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Rice Parboiling in Ghana

A Socio-Economic Survey

by

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Natural
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EXECUTIVE SUMMARY

The main objective of this study is to analyse the socio-economic aspects of the rice parboiling process as part of a larger project funded by the DFID's Crop Post Harvest Programme aimed at improving the efficiency of rice parboiling. Rice parboiling is a major economic activity undertaken in northern Ghana entirely by rural women with the number of parboilers having risen in recent years. On the assumption that rice production data are reasonably accurate (output was estimated at 281,111 tonnes in 1998) then in excess 75,000 women and possibly as many as 120,000 women are estimated to be involved in parboiling - thus making a significant contribution to the sustainability of women's livelihoods in northern Ghana. However, the parboiled rice produced is of variable quality, thus contributing to its difficulties in competing with imported rice, which now accounts for in excess of 60% of domestic consumption.

The study is divided into six sections, the first three provide background information on the origins of the study and on various aspects of rice production in Ghana. This includes a brief review of the research methodology used - namely Participatory Rural Appraisal - and the limitations of these techniques and the data collected; alongside a short outline of the techniques and processes used in rice parboiling. The fourth and fifth sections contain detailed socio-economic analysis based on interviews and the data collected.

The fourth section concentrates on the production and processing techniques involved including an analysis of the importance of parboiling to poverty alleviation and women in Ghana; production and processing (including sources of paddy supply, transportation, processing capacities); quality considerations and constraints, including strategies to improve quality; cost structures and profits; financing and credit; associations, gender issues; consumer preferences and perceptions; and finally general and specific constraints facing the sector. The fifth section analyses the marketing of parboiled rice; assesses markets and market access, as well as prices, distribution channels, constraints and future trends. A final concluding section summarises some of the major findings of the previous sections and makes some recommendations as regards possible strategies to be pursued. In addition, there are two appendices, dealing with the Terms of Reference for the socio-economic study and the checklist of questions used during the discussions with the 13 groups of women parboilers in the Northern and Upper East Regions of Ghana.

All the parboilers surveyed were engaged in additional economic activities including farming, petty trading and food vending, although rice parboiling was the dominant income source, especially from November to May when parboiling is at its peak, with several bags of paddy (80kg each) being processed by a parboiler each week. Out of season a minimum of less than 1 bag is processed each week. The returns from their labour were invariably on the low side; a typical woman in the area may earn less than €100,000 a month - equivalent to approximately US\$ 25 at the current exchange rate (March 2000). This is partly due to the small scale of their operations and poor prices received.

An initial investment of approximately €211,000 (\$53) is required to purchase equipment - much of which is acquired second hand or initially borrowed. The lack

of credit and finance to purchase equipment and paddy for processing is a major constraint, with most parboilers using their own family resources to finance the operations. The relative simplicity of the processing operation means that the largest input cost (excluding labour costs) is paddy, invariably accounting for over 80% of variable costs.

Estimates of gross margins/contribution to labour costs are very sensitive to three items namely the cost of paddy, yield and the sale price of milled rice. Nine out of the thirteen groups made a "profit" on rice parboiling, while 4 groups in the Upper East appeared to make a "loss". Nevertheless, all the groups viewed parboiling as a "profitably" (if arduous) activity, which probably accounts for the continued expansion of parboiling activities. The approximate contributions to profit/labour margins for the Northern Region compares favourably with the going wage range for farm labouring, which was approximately € 3,000 per day.

Rice quality and affordability are deemed crucial in any effort to improve the competitiveness of locally produced rice. Parboilers assessed milled rice quality mainly on physical characteristics, including colour, percentage of broken grains, swelling capacity, cooking time, and keeping quality as well as odour, taste and stickiness. In the Northern Region, parboilers recognised quality differences between their rice and that of the Upper East Region. Factors accounting for regional quality differences included water quality, efficiency of mills, types of floor, technology used, heating intensity, degree of drying, presence of moulds, harvesting and post harvest practices

Strategies used by some parboilers to improve quality included pre-cleaning and sieving, cold soaking, covering the paddy when drying, sensitivity to the critical stages in the process, and the use of "alum" to improve the water quality. Processing yields tended to vary between regions partly reflecting the more thorough pre-cleaning, processing and milling in the Upper East.

Parboiled rice consumption is popular among the communities surveyed, in part due to traditional eating habits as well as affordability and availability. Almost all the respondents labelled parboiled rice as a food security commodity. Parboiled rice is seen as tastier and cheaper than imported rice and has better keeping quality.

Invariably parboiling was undertaken on an individual basis although the importance of group formation was recognised. Groups, each made of 15-20 parboilers, are common and often undertake a range of activities including contributions at social functions (e.g. funerals, naming ceremonies), equipment sharing, occasional collective paddy buying; and, helping members to seek medical attention. Parboiling is an arduous activity involving exposure to heat, bending and development of waist and backaches, and the bleeding of palms through stirring warm paddy.

Alongside financial constraints and the arduous nature of the process other constraints identified include problems of poor quality water, varietal mixing due to flooding, the inefficiency of mills, the high cost of transportation and limited space for drying.

Price information is obtained by parboilers from friends, mill operators and through market visits. While prices are dictated by demand and supply conditions, price determination is highly influenced by the cost of paddy rice at any particular period.

There are inter-regional and intra-regional differences in prices depending on the paddy price and other costs involved in processing in any given locality. The unimodal nature of rice production combined with the lack of storage facilities means that wide price variations exist between harvesting and lean seasons. Buyers are willing to pay a premium for good quality parboiled rice. The majority of parboilers sold their rice at the milling sites, mainly because of high cost of transporting it to market centres. Some is sold at the local market but this is limited, partly because of the marketing and possible storage expenses involved. Local rice is distributed informally to consumers through a number of channels including direct sales, and through itinerant traders and retailers.

Rice is sold by volume rather than weight, using a combination of bags, basins and bowls as a means of measurement. However, the use of "arm walls" leads to variations in volumes. There are no formal grading and measuring systems but price differentials in relation to quality exist in all the markets visited. Despite trade liberalisation since 1983 and the resultant flooding of the Ghanaian market with imported rice, the consumption of locally parboiled rice is rising, partly because of devaluation of the cedi. Rice has become a staple of the Ghanaian diet and demand is growing rapidly, in part because of the relative ease of preparation. Within this market there is a growing demand for higher quality rice

Rice parboiling as undertaken in northern Ghana is time-consuming, laborious, and utilises large quantities of firewood and water. An improvement in rice parboiling activity and techniques should be recognised as an effective strategy of poverty alleviation for women in northern Ghana. The dissemination of current best practices combined with the development of a technology (or technologies) to improve local rice's competitiveness through quality improvement, would increase parboilers profit margins and increase their income. Other beneficiaries would include smallholder rice farmers, rice millers and consumers.

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1. INTRODUCTION AND BACKGROUND

1.1 Purpose, Objectives and Structure of the Study

The main objective of this study is to analyse the socio-economic aspects of rice parboiling in northern Ghana. Rural women using traditional small-scale technologies undertake all the parboiling. The parboiled rice produced is of variable quality, which contributes to its inability to compete with imported rice. The study is divided into six sections. This introductory section provides background information on the origins of the study and the project as well as various aspects of rice production in Ghana. The second section briefly reviews the research methodology used and the limitations of the data sources that are available for the analysis. A third section provides a short outline of the techniques and processes used in rice parboiling. The fourth and fifth sections of the study contain detailed socio-economic analysis of the data collected. In the fourth section aspects of the production and processing techniques are analysed. Topics covered include the importance of parboiling to poverty alleviation and women in Ghana; production and processing (including sources, constraints, seasonality and transportation); cost structures and profits; financing and credit; quality considerations and constraints; gender issues; consumer preferences and perceptions; and finally general and specific constraints facing the sector. The fifth section analyses the marketing of parboiled rice and deals with markets and market access, prices, distribution channels, constraints and future trends. The concluding section summarises some of the major findings of the previous sections and makes some recommendations as regards possible strategies to be pursued. There are two appendices, the first contains the Terms of Reference for the socio-economic study and the second contains the checklist of questions used in the group discussions.

This study forms part of the first phase of a project being funded by the Department of International Development's (DFID) Crop Post Harvest Research Programme (CPHP). The overall project title is "Improving rice-parboiling efficiency (Project A0921 and is lead by Mrs Lynda Hammond of the Natural Resources Institute (NRI), Chatham, Kent, UK and Mr. John Manful of the Food Research Institute (FRI), which is part of the Council for Scientific and Industrial Research (CSIR) in Accra, Ghana. The Rice Parboiling project's aim is to improve the efficiency and variable quality of rice parboiling in northern Ghana. This project aims to assess the importance of parboiling to poor households, (particularly to women's income); identify best practices for optimal quality using existing technologies; and examine possibilities for introducing more efficient, and less arduous new technologies which will improve quality and thus market price. Thus, a major objective is to identify interventions for improvement to the current system together with appropriate technologies to suit higher outputs; it is envisaged that the upper level of production will be in the region of 500 kg per day (compared with a current maximum of around 100 kg per day). The project aims to identify suitable parboiling technologies which would satisfy the demands of the consumer, meet with socio-economic and environmental considerations and increase production, whilst retaining the women's dominant role in parboiling.

1.2 Overall Project Outline and Activities

The project can be separated into three parts.

A. The identification of levels of output and factors affecting the quality of parboiled rice produced by rural women.

This involves a number of activities of which include:

A socio-economic survey in which an initial Participatory Rural Appraisal (PRA) was conducted with rice parboilers in Upper East and Northern Regions of Ghana to determine social factors which affect the structure of the sector and provide qualitative guidance in selecting villages for the evaluation of parboiling processes adopted by women parboilers in these regions. Based partly upon the findings of the PRA, a number of villagers in the two regions have been selected for more detailed evaluation of their processing operations. In addition, rice samples after processing will be taken and analysed for physical quality parameters. Quality parameters will be correlated to processing methods to determine intra-regional as well as inter-regional factors affecting rice quality.

Technical evaluation of current parboiling practices to include collection of field data with regard to paddy preparation, soaking and drying regimes. Quantities of firewood and water used in the process will be established

Laboratory analysis of the parboiled rice for physical quality parameters such as colour, equilibrium moisture content, white centres and pecks (grains blackened by the parboiling process) to be carried out by FRI and NRI.

Assessment of rice quality using consumer acceptance trials (taste panel tests in country). These will be carried out using untrained panellists in three urban centres (Accra, Kumasi and Tamale). The results will be subject to statistical analysis.

B. Identification of suitable technologies to improve and increase production

This involves a number of activities:

Using data from the above activities, critical unit operations in the currently used process which affect quality (both positively and negatively) will be identified and investigated.

