its primary role in the rice market is as an importer. However, since 1993 GNPA has entered the market for domestic rice, procuring from the IDA supported irrigation schemes. At present its main involvement is in procurement at the Dawhenya scheme.

The rice procured by GNPA is transported to Pokoasi where it is milled in a private rice mill. GNPA then packages the rice in GNPA branded packs of various sizes for distribution to wholesalers and retailers. Information gained from GNPA during a previous visit, suggested that little difficulty was experienced in disposing of this rice. However, GNPA are interested in improving the quality of locally produced rice, particularly in terms of cooking quality. As a result GNPA are offering a premium price for CIAT rice. The manager of the farmers' association at Dawhenya estimates that GNPA absorb approximately two thirds of the entire crop, with the remaining one third marketed through market women.

2.7 Market Women

Sales to market women may take place through the farmers' association or more commonly directly from farmers to market women. At Dawhenya there appear to be two main groups of market women who purchase from the scheme. Firstly there are market women based at Dawhenya, an example is given below. Around 20 Dawhenya traders have recently formed a traders' association, which is now a registered co-operative. The grouping was inspired largely by the example of the farmers' co-operative at the scheme, and is seen as a means of accessing external finance or assistance e.g. bank financing, and of dealing on a collective basis with the

farmers. The traders' association also provides a means of rotating liquidity within the group. The group comes together to place an order with the farmers' co-operative, those members who are able, make cash contributions, but all members receive an allocation of the purchased rice. Those members who received an allocation without contributing cash then repay the purchase price plus C500 per bag to those who advanced cash on their behalf.

The second group of market women is that based at the mills in Ashaiman. It would appear that this group, on average, has a higher turnover and more extensive trading and financing linkages.

Dawhenya Market Trader

Trader A lives in Dawhenya village. Trading in rice is her main activity. Rice is mostly purchased at Dawhenya, but she also buys from Asutsuare and Afife if rice is scarce at Dawhenya. She is a member of a Dawhenya-based association of small rice traders, the Dawhenya Co-operative Food Marketing Society Ltd. Rice is purchased both directly from farmers and sometimes through the traders' association. During the busiest part of the year she buys around 50 bags of paddy per month, going down to 2 bags per month during the slowest part of the year. She pays C40,500 to farmers, but this price reflects the fact that she has extended credit to those farmers (i.e. it is lower than C42,000). Paddy is milled mostly in the mill at Dawhenya, but some is also milled at Ashaiman. Rice is sold to retailers in Ashaiman, Tema and Accra - she delivers the rice to regular customers, hiring trucks or taxis for transport. Rice is sold as soon as possible after milling to release funds. The rice is sold in fertiliser bags that are collected from customers after use and reused.

Marketing costs and revenue are summarised below:

Item	Cost (Cedis)
Cost of paddy	40,500
Milling Charge	1,000
Transport to Accra	700
Loading/unloading	600
Total cost per maxibag of paddy	42,800
Sales revenue	44,000/bag milled rice (17 US tins)
i.e. Sales per maxibag of paddy	49,000/bag paddy (19 US tins)

3. Asutsuare Irrigation Scheme

3.1 Background

Asutsuare is located close to the Volta River at a distance of around 90 kms from Accra. The scheme has a potential irrigable area of 400 hectares and it is planted almost entirely to rice, with average yields of around 5 tonnes per hectare. During 1995 IDA estimated the total paddy production from the scheme at 1,650 tonnes. At present most of the scheme is only cropped once per year due to problems in the availability of machinery for cropping etc. There are 300 farmers on the scheme who are grouped into an association called the Asutsuare Co-operative Rice Farmers and Marketing Society. The plot size planted by each farmer varies, but the modal size is around 1 acre. IDA jointly manages the project together with the farmers' association, although the association appears to be somewhat less active than the Dawhenya association. Farmers purchase inputs, hire machinery and market their output on a largely individual basis.

The scheme has a drying floor facility, together with extensive warehouse storage. However, there are no moisture testing facilities (as there are at Dawhenya). There are also three private rice mills at the drying floor centre. The scheme levies an irrigation charge to the farmers, currently at C125,000 per hectare per season, which is repaid in paddy at the agreed rate of C40,000 per maxibag.

The supply of seed to the farmers at Asutsuare appears to be less well organised than at Dawhenya. The main varieties grown are ITTA 222 and ITTA 234. CIAT is not cultivated. Farmers frequently save their own seed over relatively long periods, although others purchase from local commercial suppliers such as Kpong Farms, Bok Nam Kims Farm or from Dawhenya or Ashaiman.

3.2 Post Harvest Practices

Paddy is harvested at Asutsuare by teams of casual labourers. Practices are similar to those at Dawhenya, but there are some significant differences. Paddy is cut, but not stacked in the field, as it is in Dawhenya. Cutting is carried out by men, but threshing and packing into sacks is carried out by women. Threshing is carried out using threshing boxes in the field, by beating the panicles against the sloping sides of the box. A team of female labourers was observed carrying out threshing in this manner, and it is apparent that significant quantities of grain are lost by being hurled outside the box in the action of threshing. No attempt is made to recover the loss by, for example, placing the threshing box on top of a tarpaulin.