A review will be undertaken of suitably scaled parboiling technologies currently in use in Asia and other regions of Africa which could have application in Ghana.

Development and manufacture of pilot rice parboiling technologies by FRI workshops, in collaboration with rural parboilers, and field testing in two areas.

Comparative assessment of rice quality from traditional and introduced technologies using laboratory analyses and consumer acceptance trials (similar to A above). The

views of market traders with regard to the quality and possible price differentials for this rice will be sought.

Technical, financial and social evaluation of field trials; the views of those involved in the field trials will be sought and data from records examined.

C. Dissemination of findings

Preparation of a simple handbook/poster and video detailing best practices for the currently used technology and recommended improved technologies aimed at extension workers and parboilers.

International workshop to disseminate research findings. Introduced technologies will be demonstrated and there will be an opportunity for participants to examine and taste the products.

Scientific paper written and submitted for publication

1.3 Related Projects

A number of other projects have been undertaken which are relevant to the current project. Thus, a previous project funded by CPHP (Project R6688) provided the initial background material upon which the current research proposal was built. Results and recommendations arising from that project included:

- There is a potential for improving the quality of parboiled rice produced in Northern Ghana.
- Since the availability of paddy is not a constraint, there may be opportunities for further improving the existing technologies so that larger volumes of paddy can be processed with the dual objectives of both improving quality and lowering costs
- Since firewood is becoming scarce in areas of northern Ghana research might be usefully conducted to investigate alternative fuels

The study established that the quality of locally produced rice is very variable and that a price premium exists for high quality rice. In the Upper West Region (where better quality parboiled rice is produced) the premium was reported (in 1996/97) to be ₵18,000 per 80 kg bag, whereas in the Northern Region (which produces the poorest quality parboiled rice) a loss of ₵2000 was reported (₵2800 =£1) The report concluded that traders in the Northern Region were unaware that they were making losses as the cost of family labour for processing operations (e.g., collecting firewood and water, as well as carrying out the actual parboiling process) is not valued. It was estimated that 65% of the cost of rice processing could be attributed to the parboiling operation.

Other previous work that has been undertaken on parboiled rice includes:

Quality perceptions for parboiled rice produced using a system developed by NRI and the Rice Processing Research and Development Centre (RPRDC) in Sri Lanka were established in 1996 under a project funded by the CPHP. The parboiling system used in this study was aimed at the larger-scale parboiling industry and used a vacuum

system to reduce soaking time prior to parboiling. This system has good potential for those countries using centralised parboiling systems and employing a cold soaking regime but perhaps would be inappropriate for Ghana. However, the scope for its introduction will be assessed as part of this project.

An earlier study carried out in Indonesia (NRI Bulletin 55) identified colour as being one of the key factors affecting quality/value relationships for parboiled rice. Project R6688 has shown that there is large colour variation between rice produced in the Northern Region and that produced in the Upper East and Upper West Regions. The causative factors for this regional variation in quality will be a focus of attention for this project, since any improvements will have a direct impact on the income of poor rice farmers.

The Central Food Technological Research Institute in Mysore has carried out research into small-scale parboiling through the DFID Eastern India Rainfed Farming Systems Project, Bihar.

Intermediate Technology has also worked on small-scale parboiling in Bangladesh in the early 1990s. Work has also been carried out by the University of Ilorin in Nigeria and by the University of Sierra Leone. These institutions will be contacted during the review of parboiling technologies to ascertain the potential application of their findings to rural parboiling in Ghana.

1.4 Assumptions and Limitations of the Study

There are several dangers and shortcomings associated with informal data collection undertaken using PRA techniques. There is a danger that the collection exercise might confirm bias, preconceptions and stereotypes. Some of the specific limitations of the analysis and PRAs include:

- difficulties in trying to generalise from the specific data collected
- inadequate availability and accuracy of secondary data
- procedures and methods when using an interpreter
- inadequate, inconsistent and conflicting information from some of the informants
- difficulties in drawing workable conclusions from confusing data
- presentation of statistical results using data collected by informal methods.

Considerable care has also to be taken in using the price and cost data. In part, this arises from spatial variation at any one time but mainly because of price inflation and the rapid depreciation of the cedi. Thus between January 2000 and July 2000 the number of cedis needed to buy a dollar has almost doubled.

1.5 The Rice Sector in Ghana

Rice has become a staple in Ghana only in recent times although the crop has been cultivated for several centuries. It is an important food for urban dwellers and is taking over from traditional, mainly root crop, staples. The most significant attempts at increasing its production were made during the last world war (1939-1945), in the early sixties and in the early seventies (Asafo, 1985). Factors encouraging increased consumption included rising incomes, favourable government pricing policies and

ease of cooking (Oteng 1997). Cultivation of rice in Ghana is spread throughout the country. The crop is grown in the savannah areas in the north and the swamps in the south. The most suitable soils for rice cultivation are heavy alluvial soils that are either flooded or waterlogged occasionally or subjected to artificial irrigation.

Annual rice production has increased considerably since 1990, when 81,000 tonnes of paddy rice were produced, to 281,000 tonnes in 1998 (see Table 1). Over 65% of the crop is grown in two northern regions – Upper East and Northern Regions - with 75% of production from rain-fed land. The greatest potential for expansion is the Savannah zone, which covers almost the whole of the northern half of the country. Rice is a cash crop - an estimated 80% of rice produced is sold; the remainder is consumed at household level or kept for seed. It is an important, income-generating, commodity for women as they are involved throughout the production chain from planting to trading (Manful and Hammond, 1998). Processing, particularly milling has been identified as a constraint to improving the quality of local rice, which is considered not to be of comparable quality to imported rice (Bam *et al*, 1998). Liberalisation of trade has led to a steady increase in rice imports (SOFRECO, 1996). In 1996, imports were estimated at about 170,000 tons. Imported rice generally sells at a higher price than local, and is considered to be of a higher quality. Over time there has been a shift by importers to handle higher quality rice, as it sells faster (Day *et al* 1997; Bam *et al*, 1998). The recent study by Day *et al.* (1997) stated that approximately 200,000 tonnes of the rice consumed in this country is imported. About 280,000 tons of paddy is produced annually and this would yield about 170,000 tons of milled rice (MOFA, 1998). The imported rice therefore sets the standard and price against which local rice is traded. The main consumption areas for rice were found to be urban areas in the south - notably Accra and Kumasi. In the rural areas, rice is grown as a cash crop, and most of it is sold, with little being retained for home consumption.

TABLE 1 GHANA RICE PRODUCTION AND HECTARAGE 1995 TO 1998

	GHANA			UPPER EAST REGION			NORTHERN REGION		
	OUTPUT Tonnes	AREA Hectares	YIELD T/Ha	OUTPUT Tonnes	AREA Hectares	YIELD T/Ha	OUTPUT Tonnes	AREA Hectares	YIELD T/Ha
1995	221290	99910	2.21	75900	31800.00	2.39	64200	24000	2.68
1996	215720	105250	2.05	82200	37900.00	2.17	49380	24000	2.06
1997	197063	117722	1.67	83400	46350.00	1.80	19200	24000	0.80
1998	281111	130393	2.16	129306	49733.00	2.60	54000	30000	1.80

Source: MOFA PPMED

Rice is cultivated in four main ecological areas in Ghana, namely

- i. Rainfed upland – northern Ghana
- ii. Rainfed lowland – northern Ghana
- iii. Inland swamp – inland valley of central Ghana
- iv. Irrigated – northern and southern Ghana

The irrigated ecosystem covers about 5% of the total rice growing area of Ghana, while rainfed uplands ranges between 10% and 15% and rainfed lowland accounting for a maximum of 65% (Oteng, 1987). Although rice is grown in all the

administrative regions of Ghana, the northern regions have in recent times been identified as the major rice growing area. Day *et al.* (1997) also found out that the irrigated fields contribute about 25% of national production.

Irrigated Schemes

In the irrigated areas of the south, farmers harvest by hand and thresh the paddy in the field into boxes or tarpaulins. The crop is then dried on cement drying floors, after which it is bagged, stored or sold. Harvesting is undertaken in March and September.

In most cases, the paddy is sold to small traders who deal in volumes of 50 to 100 maxi bags of rice (c 87 kg) per week during the main rice season. These traders, predominantly women, come and buy the crop, often while it is on the drying floor, or from the farmer's home. The paddy is purchased by the maxi-bag, approximately 87kg. The traders take the paddy to small local mills to convert the paddy into rice. These mills are of variable quality from Engelberg hullers to more modern Satake rubber roll machines. The outturn was found on the average to be about 62.5% (Day *et al.* 1997). The rice is sold in mini bags weighing approximately 50kg.

Inland valleys of Central Ghana

Rice production here is from small and scattered plots in variegated valley configurations. The *glaberima* (local red) type is quite widespread as well as the *sativa* varieties. The paddy is harvested panicle by panicle and stored. Threshing is done only when the paddy is ready to be sold or consumed. Threshing as well as drying tends to be done on bare earth floors or roadsides. The result is admixing of dirt and stones into the rice, reducing its quality and damaging the screens on the mills.

Inland valleys of Northern Ghana

In northern Ghana, harvesting of rice is undertaken in December and January when the relative humidity is very low. This leads to stress factors in the paddy grains leading to excessive breakage during milling. Parboiling overcomes the problem of milling breakages.

Rice parboiling in Ghana

Rice parboiling is a large "cottage" industry in northern Ghana, where almost all rice produced is parboiled. The women involved buy small amounts of paddy, parboil up to a bag a day, which is then milled and sold on the local markets. The rice is parboiled in batches of approximately 80 kg by rural women using traditional technologies (metal cooking pots, open fires, earth drying floors etc). Rice processing, therefore, contributes to livelihood sustainability in these regions. However the quality of the parboiled rice has been shown to be very variable and not competitive with imported milled rice (see project R6688). Moreover, the work is time-consuming, laborious, and utilises large quantities of firewood and water. Since the women parboilers have their parboiled paddy milled on a custom basis, any increase in profits due to improved quality would, therefore, accrue directly to them.

In 1998 the Ghanaian government established a working party to examine the problems associated with small scale rice processing in order to increase the competitiveness of locally produced rice (MOFA 1999).

Rice consumption and trade

In West Africa, dramatic changes in consumption habits have led to an imbalance between rice demand and supply. Rice consumption has approximately doubled between 1970 and 1990. The World Bank projects that annual growth will remain high with the importance of rice's share in consumers' diets steadily increasing. The review also states that rice has become strategically important for the region's small farmers. It is estimated that only about 15% of the 20 million hectares of inland valleys in West Africa are currently cultivated. There is, therefore, potential for rice production to expand. However, unless rice processing technologies can produce a marketable product, consumer demands will not be satisfied by locally produced rice.

The rice market in Ghana is predominantly supplied by imports, with local rice having a market share of approximately 40 per cent of the rice consumed. The Ghanaian Ministry of Agriculture is concerned about this situation and is attempting to identify measures to help to increase the competitiveness of its local rice. If the growing urban markets are to be satisfied, production will need to increase. This may be achieved by encouraging women to produce more parboiled rice of a better quality, at the present scale of operations or may involve up scaling.

2. RESEARCH METHODOLOGY

The research methodology outlined here refers only to the socio-economic study, fieldwork for which took place in March 2000, following on from a visit to northern Ghana by Lynda Hammond, John Manful and Patience Larwer in February 2000. Just prior to undertaking the socio-economic fieldwork, several meetings were held between FRI and NRI staff, in which details of the field visit to northern Ghana were discussed and a detailed questionnaire was prepared. Appendix 2 contains the checklist of questions.

During the first half of March 2000 fieldwork was undertaken in the Northern Region and the Upper East Region. Participatory Rural Appraisal (PRA) discussions were held by Wilhelmina Quaye and Peter Greenhalgh with thirteen groups of women rice parboilers, with the size of the groups ranging from 9 to 48. In all, there were 5 groups in the Tamale/Nyankpala area (Northern Region), and 8 in the Upper East Region at Bawku, Navrongo, Pusiga and Zebilla. Discussions on rice were also held with Ministry of Food and Agriculture (MOFA) extension officials, who also provided price and production statistics. Discussions were also held with Dr K O Marfo, the Director of the Savannah Agriculture Research Institute in Nyankpala, Prof. Dittoh, Dean of the Faculty of Social Sciences, University of Development Studies, Nyankpala and Ms Augustina Benlu of the IFAD/LACOSREP office in Bolgatanga. In addition, a visit was made to the rice milling operations of ICOUR (the Irrigation Company of the Upper Regions).

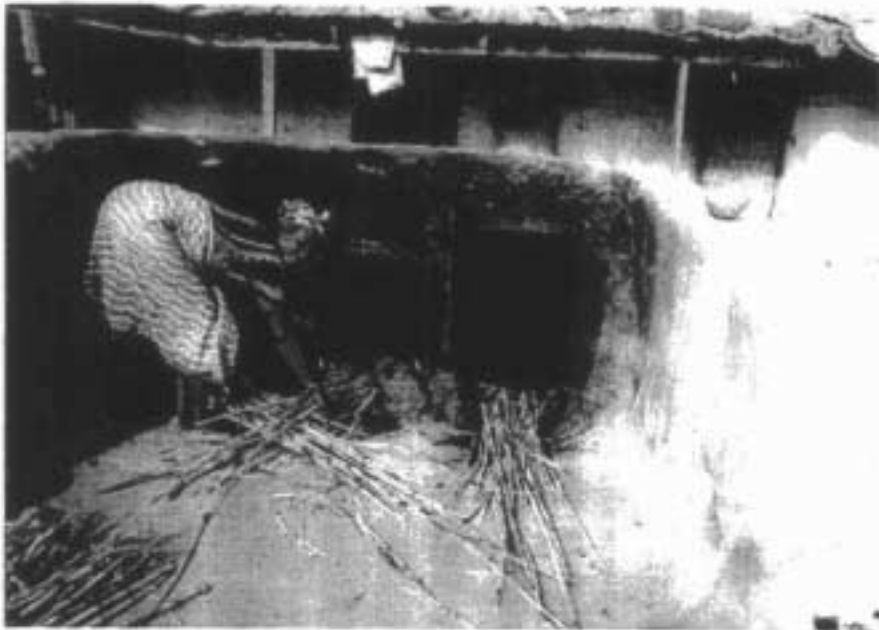
In mid March upon the return to Accra three days were spent in discussions regarding the data collected, the structure of the report and the content and timing of each authors inputs. In addition, further economic data were collected on the rice sector through discussions at the University of Ghana. Individual contacted included with Dr. N V Nyanteng and Dr Seini, of ISSER (Institute of Social, Statistical and Economic Research) both of whom had undertaken research on the rice sector. Discussions on rice were also held at the Department of Agricultural Economics with Dr Ramatu Al Hassan, Head of Department and Dr Samuel Asuming- Brimpong. Limited data on rice were also collected from the Ghana Export Promotion Council and the United States Department of Agriculture at the US Embassy in Ghana (Yaw Asante Kwabiah).

3. TECHNIQUES OF RICE PARBOILING IN GHANA

Parboiling is a thermal hydration process, which is used to produce hardened rice kernels, which are less susceptible to breakage on milling and to subsequent insect infestation. Parboiled rice also has distinctive cooking qualities and enhanced nutritional composition. Parboiling processes vary in scale and complexity ranging from household operations, similar to those detailed below, to large scale (>4 tonnes per hour) parboiling plants which use high pressure steam generation and artificial drying.

In northern Ghana the hot dry climate leads to the incidence of thermal stress fractures within the rice kernel. If milled raw, this rice would produce almost entirely broken grain. To overcome this problem parboiling is carried out by women in rural and peri-urban areas using a very simple technology. The procedures used vary from village to village (Hammond and Manful 2000) but always include the following unit operations.

- Soaking - in cold or hot water. Water enters the rice kernel and fills the interstitial spaces in the endosperm and the starch granules swell. In Ghana a period of hot soaking is employed, though in some regions this is preceded by a cold soaking period.



Heating water for soaking paddy (Upper East Region)

- Steaming. Under hot, moist conditions the starch granules continue to swell until they burst open, allowing the individual starch molecules to intertwine with those from adjacent granules. This process is known as gelatinisation. Steaming is carried out over open fires using aluminium pots. A small amount of water is placed in the pot with the soaked paddy and allowed to boil until the paddy is considered to be fully gelatinised and ready for drying.



Steaming paddy (Northern Region)

- **Drying.** The steamed grain is dried and spread on the ground to dry in the sun. As the starch granules dehydrate they shrink back to their original size. The starch molecules, which have intertwined between individual starch granules, remain coupled and therefore create a bond across any cracks, which may have been in the kernel.



Spreading parboiled paddy to dry (Northern Region)

- **Milling.** When completely dry the parboiled paddy is milled, usually on a steel huller rice mill, firstly to shear open the husk and allow the kernel to be exposed and then to remove the soft bran layers from the grain by friction/gentle abrasion.

4. SOCIO-ECONOMIC ASPECTS OF RICE PARBOILING

4.1 The Importance of Rice Parboiling

Women exclusively undertake rice parboiling¹. Generally, the income levels of the women in the survey area were low. Although the women interviewed were engaged in a number of economic activities including farming, rice parboiling, petty trading, groundnut oil and shea butter extraction and food vending, the returns from their labour were invariably on the low side. A typical woman in the area may earn less than ₵100,000.00 (one hundred thousand cedis) a month – equivalent to approximately US\$ 25.00 at the current exchange rate (March 2000). This is probably due to the small scale of their operations, which do not provide economies of scale for higher profits, alongside poor pricing systems. Rice parboiling was the main income generating activity for the majority of the women interviewed in both the Northern and Upper East Regions, contributing about 62.5 percent on average to total income (Tables 2 & 3 and Figs 1 & 2). To some extent, rice parboiling was viewed as an all-year round activity, although the peak period was November to May following the harvest (Fig 4). Although the exact figure of the number of women involved in rice parboiling activity in the study area was not available, an approximation of 25,000 to 30,000 parboilers² was made based on current production levels and the processing capacity per woman. As local rice production has increased the number of parboilers has risen. However, this number does not include other members of the extended family who assist with various aspects of the process, and invariably include 2 or 3 people for each parboiler. Thus, in excess of 75,000 women and possibly as many as 120,000 women are actively involved in rice parboiling. In addition, there are many other women indirectly involved through the collection and sale of water and fuel.

Thus, considering the large number of women involved in rice parboiling, it is obvious that a technology which improves the competitiveness of local rice through quality improvement, would increase profit margins and increase income levels of the women. It was also observed from the survey that traditionally, rice parboiling activity was passed on from generation to generation. Young females who were supposed to help their mothers on the job eventually became rice parboilers while older women who had retired from active work became "consultants" to inexperienced parboilers. Many other women were encouraged to take up rice parboiling activity in order to ensure its sustainability. Socio-culturally, rice parboilers were perceived as hardworking women and certainly an improvement in rice parboiling activity and techniques should be recognised as an effective strategy of poverty alleviation for women in northern Ghana.

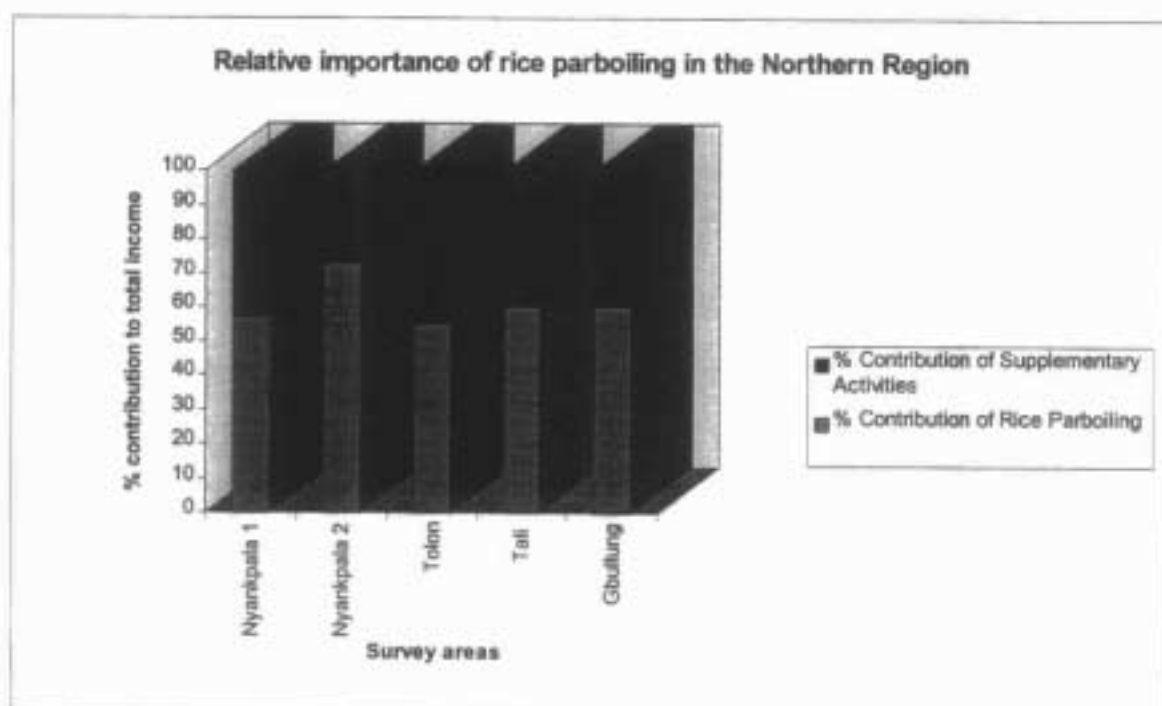
¹ For further discussion, including exceptions, see Section 4.9

² Estimates by the Statistics Division of MOFA (PPMED) suggest that paddy rice production averaged 229,000 tonnes per year between 1995 and 1998. Assuming there are 12 bags of paddy in one tonne and that the average number of bags processed by each parboiler is 100 bags per year then the number of women parboilers would total approximately 27,500. In addition, there are often 2-3 other family members assisting parboilers with some aspects of the process.