Harvesting takes place under variable conditions of drainage in the fields. Plots are planted at different times due to problems with scheduling and access to equipment for land preparation. The water management system will not allow drainage of plots ready for harvesting, but located next to immature plots. Thus, on occasion, plots must be harvested while still waterlogged. This practice was observed at Asutsuare; it results in the paddy remaining wet for several days, prior to drying at the drying floor. It also makes for muddy paddy.

Paddy is bagged and head-loaded to a point accessible by power tiller. It is then transported on trailers drawn by power tiller to the drying floor, for sun drying and winnowing. At Asutsuare, traders often purchase the paddy when it is still on the drying floor (this practice was not seen at Dawhenya, although it may occur there). A number of traders mentioned a custom whereby paddy is purchased after two days on the drying floor, with the trader supervising the finishing of drying for a final day. According to the traders this is because they do not trust farmers to dry the paddy properly, and so prefer to supervise drying and winnowing themselves. Poor drying practises are perceived by farmers, traders and millers alike to be a cause of poor quality rice and in particular high proportions of broken grains. It may not be the proportion of broken grains per se which is the problem from the traders point of

view, but possibly the fact that a high proportion of breakage is also likely to reduce the milling out-turn, a key determinant of overall profitability.

According to the project manager and traders interviewed at Asutsuare, there is a particular problem of high chaff content of paddy. This was confirmed by observation of a winnowing machine at Asutsuare. Problems with chaff are reportedly related to low levels of fertiliser application. The 'winnowing machine' consists of an adapted pesticide spraying backpack unit, of a type that is reportedly commonly used in cocoa cultivation. The unit is adapted to spray a jet of air, rather than pesticide, which is used to winnow paddy as it is tipped from bowls held overhead. It appears that machines are hired on a piece-rate basis from their individual owner-operators, primarily by traders who are purchasing paddy at the drying floors.

The problem of chaff content and winnowing quality gives the trader a strong incentive to supervise the drying and winnowing of paddy, to ensure that the chaff content is kept as low as possible. This practice is particularly common where there are credit connections between trader and farmer, allowing the process of purchase to be pre-scheduled with the trader playing a fuller post-harvest supervisory role.

Even if paddy is purchased ready bagged, most traders report having to re-dry paddy. This involves extra work or costs as the trader has to employ labour to carry out the work. One trader reported paying 3 US tins of rice for drying of 20 maxibags of paddy (equivalent to around C400 per bag). However, the price paid to farmers for paddy does not vary on the quality of drying or winnowing, and there is therefore little incentive for farmers to improve their practices in this area. Typical harvest and post-harvest costs are shown in Table 2 below.

Table 2: Typical Harvest and Post-Harvest Costs - Asutsuare

Operation	Cost per hectare
Cutting	C72,000
Threshing & Packing	C96,000
Transport o drying floor	C300/bag
Drying labour (paid in kind)	C19,000

3.3 Farm-gate Sales

All of the paddy from Asutsuare is marketed through market women. As mentioned above, sales by farmers frequently take place when the paddy is physically on the drying floor. This has a further advantage to the traders in that the quantity in each bag purchased can be measured out exactly using their own measures. This usually consists of 6 heaped buckets (No. 34 Nigerian bucket), which each weigh approximately 14.5 kg, thus producing an 87 kg maxibag (i.e. large size jute sack).

The most striking aspect of farm-gate sales at Asutsuare is the prevalence of storage activity by farmers. Most farmers reported storing at least part of their crop as bagged paddy in the large project warehouse, with the aim of selling later in the year to realise better prices. The warehouse is administered by an IDA member of staff, and there are no storage charges for farmers. It is not clear, however, why the Asutsuare farmers appear to be more able to postpone sales than farmers at other schemes. Storage losses do not appear to be a significant issue, and are not perceived by farmers or traders as a problem, with only some minor rodent damage reported.

Farm-gate price formation is the outcome of a number of influences, including a process of analysing production costs by IDA and the farmers' association to set an 'agreed' minimum target price, the influence of prices at other irrigation schemes and the influence of wider market forces. At the time of the survey the standard farm-gate price at Asutsuare was C40,000 per maxibag. However, this price was found to vary depending on the terms of the relationship between buyer and seller. If the payment is to be made by a trader in cash the current price was C38,000 per maxibag. Similarly, if a farmer is selling to a trader who has advanced him or her production credit then the price will be C2000 - C3000 below the 'going rate' i.e. C37,000-C38,000 per maxibag. One larger trader with extensive production financing operations among the Asutsuare farmers claimed to be purchasing paddy at C35,000 per bag, and this may reflect a degree of market power on the part of a particularly powerful trader.

Another striking aspect of farm-gate sales at Asutsuare was the strong seasonality of the terms on which sales take place, confirmed by a large number of respondents. During the period leading up to Christmas, sales to traders generally take place on credit, with traders paying farmers after a period of weeks or months. However, during the period of peak demand around the Easter period sales always take place on a cash basis.