TABLE 2 RELATIVE IMPORTANCE OF RICE PARBOILING ACTIVITY IN THE NORTHERN REGION OF GHANA

	Survey Areas				
	Nyankpala 1	Nyankpala 2	Tolon	Tali	Gbullung
% Contribution of Rice Parboiling	56.7	72.5	55	>50	>50
% Contribution of Supplementary Activities	43.3	27.5	45	<50	<50
Total Income	100	100	100	100	100

FIGURE 1



Supplementary Activities Undertaken

- | | |
|-----------------------------|-------------------|
| 1. Groundnut oil extraction | 4. Food vending |
| 2. Shea butter extraction | 5. Farm labouring |
| 3. Farming | 6. Petty Trading |

TABLE 3 RELATIVE IMPORTANCE OF RICE PARBOILING IN THE UPPER EAST REGION OF GHANA

	G1	G2	G3	G4	G5	G6	G7	G8
%Contribution of Rice Parboiling	>50	80	>50	60	65	>50	>50	50
% Contribution of Supplementary Activities	<50	20	<50	40	35	<50	<50	50
Total Income	100	100	100	100	100	100	100	100

- | | | | |
|----|-----------------|----|-------------------------|
| G1 | Zebilla 1 | G5 | Bawku Gingande |
| G2 | Zebilla 2 | G6 | Bawku Gonduri |
| G3 | Pusiga Tesungo | G7 | Navrongo Sabora Langa |
| G4 | Pusiga Sarabogo | G8 | Navrongo Sabora Dorania |

FIGURE 2

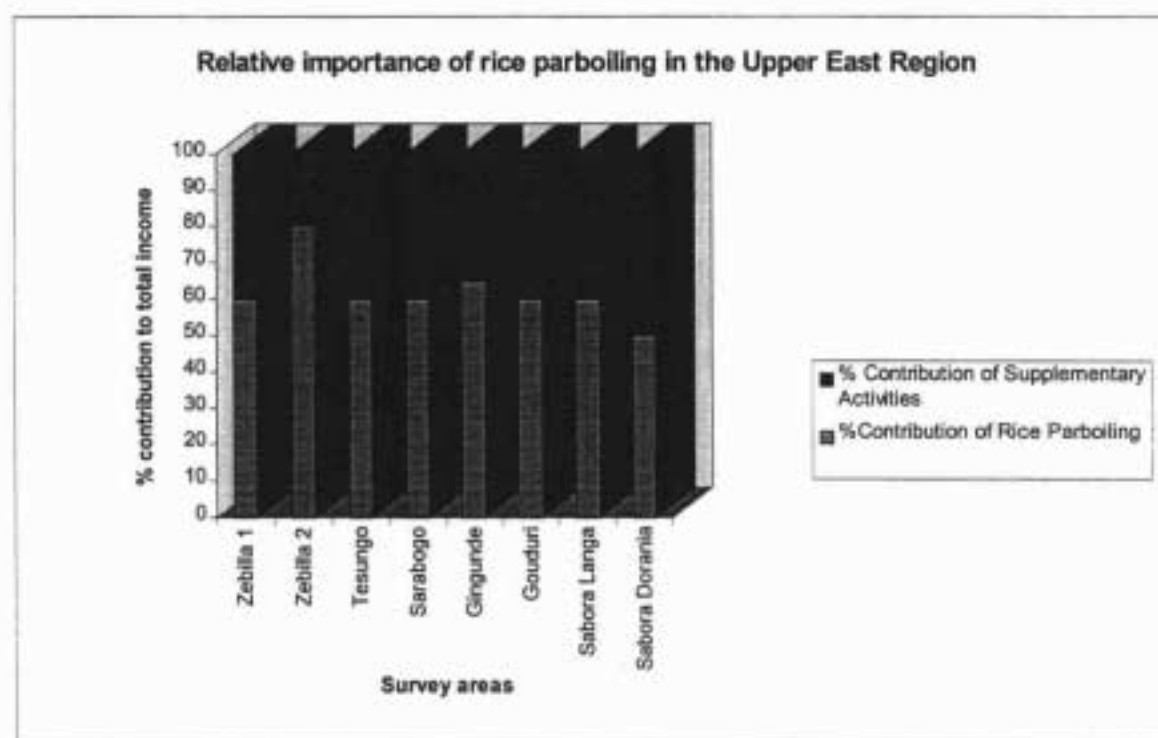
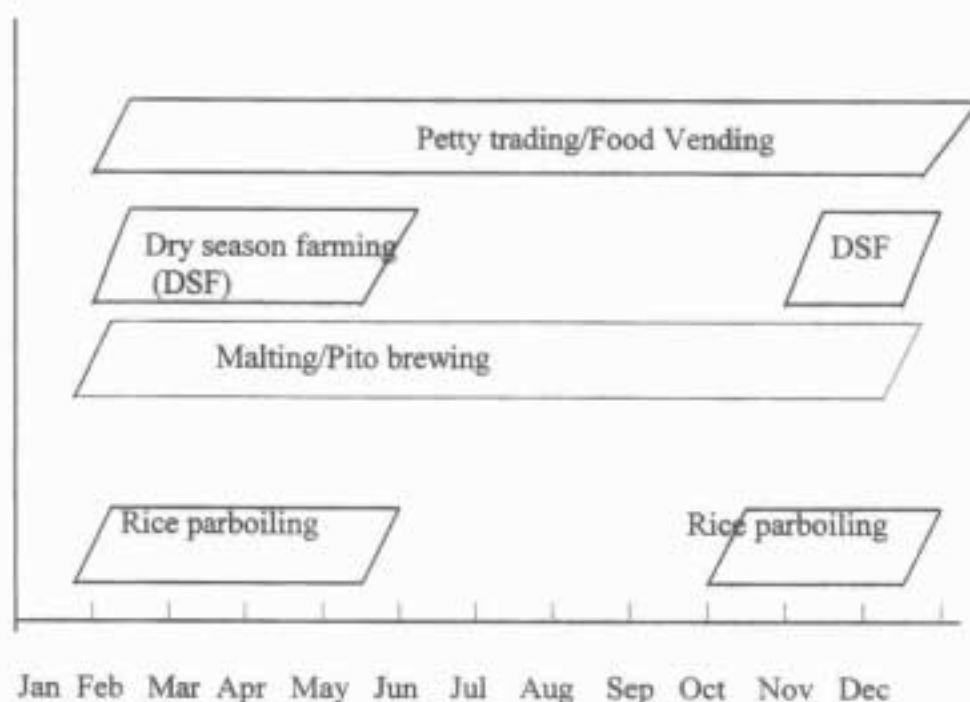


FIGURE 3 SUPPLEMENTARY INCOME GENERATING ACTIVITIES

Supplementary Activities	G1	G2	G3	G4	G5	G6	G7	G8
Farming	√	√	√	√	√	√	√	√
Petty trading	√	-	√	√	√	-	√	-
Shea butter processing	√	-	√	√	-	√	√	√
Pito brewing	√	-	√	-	-	√	√	-
Ground Oil Extraction	-	√	-	-	-	-	-	-
Malting	-	√	√	-	-	-	-	-
Food Vending	-	-	-	√	-	-	√	√
Groundnut Shelling	-	-	√	√	-	-	√	-
Pottery Making	-	-	-	√	-	-	-	-
Farm Labouring	√	√	√	√	√	√	√	√

See Table 3 for key to districts

FIGURE 4 CALENDAR OF ACTIVITIES OF RESPONDENTS



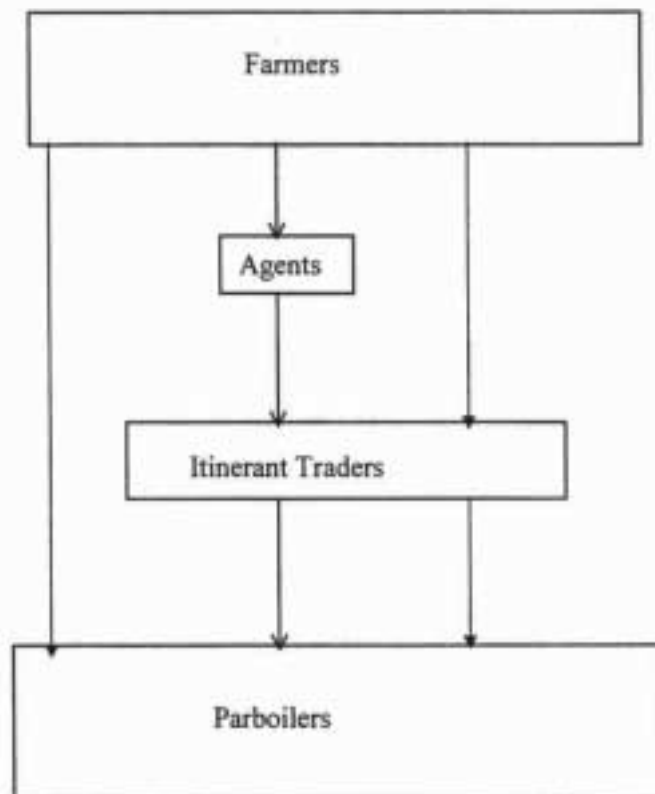
4.2 Production and Processing: Sources of Paddy Supplies

Paddy rice is usually obtained from within a radius of 8 km of the women's compound, where the parboiling is invariably undertaken. The paddy is purchased from farmers in the various localities, including the surrounding villages, as well as from the local market and sometimes from outside markets. Parboilers at Navrongo sometimes obtained paddy from the Ministry of Food and Agriculture's Irrigation Company of the Upper Regions (ICOUR). The majority of parboilers buy from farmers who inform them when paddy is available for sale in their houses. Usually paddy sales are made on a cash and carry principle but sometimes it is sold on credit with no interest charged. This is especially the case when there is excess supply. However, credit consideration is given to only trustworthy parboilers. Also some parboilers organised group purchases and bought up to 10 bags of paddy at a time from a farmer who would readily give some credit on the consignment, although invariably part payment in cash was usually made on such occasions.

In terms of paddy availability, peak and lean seasons for paddy supplies occur between November and January which is the harvesting season and July - August (after planting) respectively.

The distribution channels for paddy are shown in Figure 5.

FIG 5 DISTRIBUTION CHANNELS FOR PADDY RICE



As illustrated in Figure 5, parboilers normally used the direct paddy distribution channel when paddy was in excess supply. However, when there was shortage of paddy, parboilers bought from traders who had purchased the paddy from farmers after harvesting and held it in stock in order to benefit from the higher prices that invariably occur prior to the next harvest. Some traders purchased paddy from farmers through commissioned agents who did not take title to the goods but bought paddy on behalf of the traders for a fee. It was observed that parboilers did not store paddy due to lack of capital.

4.3 Transportation of Rice

The mode of transportation of paddy rice from the purchasing points to the processing sites included:

- i. Head load: female adults head load smaller quantities of paddy, usually around 40 kg at a time.
- ii. Push cart: this was commonly used in all the villages to transport relatively large quantities of paddy at a cost of €1500-€2000/bag depending on the distance involved.
- iii. Donkey cart: this was popular in the Upper East Region. It was used to cart paddy over both short and long distances
- iv. Tractor trailer and mammy trucks: these were used to haul large quantities of paddy over longer distances at a cost of about €1000-€2000/bag
- v. Bicycles: bicycles were used by boys to cart up to half bag of paddy.

A summary of the mode of transportation used by parboilers in the various survey areas is shown in Table 4 & 5.

TABLE 4 MODE OF TRANSPORTATION USED BY PARBOILERS IN THE NORTHERN REGION OF GHANA

Mode of Transport	Survey Sites				
	Nyankpala 1	Nyankpala 2	Tolon	Tali	Gbullung
Headload	√	√	√	√	√
Pushcart	√	√	√	√	√
Bicycle	√	√	√	√	√
Mammy Trucks & Trailers	-	√	-	-	-
Donkey Cart	-	-	-	-	-

TABLE 5 MODE OF TRANSPORTATION USED BY PARBOILERS IN THE UPPER EAST REGION OF GHANA

Mode of Transportation	Survey Sites							
	G1	G2	G3	G4	G5	G6	G7	G8
Headload	√	√	√	√	√	√	√	√
Pushcart	√	√	√	√	√	√	√	√
Bicycle	√	√	√	√	√	√	√	√
Mammy Trucks & Trailers	-	-	-	-	-	-	-	-
Donkey Cart	√	√	√	√	√	-	√	√

4.4 Processing Capacities

The level of processing depends largely on the availability of paddy, which in turn is highly influenced by the scale of production as well as the amount of rainfall in any particular year. It is expected that production in the year 2000 will be lower since farmers in the Upper East Region had diverted into tomato production due to excess supplies of rice the previous year, which adversely affected prices. Other factors affecting processing capacity include the availability of capital, the intensity of farm work and the prevailing weather conditions. Rice parboiling is performed throughout the year. However, less processing is done when there is a lot of work on the farm and when drying of paddy becomes difficult, particularly during the rainy season.

On average, the maximum processing capacity per processor was 2 bags of paddy per cycle at a processing frequency of 2-3 times a week (see Table 6). This occurs between November and January when paddy is regularly available while a minimum of less than 1 bag of paddy is processed per week in the lean periods of May-June. Only a few parboilers were able to process up to 10 bags per week, and in this case at least two women would be involved in the processing.

TABLE 6 AVERAGE AMOUNT OF PADDY PROCESSED BY A PARBOILER EACH WEEK (80 kg bags)

Northern Region			Upper East Region		
Group	Max.	Min.	Group	Max.	Min.
Nyankpala 1	6	1	Zebilla 1	10	1
Nyankpala 2	6	-	Zebilla 2	8	1
Tolon	6	-	Pusiga Tesungo	4	-
Tali	6	<1	Pusiga Sarabogo	4	-
Gbullung	6	<1	Bawku Gingande	6	-
			Bawku Gonduri	6	1
			Navrongo Sabora Langa 1	8	1
			Navrongo Sabora Langa 2	6	<1

4.5 Quality Considerations and Constraints

The quality of milled parboiled rice was assessed by the parboilers based on physical characteristics, such as colour, percentage of broken grains, swelling capacity, cooking time and keeping quality when cooked. Other characteristics mentioned included odour, taste and stickiness. In the Northern Region, parboilers recognised quality differences between their rice and that of the Upper East Region. The reasons assigned to the regional differences in the quality of rice included the following factors:

Quality of Water

The quality of water used was perceived to be a key limiting factor affecting the quality of rice in the Northern Region. Poor quality water from the local dam was mostly used in the dry season, while relatively better quality water from the wells was used in the rainy season. Comparatively, the quality of pipe-borne water used in the Upper East Region was far better, more easily accessible and readily available than that in the Northern Region.

Efficiency of Mills

Diesel powered rice mills, which were much older and less efficient, were used in most of the villages visited in the Northern Region. Milling machines lacked aspirators and therefore parboilers had to winnow the milled rice in order to separate the chaff from the grain. On the other hand, relatively efficient mills, which produced a better quality of milled rice, were used in the Upper East Region.

Types of Floor

Beaten clay floors were mainly used for drying paddy in the Northern Region. However, in the Upper East Region, cemented/concrete floors were used, and were considered to produce a better quality of dried rice than that obtained from beaten clay floors. It was also reported that cemented floors that developed holes could adversely affect the quality (through contamination of the rice with stones and dirt). Some parboilers in Navrongo, who had limited floor space, dried their paddy on roof tops. Also this drying technique reduces losses arising from animals. Concrete floors are more durable, lasting for 2-3 years, but are more expensive. About 2-3 bags of cement are needed for construction of a drying space. Beaten clay floors were estimated to last for only 4 months and needed regular maintenance.

Technology Use

In the Upper East Region, the majority of parboilers were quality conscious and made the effort to stay competitive in the local rice market. Therefore, particular attention was given to the critical stages of processing which affected quality. These include

- variety of paddy used
- cleaning of paddy
- washing of dirty paddy
- regulating heat intensity during boiling
- degree of drying
- evenly and thinly spreading of paddy during drying.

On the variety of paddy used, the most preferred varieties in the Upper East Region were *Abidjan*, *Sikamo*, *Abunga* and *Agona*, while in the Northern Region *Afife*, *Faro* and *Mandee* varieties were preferred for the production of better quality parboiled rice.

Heat Intensity

Parboilers believed that heat intensity could affect the colour of the milled rice, resulting in variable colouration. In Navrongo, parboilers mentioned that experience in processing is very important and hence new rice parboilers needed to liaise with experienced women who were referred to as "consultants".

Degree of Drying

Parboilers considered that parboiled paddy should be evenly and thinly spread to avoid either over drying or insufficient drying. Windy weather conditions were claimed to be the best for drying while hot sun is not suitable. There was a belief that if grains with wide variation of moisture content are dried together, some grains tend to be over dried and some insufficiently dried. This they believed could lead to cracks in the grain, raising the percentage of broken grains during milling.

Presence of Moulds

Significant amounts of the wet season paddy harvest are lost through quality

deterioration by mould growth because of inadequate sunshine for drying.

Harvesting and Post Harvest Practices

Some of the harvesting and post harvesting conditions and factors that were stated to affect quality included:

The traditional method of harvesting using a sickle was claimed to give better quality rice than mechanical harvesting (combine harvester), which can lead to a high percentage of broken grains.

Threshing floors - the state of threshing floors affects the quality in terms of collection of foreign matter especially stones in the paddy. One source suggested that the use of tarpaulin would assist in the production of a better quality paddy.

Timing of harvesting - early harvesting results in a high percentage of immature, unfilled and partially filled grains that break easily on milling. Also uniform drying becomes difficult when grains are immature. Delays in harvesting lead to a high percentage of breakages during milling.

Varietal mixes of paddy - some respondents believed that the flooding of rice fields lead to materials being transported from one field to another resulting in varieties becoming mixed.

Strategies to Improve Quality

Strategies employed by some parboilers to ensure a higher quality of parboiled rice are:

- Pre-cleaning to remove foreign matter such as stones, debris, dirt etc.
- Sieving to remove sand.
- Cold soaking to remove immature grains, dirt and clay. Also soaking was believed to reduce percentage of broken grain.
- Use of local mats and jute sacks for covering paddy when drying to reduce the impact of heat.
- Being sensitive to critical stages already discussed.
- Use of "alum" to improve the quality of water; this practice causes the rapid sedimentation of suspended clay particles in the water.

4.6 Financing and Credit

A large proportion of the respondents used their own resources to finance processing activities. Seed money and working capital were raised from other income generating activities, especially farming and farm labouring. Most women undertake harvesting services and are often paid in kind, which in turn they sell for cash. Sometimes paddy rice is obtained through gleaning of rice fields after harvesting. Other sources of financing included short-term credit on paddy purchases from farmers and soft loans from relatives and friends.

Surprisingly, parboilers at Navrongo were sceptical about credit purchases of paddy from farmers due to the relatively short pay back period, which is difficult to meet when losses are incurred.

No formal credit assistance had been received, but parboilers expressed a dire need for credit assistance from the formal sector. In view of this, parboilers in Upper East Region had organised themselves into groups of 15-20 members through the help of extension officers from Ministry of Food and Agriculture and District Assemblies to enable them to seek credit under the Upper East Land Conservation and Smallholder Rehabilitation Project (MOFA/IFAD funded). This project is designed with a general objective of providing rural people with opportunities to improve their living conditions. The interest on the loans is at the prevailing bank rate and is underwritten by IFAD with no collateral required from the borrower.