3.4 Traders

Asutsuare appears to be somewhat less reliant on market women from Ashaiman for the marketing of its output. Traders interviewed tended to be from the surrounding area, or to be drawn from among the female farmers on the scheme, although traders from Ashaiman do also source from the scheme. There is some evidence that the mills at Asutsuare provide a similar focal point for a number of traders as the mills at Ashaiman provide for the Ashaiman traders. There is also a wide range of scales of trading at Asutsuare. One larger trader interviewed was also part owner of one of the three mills at the scheme, and buys in large quantities (up to 400 maxibags per month) from around 50 farmers who are provided with production credit, primarily in the form of inputs. This trader's main outlets are wholesale shops in Accra, particularly those around the Makola market area. Other traders purchase in smaller quantities and market rice to retailers and cooks who prepare food for sale to schoolchildren in the local area, and in surrounding towns such as Ada, Odumasi and Somanya. Some rice is also marketed to wholesalers in Kumasi, though this does not appear to be a major outlet.

Like the farmers, traders at Asutsuare appear to engage in more inter-seasonal storage than is apparent at the other schemes - though the main method of operation for most traders is still to turnover stock as rapidly as possible in order to release funds for further purchases.

Asutsuare Traders

Trader B buys rice from Dawhenya, Asutsuare and Afife. Asutsuare is the most important source of paddy, and trader B is also part owner of one of the mills there. All paddy purchased is milled at Asutsuare, and rice is sold to wholesalers in Accra. Rice is sold in non-returnable bags (purchased new at C550 each). Purchases of paddy may be made on cash or credit terms - but always for cash during the peak rice marketing period around Easter. Trader B provides production credit in the form of inputs and some cash to around 50 farmers on the scheme and is thus able to purchase paddy at C35,000 per maxibag (at the time of the study). At the present time some paddy is stored in the project warehouse at Asutsuare, since the market is not promising. Sales to wholesalers in Accra are usually on the basis of two weeks to two months credit. The selling price now is C39,000 - C40,000, and profits per bag for this time of year are low. Profits will be higher during the peak period.

Drying of paddy is a major issue for trader B. All paddy purchased from farmers to whom production credit is advanced is purchased on the drying floor. Purchases are also made from other farmers in bags, but care must be taken to ensure that it has been properly dried otherwise it must be re-dried at extra cost. Labourers can dry 20 bags of paddy/day at a total cost of C6,000 (i.e. C2000/day for each labourer).

The most important problems for trader B is cash-flow – particularly when cash is tied up in inputs purchased for farmers and rice is not selling quickly. In addition, the chaff content of milled rice is too high and customers have complained about this.

Trader C is from Odumasi and buys paddy only from Asutsuare. Paddy is milled at Asutsuare and rice is sold to regular customers (retailers or those who cook and sell rice in Kpong and the surrounding area). Paddy is purchased at C40,000/maxibag and milled rice is sold at C42,000/bag (containing 17 US tins). The profit margin for trader C is in the form of extra rice that is obtained from milling one maxibag over and above the amount required to fill the bag of milled rice. This is usually one or two US tins per maxibag. This 'extra' rice is retailed at C2,500 per US tin.

Trader C gives production credit (as inputs) to three farmers, and buys from them at C37,000 per maxibag. She buys from other farmers at C40,000 per maxibag. At the time of the survey (late Nov.) business is slow (she only purchased 3 bags of paddy this month) and all sales are on credit. Business will improve after Christmas and towards Easter, and sales will be made on cash terms. Paddy is usually purchased in bags from farmers, and often needs re-drying. She does this herself. The major business problem cited by trader C is defaulting customers who have received supplies on credit.

3.5 Milling

Milling there are three privately owned mills at Asutsuare which mill almost all of the crop. All the mills are Satake-type machines, and are powered by diesel engines. The milling charge at Asutsuare is C1,500 per maxibag, and reflects the higher costs of powering the mill using diesel in place of the electricity used at Dawhenya or Ashaiman. There does not appear to be a perception of any major differences in the quality of the milling between the three mills, though traders perceive milling quality as a problem. Traders at Asutsuare mentioned the problem of chaff and paddy present in milled rice, as well as the quality of polishing.

4. Afife Irrigation Scheme

4.1 Background

Afife Irrigation Scheme was first developed in the 1950s and has a developed irrigable area of 880 hectares. This year, 800 hectares of rice were planted for the major crop. The scheme is farmed by around 700 farmers, with yields of around 4 tonnes per hectare. Irrigation is entirely gravity-fed, and thus irrigation service charges are considerably lower than the other schemes surveyed at C50,000 per hectare. There is a farmers' association which works with IDA to manage the project, particularly with regard to the hiring of land preparation equipment. However, the farmers' association is not active in marketing the crop. Some efforts have been made by IDA management and farmers to interest GNPA in sourcing from the scheme. However, the price being offered by GNPA at C38,000 per maxibag is felt to be too low by farmers, so no sales have been made through this route.

The scheme is divided into 11 sections, each with its own drying floor and storage shed facility. There are also around 12 mills on the scheme which are privately run, together with one mill operated by the parastatal Ghana Food Distribution Corporation (GFDC). It is reported that this mill will now be divested from GFDC.

Seed supply at Afife was previously organised by IDA, but farmers now increasingly rely on their own seed, or from friends. A range of improved varieties are grown at Afife including GRUG 7 (introduced by IDA in 1992), CIAT (introduced in 1995, and now among the most popular) and TOX. In the field, a number of farmers were found to be cultivating a Thai variety that is reportedly very old (and therefore its quality must have deteriorated).

4.2 Post-Harvest Practices

Post-harvest practices are similar to other schemes with one or two important variations. Teams of male labourers carry out cutting and threshing. Threshing is carried out by threshing the panicles against a bottomless threshing box that is placed on top of a tarpaulin. Some threshing operations were observed, and again there were problems with harvesting taking place in waterlogged fields, resulting in muddy paddy that was also observed at the drying floors.

All other post-harvest practices are the same as those at Asutsuare. Drying and winnowing operations are carried out by women (and sometimes boys) who are engaged to assist with bird-scaring in the period leading up to harvest. Typical post harvest costs are given in Table 3.

Table 3: Typical Post Harvest Costs: Afife

Operation	Cost per hectare
Cutting and threshing	C100,000
Transport to drying floor	C19,000 – C24,000
Winnowing and drying	C48,000 (0.5 bags per acre)

4.3 Farm-gate Sales

Farm-gate sales follow a similar pattern to the other schemes, although there is some evidence that farmers are involved to some extent in milling paddy, which is sold to local market women as milled rice.

One large farmer at Afife mills some of his paddy using his own mill prior to sale in bowls to local market traders - the remainder of the crop is sold as paddy to market women from Ashaiman. Farmers sell milled rice at around C2,400 per enamel bowl (with extra handful) to local market women at the mill on the scheme which is run by GFDC. Farmers tend to be less involved in inter-seasonal storage than the farmers at Asutsuare, although those farmers who finance production from their own resources (or through loans from relatives) are able to store their crop after harvest for sale later in the season at improved prices.

4.4 Traders

All sales of paddy from Afife are made to market women. The market women who purchase from Afife tend to fall into two main groups. The first group consists of local market women who tend to deal in smaller quantities, buying paddy or occasionally milled rice from farmers. Milled rice is then sold by these traders at local markets in the surrounding region including, Agbozume, Akatsi, Dzodze, Denu and Dabala. The rice is sold by some in olunka (enamel bowl) measures - a form of low-level wholesaling to retailers from villages and other women who prepare cooked rice for sale. Some of these traders actually retail rice directly. Many of these traders come from the village of Avalavi, very close to the irrigation scheme, and are attempting to organise an association. The peak marketing period is at Christmas when they will be buying around 5 bags per market day. This group of traders has very limited financing connections to farmers. These traders also source rice from Lome in Togo at certain times of the year when rice is not available at Afife.

The second group of traders is the Ashaiman market women. This group of traders is more important in terms of the quantity purchased, and the volume of sales to Ashaiman women has reportedly been increasing over the past few years.

4.5 Ashaiman Market Women

The market women based in Ashaiman are a major influence in the marketing of rice from the irrigated schemes. Typically, these retailers live in Ashaiman and purchase from more than one of the irrigated schemes in the south-eastern part of the country i.e. Dawhenya, Ashaiman, Weija, Asutsuare and Afife. Afife and Dawhenya are generally cited as the most important sources of supply to these traders, and are also recognised to produce higher quality paddy. Similarly, it appears that the Ashaiman traders are of the greatest importance as an outlet for Afife and Dawhenya. At Asutsuare farmer-traders, and other locally based traders appear to be of greater importance.

In terms of turnover, traders cited purchases of up to 400 bags of paddy. (i.e. around 30 tonnes) per month during the busiest period of the year, which from the rice traders' point of view is during the lean season between January and March, and around Easter-time when demand for rice is increasing. During the slowest periods of the year, trade may virtually come to a standstill, particularly when large volumes of imports reach the market.

The seasonality of the rice trade is also reflected in the prices paid to farmers and in the terms on which transactions take place. During the lean season, when demand for rice is high and trade is brisk, prices are up to C10,000 per bag higher and payment is made in cash. Traders must pay farmers in cash, and similarly, retailers must pay wholesalers in cash in order to secure supplies. During the slower times of the year, purchases and sales tend to be made on credit. No interest is charged, but payment can be made up to a few weeks after taking possession of the stock.

The Ashaiman market women purchase paddy which is transported to Ashaiman for milling. Turnover is normally fairly rapid, as the women need to release funds quickly for further purchasing, and there is relatively little evidence of inter-seasonal storage to take advantage of price swings. However, the mills visited did have significant storage sheds close-by in which traders can store either paddy or milled rice for relatively short periods prior to its further movement thorough the marketing chain.