4.7 Cost Structures and Profits

During group meetings, discussions were held regarding input costs and the revenues and income received from rice parboiling. Each group was asked to estimate the various costs incurred in processing one bag of paddy, the revenues received from the sale of the milled rice, the equipment used and its cost along with estimates of "profitability" by parboilers in the Upper East Region. The data collected from each group are summarised in Table 7 (cost structures) and Table 8 (equipment used, cost and depreciation). There are a number of general points arising from these data:

- No group or individual parboiler included the cost of labour inputs when discussing the costs of the operation; this was even the case when other women/girls were involved in undertaking some of the work.
- During the year there is some variation in input costs (e.g. paddy, fuel, water) and on occasions a range of costs were provided and, in part, this could account for some of the cost variations between groups contained in Table 7. However, efforts were made to try to obtain current costs and revenues.
- Excluding labour costs, by far the largest input cost was the purchase of paddy which invariably accounted for over 80 per cent of variable costs. Operating costs were higher in the Upper East almost entirely because paddy prices were higher and had risen considerably just prior to the discussions.
- Yields of milled rice varied somewhat between groups, with yields appearing to be higher in Northern Region – where estimates of yields varied between 22 and 24 bowls per bag of paddy processed. There was a wider yield range in the Upper East Region, varying between 15 to 21 bowls per bag. Part of this difference is accounted for by the different bowl sizes used in measurement (i.e. the use of

“arm walls” in the Upper East”). The larger content of the bowls in the Upper East partly accounts for the higher price received for milled rice. In addition, there is more thorough pre-cleaning, processing and milling in the Upper East and this may account for some of the variation. More accurate data on yields will become available following the in-depth technical survey of rice parboiling techniques currently being undertaken in a number of selected villages in the Northern and Upper East Regions.

- Estimates of gross margins/contribution to labour costs are very sensitive to three items namely the cost of paddy, the yield and the price at which the milled rice is sold. While the cost of other inputs are reasonably consistent and probably fairly reliable it is variations in the price of paddy and milled rice as well as variable yield estimates that necessitate these data being treated with a degree of caution.
- From the data collected, nine of the thirteen groups made a “profit” on the parboiling of rice, while four groups in the Upper East appeared to make a “loss”. However, when each of the groups in the Upper East were asked directly about the “profits” made on parboiling one bag of rice, all of them viewed parboiling as a “profitable” (if arduous) activity. Estimates of “profitability” ranged between C 2,200 and 10,000 per bag of rice between the different groups. This, in part, would account for the expansion of parboiling activities in the north. Hence, the cost, revenue and profitability data contained in Table 7 should be treated with a degree of caution and should be used to provide orders of magnitude rather than definitive cost estimates.
- The approximate contributions to profit/labour margins (less fixed costs – which are discussed below) for the Northern Region compares favourably with the going wage range for farm labouring which was approximately C 3,000 per day.
- Equipment used in rice parboiling and its estimated costs are detailed in Table 8. An initial investment of the order of C 211,000 (\$53) would be needed to set up as a rice parboiler, although no one purchased all the equipment at once and many acquired second hand equipment. The straight-line depreciation method has been used in estimating depreciation and this is calculated at just over C 50,000 per year. If it is assumed that 6 bags of paddy are processed per week (24 per month) then the fixed cost charged per bag is equivalent to about C 180.

TABLE 7 COST STRUCTURES OF PROCESSING ONE BAG OF PADDY RICE AMONG PARBOILING GROUPS IN THE NORTHERN AND UPPER EAST REGIONS OF GHANA (Cedis)

Northern Region

Item	Site 1	Site 2	Site 3	Site 4	Site 5
Transportation	2,000	2,000	2,000	2,000	2,000
Labour	-	-	-	-	-
Milling	2,000	2,000	3,000	3,000	4,000
Fuel	2,000	2,000	2,500	3,000	3,000
Water	1,600	1,600	800	2,000	800
Paddy	40,000	40,000	40,000	40,000	40,000
Total Variable Cost	47,600	47,600	48,300	50,000	48,000
Yield/bag of Paddy	22 bowls	24 bowls	23 bowls	24 bowls	24 bowls
Selling Price/bowl (¢)	2,300	2,200	2,400	2,400	2,200

Upper East Region

Item	Site 1	Site 2	Site 3	Site 4	Site 5
Transportation	-	-	3,000	2,000	2,000
Labour	-	-	-	-	-
Milling	3,000	3,000	5,000	5,000	4,000
Fuel	2,000	2,000	4,000	4,000	4,000
Water	200	200	200	200	3,000
Paddy	50,000	50,000	50,000	60,000	50,000
Total Variable Cost	55,200	55,200	72,200	71,200	63,000
Yield/bag of Paddy	17 bowls	18 bowls	20 bowls	20 bowls	21 bowls
Selling Price/bowl (¢)	2,400	2,400	3,500	3,500	3,200
Revenue (¢)	40,800	43,200	70,000	70,000	67,200
Gross Margin/Contribution to Labour (¢)	(14,400)	(12,000)	(2,200)	(1,200)	4,200

Table 7 (contd.)

Upper East Region

Item	Site 6	Site 7	Site 8
Transportation	2,000	4,000	3,000
Labour	-	-	-
Milling	5,000	4,000	4,000
Fuel	3,000	4,000	4,000
Water	200	200	200
Paddy	48,000	60,000	70,000
Total Variable Cost	58,200	72,200	81,200
Yield/bag of Paddy	20 bowls	15 bowls	18 bowls
Selling Price/bowl (¢)	3,200	3,000	5,500
Revenue (¢)	64,000	75,000	90,000
Gross Margin/Contribution to Labour (¢)	5,800	2,800	8,800

TABLE 8 PROCESSING EQUIPMENT USED, COST AND DEPRECIATION

Item	No. per Processor	Average Cost/ Unit (€)	Total Cost (€)	Useful Life	Annual Cost (€)
Aluminium Pot (big)	1	80,000	80,000	6	13,333
Aluminium Pot (small)	1	50,000	50,000	6	8,333
Clay Pot	2	6,000	12,000	6	2,000
Bucket	1	22,000	22,000	5	4,400
Stirring wood	1	1,000	1,000	2	500
Calabash	2	1,000	2,000	1	2,000
Basin	1	24,000	24,000	5	4,800
Basket	1	1,000	1,000	1	2,000
Koko' bowl	1	6,000	6,000	5	1,200
Sieve	1	1,000	1,000	2	500
Polypropylene Sheets	10	1,200	12,000	1	12,000
					51,066

4.8 Associations

The importance of group formation seems to be well acknowledged among people in the survey areas. Although most of the parboilers were informally organised into groups of between 15 and 20 parboilers, they processed individually. However, parboilers at Navrongo, who were very well organised, occasionally process as a group and keep profits in the group bank account. Some of the benefits common to the groups include:

- contributions at social functions, such as funerals and naming ceremonies
- sharing of equipment
- occasionally buying paddy collectively
- helping members to seek medical attention

In addition to these, parboilers in Navrongo gave credit assistance to needy members to pay their wards school fees and medical bills. They had also started building a day care centre.

4.9 Gender Issues

Rice parboiling is exclusively a female activity in the survey areas. Nearly all the tasks connected with rice parboiling were left to the females (both young and adults). However, some men were attracted into paddy marketing when profit margins were high. Decision making on parboiling was solely undertaken by women without any interference from the men, except perhaps to give advice on the availability of paddy. Husbands may also help with financing and in some cases with transportation and driving away animals during drying. A summary of the sex specific activities is presented in Tables 9 & 10.

TABLE 10 GENDER SPECIFIC ACTIVITIES IN THE SURVEY AREAS - NORTHERN REGION OF GHANA

ACTIVITY	Gender				
	G1	G2	G3	G4	G5
Purchasing of Paddy	FA	FA	FA	FA	FA
Transportation of Paddy	YM	YAM	YAF	YBS	BS
Fetching of water	YM	YF	YAF	YAF	YAF
Splitting of fuelwood	YM	YAF	YAF	YAF	YAF
Actual Parboiling	YAF	YAF	YAF	YAF	YAF
Marketing of Milled Rice	FA	FA	FA	FA	AF

TABLE 10 GENDER SPECIFIC ACTIVITIES IN THE SURVEY AREAS - UPPER EAST REGION OF GHANA

ACTIVITY	Gender							
	G1	G2	G3	G4	G5	G6	G7	G8
Purchasing of Paddy	FA	FA	FA	FA	FA	FA	FA	FA
Transportation of Paddy	BS	YAF	YAF	YAF	YAF	BS	YA	YAM
Fetching of Water	YAF	YAF	YAF	YAF	YAF	YAF	M	YAF
Splitting of fuelwood	BS	YAF	YAF	YAF	YAF	YAF	YAF	BS
Actual Parboiling	YAF	YAF	YAF	YAF	YAF	YAF	YAF	YAF
Marketing of Milled Rice	FA	FA	FA	FA	FA	FA	YAF	FA

Key

YM	-	Young Males	FA	-	Female Adults
YF	-	Young Females	MA	-	Male Adults
YAF	-	Young and Adult Females	BS	-	Both Sexes
YAM	-	Young and Adult Males			

Generally, men were not engaged in rice parboiling because it was believed that cooking was the responsibility of women, while men were more responsible for food production with relatively little help from women. Hence, daughters help their mothers while sons either go to school or work on the farms with their fathers.

4.10 Consumer Preferences and Perceptions

Parboilers were consulted as regards their perceptions of consumer preferences. Basically, the quality of rice and affordability were deemed crucial in any package geared towards improvement in competitiveness of locally produced rice. From the consumers' viewpoint, the following list shows the perceived desirable qualities of parboiled rice.

<i>Description</i>	<i>Desirable Quality</i>
Appearance	light coloured
Odour	pleasant
Grain Size	whole, long and slender
Swelling Capacity	high
Finger feel/texture	sticky
Cooking time	relatively short
Keeping qualities	keep for a long time before going bad
Taste	tasty

However, it was observed that parboilers had very little knowledge about the inherent nutritive value of parboiled rice. It was realised that consumption of parboiled rice is popular among the people in the communities surveyed, partly due to the traditionally acquired eating habits and also its affordability and availability. Almost all the respondents labelled parboiled rice as a food security commodity. More detailed analysis of consumer preferences will be undertaken in the planned consumer survey of rice preferences.

Respondent perceptions in the survey villages about parboiled rice vis-à-vis imported rice include:

- parboiled rice is tastier than imported rice and could be eaten without sauce
- it is comparatively less expensive
- parboiled rice is best for local dishes like rice ball (*omo tuo*)
- it has greater keeping quality particularly when boiled and is readily available.

4.11 General and Specific Constraints

Generally, lack of funds for acquisition of equipment and paddy as well as for drying floor maintenance was common among the parboilers. This problem notwithstanding, parboilers try as much as possible to raise capital from other economic activities but this was inadequate to allow for bulk paddy purchases for even for short term storage. Also, it was observed that parboilers who did not own some equipment, especially the young ones, borrowed from friends.

Other general complaints were the high cost of paddy in the lean season; the drudgery

involved in processing; exposure to heat, which resulted in fever, dizzy spells and bodily pains; the development of waist and back aches due to continuous bending and bleeding of palms when used to stir warm paddy. The instability of paddy prices was also a common problem. Parboilers linked this problem to a lack of money to hold paddy stocks for lean season processing.