The main source of profit for the Ashaiman market women appears to lie in the manipulation of relatively small quantities. Broadly, one maxibag of paddy produces one 50 kg bag of milled rice, with an excess usually of between 2 and 3 American tins, depending on the quality of the original paddy (i.e. 5.6 to 8.4 kg or 11 to 17% of the total output of milled rice). The milled rice is sold for a price that roughly equates to the cost of production, i.e. the cost of the paddy plus transport, loading and processing costs. Thus the extra American tins constitute the profit margins of the traders, and are clearly perceived as such by them.

The Ashaiman market women are active financiers of rice production, providing production credit to farmers on the irrigation schemes in the form of inputs or cash. The largest traders will sponsor up to around 50 farmers with production credit. No interest is charged on such loans to farmers, but they do hold a number of advantages from the point of view of the trader, as follows:

- supplies are secured, and a stable relationship with suppliers is established;
- the price paid is generally C2,000 to C3,000 lower than the ruling market price;
- such arrangements reduce transaction costs for traders in sourcing supplies;
- supervision of the drying and winnowing of paddy is more common where there is a credit relationship between farmer and buyer.

Availability of credit is the major constraint for most Ashaiman market traders. With greater funds, more supplies could be purchased, and the possibility of storage for price increases could rise.

Ashaiman Trader met at Afife Scheme

This trader buys paddy from Asutsuare, Dawhenya and Afife. She also purchases from Anyrawase (an area of inland valley cultivation near Ho in Volta Region) when paddy is unavailable in the schemes. The quality of the paddy from Anyrawase is not as good as from the irrigation schemes. She buys most paddy from Afife, where the quality is better and she supplies credit to 12 farmers. At the busiest time of the year she buys around 100 bags per month, currently (November) she is buying around 50 bags/month. All paddy is milled at Ashaiman and rice is sold to retailers at Ashaiman and Tema. She currently buys paddy at C40,000 per maxibag. This produces, on average, a milling out-turn of 19 US tins, of which 17 tins go into a sack of milled rice (currently selling at C42,000).

Paddy is purchased usually from the drying floor and measured into maxibags using 6 heaped buckets ('Nigerian No. 34 bucket'). She never buys paddy that has been bagged by farmers. Most of the paddy comes from the farmers she supplies credit to, at a price of C2,000 lower than the ruling farm-gate price. When she buys from these customers she does not pay for 2 weeks. When buying from others she pays cash. Currently, she has to sell rice on credit, but after Christmas when there is less rice in the market she expects retailers to pay cash. She pays C1,600/bag to transport paddy to Ashaiman, including loading. Retailers buy milled rice from the mill. The main problem is the lack of finance, particularly to take advantage of the inter-seasonal price increases. Currently she is obliged to sell rice immediately in order to release funds.

4.6 Milling

A number of millers were interviewed. Mills appear to fall into two main groups – the more sophisticated 'Satake-type' mills often from China or Taiwan, and the more simple 'huller-type' mill. Most of the irrigated rice is milled in the former type. Probably around 40% of the paddy is milled in Ashaiman, with the rest either milled at the mills located in the irrigation projects, or at Pokoasi under the GNPA purchasing arrangement (in the case of Dawhenya).

Mill at Asutsuare

A female trader and a male miller jointly own this mill at Asutsuare. The mill reportedly used to be able to mill around 150 maxibags of paddy per day, when it was purchased for C5 million three years previously. Now it is only able to mill around 50 maxibags per day. At the busiest times of the year, around 50 maxibags are milled. The machine is diesel powered and requires 5 gallons to mill 50 maxibags, at a cost of C2,750 per gallon.

Maintenance of the machine, which is now around 20 years old, is a major headache: fan belts, rollers and sieves must be replaced regularly. The problem is the poor quality of locally produced 'imitation' spare parts. The miller quoted the need to replace sieves once every two weeks. New imported rollers cost C200,000 per pair – or C120,000 if the rubber roller is replaced locally; sieves cost C35,000 per pair. The miller explained that competition from electrically driven mills in town that have lower running costs is affecting the business. The mill appears to save on costs (in comparison to the Ashaiman mills) by obliging the owner of the paddy to provide labour for feeding the mill. There is also some competition between the three millers at Asutsuare – on the basis of milling quality. The poor quality of spare parts can affect milling quality resulting in the presence of chaff and poor polishing on milled grain.

Rough estimates of running costs and revenues (based on milling throughput of 500 maxibags/month) are given below:

Item	Value (Cedis)
Costs	
Diesel @ C2,750 per gallon (1 gallon needed to mill 10 maxibags)	137,500
Labourer	120,000
Spare parts (estimated)	200,000
Transport of rice bran @C400/bag (estimated)	40,000
Total cost (excluding depreciation)	**497,000**
Revenues	
Sale of rice bran (100 bags of rice bran – 1 sack of bran produced per 5 maxibags paddy milled)	300.000
Milling charges @ C1,500/bag	750,000
Total revenue	**1,050,000**

Clearly the milling business varies from season to season. The major problem consistently cited by all millers interviewed was the problem of spare parts for machines. Most millers use locally manufactured 'imitation' parts to replace sieves and rollers on machines. The quality of these spare parts is universally perceived to be low. Some millers do purchase imported spares - but these are difficult to obtain and considerably more expensive than local spares. Prices quoted for repair of new rollers were C200,000.

5. Marketing Margins and Costs

This section attempts to piece together information on the marketing margins and build up of marketing costs.

5.1 Milling Out-turn

Milling out-turn is a difficult subject to investigate, because it is through the manipulation of weights and measures that market traders achieve most of their profit. Thus, enquiries regarding typical milling out-turns (i.e. how many of what measure of paddy go into a mill in order to produce how many of what measure of milled rice) probe at the heart of traders' profitability. The miller at Kanawu estimated the out-turn to be 21 to 22 olunka[2] (which would equate to 60 to 62 kg milled rice) per 84 kg bag of paddy milled.

A summary of the various estimates of milling out-turn is given below in Table 4. The estimates suggest that the milling out-turn from a maxibag of paddy does vary to some extent, reflecting the quality of the paddy, and the milling process itself. In addition, it is clear that profit margins of traders depend crucially on the difference

[2] The term olunka is a term which appears to be used to refer to any measuring container. In this study it was found to refer to the 'American tin', a reused tin frequently used for measuring grains, and a 20 cm enamel bowl. These are slightly different measures. Weighing trials revealed that a heaped American tin contains around 2,849 g of rice and a heaped enamel bowl contains around 3,000 g.

between the milling out-turn from a maxibag of paddy, and the amount of milled rice actually sold in each bag.

Table 4: Summary of estimates of milling out-turn

Source of estimate	Milling out-turn per maxibag of paddy	Amount marketed in sack of milled rice
Rice miller, Ashaiman	21-22 US tins (60-62.5 kg)	
Rice miller, Dawhenya		18 US tins (51.1 kg)
Rice miller, Dawhenya	19 US tins (53.96 kg)	16.5 US tins (46.86 kg)
Rice farmer, Dawhenya	18 US tins (51.12 kg) for average quality paddy. 20-21 US tins (56.8- 59.6 kg) for good quality paddy	16.5 US tins (46.86 kg)
Asutsuare Project Manager	20-21 US tins (56.8- 59.6 kg) for good quality paddy	17 US tins (48.28 kg)
Rice trader/mill owner, Asutsuare	18 US tins (51.12 kg)	52 kg
Rice trader, Asutsuare	19-20 US tins (53.96-56.8 kg)	18 US tins (51.12 kg)[1]
Rice trader, Asutsuare	18-19 US tin (51.12-53.9 kg)	20 US tins (56.8 kg)[2]
Rice trader, Asutsuare	20 US tins (56.8 kg)	16.5 US tins (46.8 kg)
Rice trader, Asutsuare	16-20 US tins (45.44-56.8 kg)	17 US tins (48.2 kg)
Rice trader/farmer, Asutsuare	18-20 US tins (51.12-56.8 kg)	17 US tins (48.2 kg)
Rice trader, Afife	19 enamel bowls (57 kg)	17 bowls (51 kg)
Rice trader, Afife	16-17 bowls (48-51 kg)	15 bowls (45 kg)
Rice miller, Afife	16-18 bowls (48-54 kg)	
Rice miller, Afife	16-17.5 bowls (48-52.5 kg)	
Rice miller, Ashaiman	19-20 US tins (53.96-56.8 kg)	17 US tins (48.2 kg)

[1] This trader was actually observed in the process of filling bags with milled rice. Despite her claims, observation revealed that 17 US tins (48.28 kg) were placed in each sack.

[2] This trader was unique in placing a larger number of olunka in each sack of milled rice than the number realised from the milling out-turn from a maxibag of paddy. However, this was plausible as the price the trader claimed to charge per sack of milled rice(C50,000) was appreciably higher than those quoted by other traders.

Based on observation, average figures could be taken as follows:

- Weight of maxibag of paddy 87 kg
- Milled rice out-turn 54 kg
- Weight of sack of milled rice 48.5 kg

5.2 Marketing costs

Transport:

Transport charges vary according to the load size. Larger load sizes enable traders to pay a lower rate per bag, but it is not always possible to realise scale economies in this way. Transport is generally hired by traders and may be in the form of larger 'cargo' trucks or smaller Datsun minibuses or even taxis. Examples of transport costs are given in Table 5.

Table 5: Typical transport costs quoted

Journey	Estimated distance	Cost per maxi bag	Rate per maxibag per km
Afife- Ashaiman	130 km	C1,600	C12.3
Dawhenya-Ashaiman	16 km	C500	C31.3
Dawhenya-Accra	50 km	C700	C14.0
Ashaiman-Accra	35 km	C500-C1,000	C14.3-C28.6
Asutsuare-Accra	90 km	C800	C8.9
Asutsuare-Ada	100 km	C1,000	C10.0
Asutsuare-Accra	90 km	C800	C8.9

Loading and unloading costs:

Frequently, loading costs are included in transport costs. However, unloading usually results in charges for traders. Figures quoted for loading and unloading ranged between C100 to C600 per bag. An average figure would be around C400 per bag.