Region specific constraints and possible solutions are indicated below:

Northern Region

Constraint

Poor quality of water
(Mostly dam water was used)
Varietal mixes due to flooding
Inefficiency of mills
High cost of transportation

Coping Strategies/Possible Solution

Use of "alum" for purification
-
-
Usually head load, when there is no money. Also suggested credit assistance to enable groups to purchase their own donkey carts.

Upper East Region

Constraint

Limited drying space
Lack of stirring device

Coping Strategies/Possible Solution

Use of roof top floor
Use of brooms, broken calabashes, rakes

5. PARBOILED RICE MARKETING

5.1 Markets

Project R6688 funded by the CPHP has produced a report of a Preliminary Study of Consumer Preferences and Price/Quality Relationships which concluded that buyers are willing to pay a premium for good quality parboiled rice, even though it does not have to compete with imported raw rice.

Parboiled paddy is custom-milled and sold immediately either at the milling site or at local markets. It was observed that the majority of parboilers invariably sold at the milling sites, mainly because of high cost of transportation to the market centres. Other reasons are the high cost of storage of unsold rice at the market centres and other marketing expenses, such as market fees and tolls as well as handling charges, which make marketing of rice at the market centres unattractive to rice parboilers.

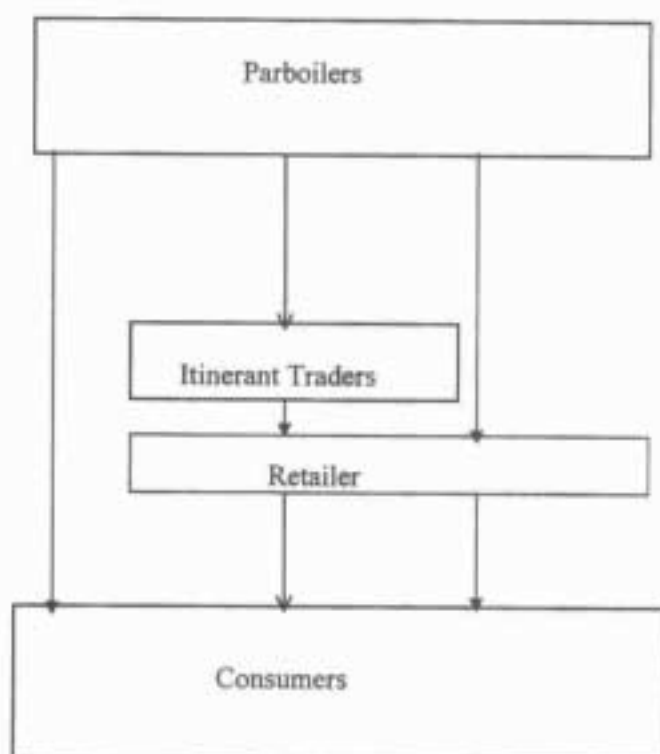
Almost all the local markets in the various sites were managed by the Market Management Committees of the district assemblies. These committees are responsible for the maintenance of market physical structures and facilities, allocation of space and stalls and the collection of market fees and tolls, as well as ensuring that sales are conducted fairly. For markets to be effective, market days are normally co-ordinated at the district level so that neighbouring markets take place on different days in order to attract substantial volumes of business. Most markets visited were organised at three-day intervals.³ Allocation of stalls and space was done such that traders selling the same commodities were concentrated in a particular area at the market. Rice was displayed openly in basins and sold on a cash and carry basis.

5.2 Distribution Channels for Rice

As Figure 6 illustrates, locally produced rice is distributed informally through any of the following channels:

- i. Direct sales to final consumers by parboilers themselves. This was not a common practice.
- ii. Rice is sold to final consumers through a retailer. This channel was commonly used in all the villages visited.
- iii. Itinerant traders who visit the rural markets assemble rice from parboilers in large quantities, package in polypropylene sacks and truckload to sub-urban and urban markets including Tamale, Kumasi and Accra. Rice may then be distributed through various intermediaries before reaching the final consumers. This channel was mostly used to distribute local rice to consumption centres in Southern Ghana although small quantities were thought to be sold to neighbouring countries. It was realised that a few parboilers also traded their rice directly. These parboilers may augment their stocks by purchasing from other parboilers.

FIGURE 6 DISTRIBUTION CHANNELS FOR PARBOILED RICE



5. 3 Price Information

Although the Ministry of Food and Agriculture (Policy Planning, Monitoring and Evaluation Division) collects information on prices and commodity movements on a regular basis, parboilers had very little knowledge about this. Information about prices of local rice was rather sought by parboilers from friends and mill operators. Sometimes parboilers visit other markets to obtain information on the existing price.

It was reported that although the price of local rice was dictated by supply and demand conditions, price determination was highly influenced by the cost of paddy rice at any particular period. There were inter-regional and intra-regional differences in prices depending on the price of paddy and other costs involved in processing in any given locality.

5. 4 Standardisation of Weights and Measures

It was observed that rice is sold by volume rather than weight, using a combination of bags, basins and bowls as a means of measurement. There are no formal grading and measuring systems. However, price differentials in relation to quality existed in all the

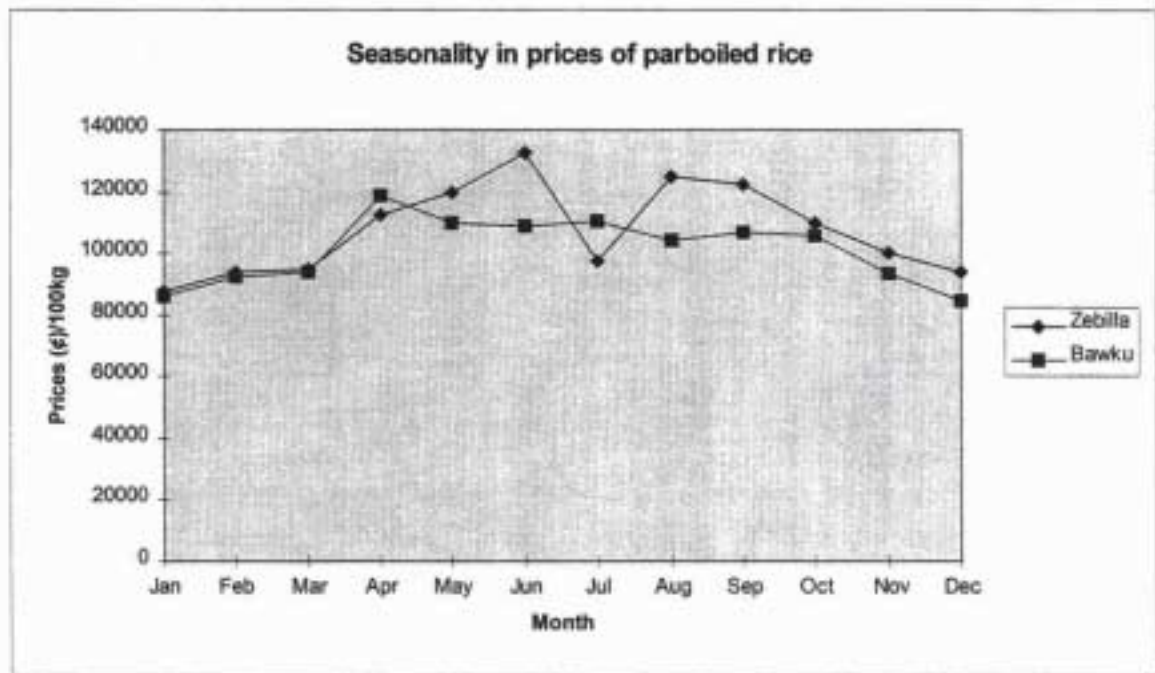
³ Markets are organised on a 3-day interval in the Upper East Region and mainly 6 day intervals in the Northern Region.

markets visited. Also, there were variations in volumes of the measuring bowl due to the use of "arm walls" (in the Upper East Region); this was introduced by traders and leads to inefficiencies in the pricing system. The measuring bowl without the "arm wall" weighs about 2.5 kg but with the "arm wall" weighs about 3.0-3.1 kg.

5.5 Seasonality in Prices

Due to the unimodal nature of rice production in northern Ghana and the lack of storage facilities, wide price variations exist between harvesting and lean seasons. The survey revealed that during the harvesting season demand for rice is very low because of the availability of other staples such as yams, sorghum and millet (See Fig. 7).

FIGURE 7 SEASONALITY IN PRICES OF PARBOILED RICE



Source: MOFA Regional Offices

5.6 Access to Markets

There were no barriers to market entry. Road networks linking the processing sites and market centres are generally motorable throughout the year.

5.7 Marketing Constraints and Possible Solutions

During the discussions a number of marketing constraints were identified along with possible solutions and coping strategies. These included:

Constraints

Use of "arm walls"

Less demand at harvesting

Traders sometimes default in paying for rice bought on credit

Buyers dictating price when there is excess supply

Possible Solution/Coping Strategies

Some parboilers avoid selling to traders who measure with arm walls

Parboilers explore markets outside the localities when there is excess supply of rice in the local market.

Majority do not sell on credit anymore

5.8 Future Trends

The consumption of locally parboiled rice is on the increase. This is despite the Government's trade liberalisation policies, which have been pursued since 1983 under the Economic Recovery Programme and which have led to the flooding of the Ghanaian market with imported rice. In part, the increased consumption of local rice can be partly explained by the devaluation of the Cedi and the resultant relative price rises for imported rice – a situation that is likely to continue. Generally, rice has become a staple in the diets of most Ghanaians. The market for rice is expanding rapidly especially among the urban middle classes due to its convenience in cooking. Within this market there is a growing demand for higher quality with long slender grains attracting a premium price. In order to take advantage of this new emerging domestic market it is necessary that detailed consumer acceptability studies be conducted in the urban consumption centres and the results incorporated into the quality improvement programme. The survey also revealed that demand for parboiled rice, especially the better quality rice produced in the Upper East Region, is high in northern and, to a lesser extent, in southern Ghana for several reasons already discussed under quality considerations (section 4.5). There was a suggestion (as yet unconfirmed) that local parboiled rice had a higher nutritive value than imported rice. If this proved to be the case then educational campaigns on the nutritive value of parboiled rice could be embarked upon to increase awareness among the entire Ghanaian populace thus helping to raise the market share of local parboiled rice in overall domestic rice consumption.

On the supply side, the growth trend in the number of parboilers for the past three years has been quite encouraging as more female adults enter into the business and young females are groomed to take over from older ones. Rice parboiling techniques are invariably passed on from one generation to another and this ensures its sustainability over the years.