Bagging:

Bagging is not a major component of marketing costs. Traders generally make paddy purchases using their own jute maxibags that cost C1,200 each but which generally last for periods of up to three years. The jute maxibags are also repaired frequently in order to extend their life. Sales of milled rice are generally made in sacks of the type used for fertilisers and contain around 50 kg. Many of these white sacks are manufactured by GMG. They cost C350 to C600, depending on whether or not they are purchased new. Some wholesale traders sell the bag with the rice, while other

wholesalers who supply market retailers will collect used sacks from their customers for reuse.

Milling charges:

Milling charges vary quite widely. The standard rate at Ashaiman and also the mill at Dawhenya is C1,000 per maxibag. At Asutsuare the standard rate is C1,500 per maxibag, while at Afife, the GFDC mill charges C2,500 per maxibag. Other private millers generally charge one and a half 20 cm enamel bowls of milled rice in kind. This is equivalent to a charge of 4.5 kg rice, worth approximately C4,000 per maxibag. The variation in milling charges does not appear to be the outcome of lack of competition – because there are over 10 private mills at Afife. The mills at Ashaiman may be in a position to charge lower rates due to a higher overall capacity utilisation and their access to electrical power, which is reportedly cheaper than powering the mill with diesel. Mills at Asutsuare and Afife are diesel-driven.

Total marketing costs:

An example of accumulated marketing costs are summarised below in Table 6.

Table 6: Typical build-up of marketing costs; Ashaiman-based trader

Item	Cost
Cost of paddy (87 kg maxibag)	C40,000
Transport costs	C1,000
Loading/unloading costs	C400
Re-drying costs/labour	C500
Jute maxibag depreciation	C200
Cost of rice bags	C550
Milling charges	C1,000
Total	**C43,650**
Revenue (Based on milling out-turn of 19 US tins per paddy maxibag and a wholesale price of C44,000 per 17 US tin sack of milled rice)	C49,000
Profit per maxibag	**C5,300**

It is unlikely that many of the other traders will be able to realise the same margins as the Ashaiman traders, due to the fact that they are likely to pay higher milling charges, and may not be able to realise economies of scale in transportation. A more exact

analysis of the marketing margins for a representative group of traders would require more survey work, with direct measurement of quantities bought and sold, since the manipulation of weights and measures is a crucial determinant of trader profits. For example, practices such as the addition of an extra handful in measuring are common. Nonetheless, an initial assessment of trader margins would suggest that profits are not excessive. This would be expected given the large number of traders, and the competition that they face from imported rice in their main markets.

5.3 Price Information

Summaries of farm-gate prices and wholesale prices for various locations are given in Tables 7 and 8.

Table 7: Summary of farm-gate prices

Source	Price/maxibag	Notes/Terms of transaction
Dawhenya	C42,500	GNPA offer price for CIAT rice
Dawhenya	C40,500	GNPA price for other varieties – also paid by some traders
Dawhenya	C40,000	Prevailing farm-gate price quoted by Ashaiman traders
Dawhenya	C38,000	Price to trader supplying production credit
Asutsuare	C40,000	Prevailing farm-gate price quoted by farmers /traders supply on credit
Asutsuare	C35,000-C38,000	Prices quoted for traders supplying production credit
Asutsuare	C38,000	Price to traders paying cash
Afife	C40,0000-C42,000	Prevailing farm-gate price
Afife	C40,000	Price to trader supplying production on credit

Table 8: Summary of wholesale prices: local and imported rice

Source	Price/sack of milled rice	Comments
Local rice		
Ashaiman traders	C44,000	50 kg sack
Ashaiman retailer	C45,000	Price paid by retailer for sack of local rice
Asutsuare trader	C40,000	Quoted wholesale price for sack
Asutsuare trader	C42,000	17 US tin (48.3 kg) sack
Asutsuare trader	C50,000	20 US tin (56.8 kg) sack
Ashaiman trader	C42,000	17 US tin (48.3 kg) sack
Imported rice		
Ashaiman wholesaler	C40,000	50 kg sack of GNPA Pakistani 15% broken LG rice
Ashaiman wholesaler	C53,000	50 kg sack of IMEXCO[1] US style 'Lucky Rice' brand
Ashaiman wholesaler	C56,000	50 kg sack of Thai premium 10% broken LG rice
Ashaiman wholesaler	C45,000	25 kg sack of perfumed Thai rice

[1] IMEXCO is one of the major importers of rice in Ghana. It sells imported rice in 50 kg sacks under its own brand name of Lucky Rice.

5.4 Rice Retailing

Rice retailing was observed at a number of locations, and information was obtained from interviews with retailers and traders. Retailing usually takes the form of sale by volume measures based on heaped reused empty tins or bowls. Rice packaged in small plastic bags following measuring which is undertaken in front of the customer. The most widespread measures observed were reused tins that contained either 260 g or 480 g. Other retailing measures used in the Afife area in Volta Region were the 20 cm enamel bowl (weight 3,000g) and two other plastic bowl measures (weight of the smaller measure = 720 g, larger size weight unknown).

Retailers at the market centres in Accra, Ashaiman and the southern part of the country commonly sell a range of rice at different prices reflecting differing grades and colours. Commonly, a retailer will have a selection of three or four imported rices at different prices, along with a local rice, usually originating in one of the irrigation

schemes. Retailers purchase imported rice from wholesale shops, and local rice from market women who usually deliver rice to a number of regular retail outlets. Rice is commonly supplied on credit in this manner allowing retailers around two weeks before payment. During periods of high demand retailers may need to pay cash to secure supplies from traders, and also may collect rice from the mills.

Retail prices at various locations were collected, and are shown in Table 9 below, together with some comparative retail prices of imported rice. Some low-grade imported rice is retailing at prices marginally below the price of Ghanaian rice. Rice is also retailed in cooked form to schoolchildren, and in the form of 'waache' - a Ghanaian sticky rice dish, served with sauce.

Table 9: Summary of retail prices

Source	Price per kg	Unit and price
Ashaiman retailer	C962	C250 per 260 g tin of Dawhenya rice
Ashaiman retailer	C865	C225 per 260 g tin of low grade imported rice
Ashaiman retailer	C1,154	C300 per 260 g tin of imported 'Lucky Rice'
Ashaiman retailer	C1,346	C2,500 per US tin (2,840 g) of Asutsuare rice
Asutsuare trader/retailer	C880	C2,600 per 20 cm enamel bowl (3,000 g) of Afife rice
Afife trader/retailer	C867	C700 per 720 g bowl of Afife rice
Agbozume (near Afife) retailer	C972	

6. Issues Relating to Quality

Some preliminary observations can be made about potential influences on the quality of rice being produced by irrigation schemes.

6.1 Drying

Discussions with traders and millers highlighted drying as a major problem. Poor drying of paddy is widely perceived to lead to unnecessarily high levels of broken

grains when paddy is milled. Millers also cite the problem of caking on sieves as a result of milling poorly dried paddy. Traders, generally, do not trust farmers to dry paddy properly, and thus incur extra costs in employing labour to carry out re-drying, or spending time in supervising drying themselves - adding to the general transaction costs. Drying is a particular problem during the rainy months of June/July.

6.2 Winnowing

Winnowing is another problem area. Due to the use of volume measures for virtually all transactions, and the absence grading paddy, farmers have little incentive to ensure that their paddy is well winnowed before sale. This adds to the incentive for traders to develop credit relationships with farmers, because when tied in this manner it is easier for traders to oversee the drying and winnowing of the paddy. Winnowing is tested by throwing and handful of the paddy up in the air to observe the level of chaff content. Poor winnowing eats directly into the traders' profits by reducing milling recovery rates, and hence the amount of 'extra' rice which is accrued by the trader.

6.3 Foreign matter/stones

This does not appear to be a major problem. Threshing practices do not appear to introduce large amounts of foreign matter into the paddy, and the drying floor facilities are also helpful in this regard.

6.4 Milling Problems

Direct observation suggest that the mills suffer frequent and chronic maintenance problems. Rollers and sieves are constantly patched up in a fairly rudimentary manner. Millers acknowledge that this does have knock-on effects into the quality of the milled product. The use of very simple 'huller-type' machines for milling paddy also appears to result in a lower quality milled product with the presence of chaff and paddy grains.

6.5 Cooking qualities

A number of respondents mentioned that a key problem with local rice is the hardness on cooking. Some also mentioned that rice can have a high starch content which is not appealing to consumers.

7. Overall Market Flows and Patterns

In general most of the irrigated rice is grown in the south eastern part of the country, principally on the three irrigated sites surveyed. The majority of this rice is consumed in the Accra, Ashaiman, and Tema area. There is some evidence that irrigated rice reaches Kumasi, but the majority is clearly consumed in Accra/Tema. Some of the irrigated rice may reach other parts of the country (e.g. Takoradi, Kumasi etc.) via wholesale shops in Accra that are supplied by some of the larger market women who purchase from the irrigation projects. In addition, a proportion of the rice produced at each scheme is marketed in markets in the surrounding areas (e.g. Akuse, in the case Asutsuare; and Akatsi and Agbozume in the case of Afife) usually by local market traders operating at a relatively smaller scale.

The irrigated rice produced in Ghana does find a ready market in the urban centres, but it usually retails towards the lower end of the price scale. One or two imported rices are cheaper than the local irrigated rice, but they are low grade imports - and probably of lower quality than the Ghanaian irrigated rice. Most of the imported rice sells at prices that are higher than that of irrigated rice, and there is clearly a large market in urban centres of Accra/Tema, as well as smaller centres in the south, for rice of high quality. Nonetheless, the market for Ghanaian irrigated rice does not appear to be constrained - if there were more production, it could definitely find a market at the right price. Improvements in irrigated rice production and marketing practices would certainly enable Ghanaian rice to compete more effectively with imported rice. From a national point of view, realising the potential of rice production in inland valleys may be the most efficient means of promoting domestic production.