6. SUMMARY AND CONCLUSIONS

6.1 Introduction and Research Methodology

The previous five sections have provided an analysis of the socio-economic aspects of rice parboiling in northern Ghana. As detailed in Section 1, this study is part of the first phase of a larger project funded by the CPHP of DFID and undertaken by NRI and FRI. The overall aim of the Rice Parboiling Project is to improve the efficiency and variable quality of rice parboiling in northern Ghana. The project aims to assess the importance of parboiling to poor households, identify best practices for optimal quality using existing technologies; and examine possibilities for introducing more efficient, and less arduous new technologies which will improve quality and thus market price. Thus, a major objective is to identify interventions for improvement to the current system together with appropriate technologies to suit higher outputs; it is envisaged that the upper level of production will be in the region of 500 kg per day (compared with a current maximum of around 100 kg per day). The project aims to identify suitable parboiling technologies which would satisfy the demands of the consumer, meet with socio-economic and environmental considerations and increase production, whilst retaining the women's dominant role in parboiling.

The socio-economic study is divided into six sections.

1. An introductory section which provides background information on the origins of the study and on various aspects of rice production in Ghana.
2. A brief review of the research methodology used – namely PRA - and the limitations of the data sources that are available for analysis.
3. A short outline of the techniques and processes used in rice parboiling.
4. Detailed socio-economic analysis of the data collected concentrating on the production and processing techniques involved including an analysis of the importance of parboiling to poverty alleviation and women in Ghana; production and processing (including sources of paddy, seasonality and transportation); quality considerations and constraints, including strategies to improve quality; cost structures and “profits”; financing and credit; gender issues; consumer preferences and perceptions; and finally general and specific constraints facing the sector.
5. An analysis of the marketing of parboiled rice, assessing the markets and market access, prices, distribution channels, constraints and future trends.
6. This concluding section summarises some of the major findings of the previous sections and makes some recommendations as regards possible strategies to be pursued.

There are two appendices, the first contains the detailed Terms of Reference for the socio-economic study and the second contains the checklist of questions used in the group discussions.

The primary analysis for the socio-economic study is based on data collected in March 2000 using Participatory Rural Appraisal (PRA) methods. In all discussions were held with thirteen groups of women rice parboilers in the Upper East and Northern Regions of Ghana, with the size of the groups ranging from 9 to 48. While PRA analysis has many benefits there are a number of shortcomings associated with informal data collection, particularly with regard to the difficulties of trying to

generalise from the specific data collected. To assist in the analysis, additional discussions were held with a number of individuals and organisations knowledgeable about the Ghanaian rice sector. Secondary data were also collected from various existing reports along with grey literature. The following sections summarise the finding from socio-economic survey.

6.2 The Rice Sector in Ghana

During the 1990s paddy rice production has increased considerably with MOFA data suggesting a growth from 81,000 tonnes in 1990 to 281,000 tonnes in 1998.⁴ Over 65% of the crop is grown in two northern regions – Upper East and Northern Regions – where there is considerable scope to expand output. Rice is a cash crop - an estimated 80% of rice produced is sold; the remainder is consumed at household level or kept for seed. It is an important, income-generating, commodity for women as they are involved throughout the production chain from planting to trading. Almost all domestically produced rice in northern Ghana – which dominates national output – is parboiled, a process which is undertaken by rural women using traditional small-scale technologies.

The rice parboiling process is relatively simple. The women involved buy small amounts of paddy, parboil in batches usually up to a bag (80 kg) a day, which is then milled and sold on the local markets. Traditional technologies are used involving metal cooking pots, open fires, earth drying floors etc. In 1998 the Ghanaian government established a working party to examine the problems associated with small scale rice processing in order to increase the competitiveness of locally produced rice.

Locally produced rice is of variable quality, which contributes to its difficulties in competing with imported rice. Processing, particularly milling, has been identified as a constraint to improving the quality of local rice. The market for rice has expanded rapidly over the past few decades and trade liberalisation has led to a substantial growth in rice imports, which now account for in excess of 60 per cent of domestic consumption. Imported rice generally sells at a higher price than local, and is considered to be of a higher quality and sets the standard and price against which local rice is traded.

6.3 The Importance of Rice Parboiling

The number of rice parboilers is increasing although no exact figure exists. An approximation of 25,000 to 30,000 parboilers was made based on current production levels and the processing capacity per woman. In addition, each parboiler invariably has 2 or 3 members of the extended family who assist. Thus, in excess of 75,000 women and possibly as many as 120,000 women are actively involved in rice parboiling. In addition, many other women are indirectly involved through the collection and sale of water and fuel.

⁴ The reliability of recent MOFA rice production data has been questioned by the Centre for Economic Policy Analysis, see CEPA (2000) pp. 24-25.

Women almost exclusively undertake rice parboiling, which is perceived as an activity requiring very hard work. All those surveyed were engaged in additional economic activities including farming, petty trading and food vending. The returns from their labour were invariably on the low side; a typical woman in the area may earn less than ₺100,000 (one hundred thousand cedis) a month – equivalent to approximately US\$ 25.00 at the current exchange rate (March 2000). This is partly due to the small scale of their operations and poor pricing systems.

Comparatively, rice parboiling is the main income generating activity for the majority of the women interviewed in both regions, contributing about 62.5% on average to total income. Rice parboiling was viewed as an all-year round activity, although the peak period was November to May following the harvest.

Rice parboiling is passed on from generation to generation. Young females who helped their mothers eventually became rice parboilers while older women who had retired from active work became "consultant's" to inexperienced parboilers.

6.4 Production, Processing and Transportation

Sources of paddy Parboiling is invariably undertaken in a woman's compound with the paddy rice usually being obtained from within a radius of 8 km. The majority of paddy is purchased from local farmers, although markets and traders are used occasionally. The price of a bag (80 kg.) of paddy ranged between ₺40,000 to ₺70,000. Paddy is usually purchased on a cash and carry basis, although it is sometimes sold on credit with no interest charged. Credit sales are made when there is excess supply and only made to trustworthy parboilers. Occasionally group purchases of up to 10 bags of paddy at a time are made from farmers, partly on credit. The peak season for supplies is November to January (after harvesting) and the lean season is July - August (after planting). In the lean season, paddy may be bought from traders who purchase after the harvest and hold in stock to benefit from higher prices later in the year. Insufficient capital means that parboilers are unable to store paddy. Moreover, efforts to increase in the quantity of paddy processed by each parboiler would necessitate increased working capital requirements.

Transport of paddy Various methods are used to transport the paddy including head loading (approximately 40 kg at a time); push carts, costing around ₺1500-₺2000/bag depending on distance; donkey carts, especially in the Upper East Region; tractor trailer and mammy trucks are used to haul larger quantities over longer distances at a cost of about ₺1000-₺2000/bag; and bicycles which can carry up to half bag of paddy.

Processing capacities The major factor affecting processing levels is the production and availability of paddy. Other factors include the capital availability, the intensity of farm work and the prevailing weather conditions. The maximum processing capacity is between November and January when on average 2 bags of paddy per processor per cycle is achieved with a processing frequency of 2-3 times a week. A minimum of less than 1 bag is processed per week in the lean periods of May-June. Few parboilers are able to process up to 10 bags per week, and in these cases at least two women are involved.

6.5 Financing, Credit, Costs and "Profits"

Finance and credit A large majority of parboilers use their own resources to finance processing. Seed money and working capital are raised from other income generating activities, especially farming. Other sources of financing include short-term credit on paddy purchases from farmers and soft loans from relatives and friends. No formal credit assistance was identified although parboilers expressed a dire need for credit assistance from the formal sector. Some groups had been formed in the Upper East Region partly with the aim of accessing credit, interest on which was charged at the prevailing bank rate and underwritten by IFAD with no collateral required from the borrower.

Cost Structures and Profits various data was collected on input cost and revenues received from rice parboiling, which was used to estimate "profitability". These data should be treated with a degree of caution and used to provide orders of magnitude rather than definitive cost estimates. There are several general points arising from the data:

- No group or individual parboiler included the cost of labour inputs when discussing the costs of the operation; even when other women/girls were involved in the work.
- Input costs vary during the year (e.g. paddy, fuel, water) and on occasions a range of costs were provided, which could account for some of the cost variations between groups.
- Excluding labour costs, by far the largest input cost was paddy, which invariably accounted for over 80% of variable costs. Operating costs were higher in the Upper East almost entirely because paddy prices were higher.
- Yields of milled rice varied between groups; yields appeared higher in Northern Region (22 to 24 bowls per bag of paddy processed), although there was a wider yield range in the Upper East Region (15 to 21 bowls per bag). This is partly accounted for by the different bowl sizes and more thorough pre-cleaning, processing and milling in the Upper East.
- Estimates of gross margins/contribution to labour costs are very sensitive to three items: cost of paddy, yield and sale price of milled rice.
- The data show that 9 of the 13 groups made a "profit" on the parboiling of rice, while four groups in the Upper East appeared to make a "loss". Nevertheless, all the groups viewed parboiling as a "profitably" (if arduous) activity, which probably accounts for the continued expansion of parboiling activities.
- The approximate contributions to profit/labour margins for the Northern Region compares favourably with the going wage range for farm labouring, which was approximately € 3,000 per day.
- An initial equipment investment of approximately € 211,000 (\$53) is needed to set up as a rice parboiler, although no one purchases all the equipment at once and many acquired second hand equipment. Depreciation is calculated at just over € 50,000 per year. Assuming 6 bags of paddy are processed per week (24 per month) then the fixed cost charged per bag is equivalent to about € 180.

6.6 Quality: Actions and Perceptions of Parboilers and Consumers

The quality of rice and its affordability are deemed crucial in any package geared towards improving the competitiveness of locally produced rice. Parboilers assessed milled rice quality mainly on physical characteristics, such as colour, percentage of broken grains, swelling capacity, cooking time and keeping quality when cooked. Other characteristics mentioned included odour, taste and stickiness. In the Northern Region, parboilers recognised quality differences between their rice and that of the Upper East Region. The reasons assigned to the regional differences in the quality of rice included the quality of water, efficiency of mills, types of floor, technology used, heating intensity, degree of drying, presence of moulds, harvesting and post harvest practices (including threshing floors, timing of harvest, varietal mixes of paddy, while sickles were claimed to give better rice quality than mechanical harvesting).

Strategies employed by some parboilers to improve quality included pre-cleaning to remove foreign matter such as stones, debris, dirt etc.; sieving to remove sand; cold soaking to remove immature grains, dirt and clay; use of mats and sacks to cover paddy when drying to reduce the impact of heat; being sensitive to the critical stages in the process; use of "alum" to improve the water quality of water. It might be possible to use other natural products to purify the water, such as *Moringa oleifera* seed which could be grown in northern Ghana.

From the consumers' viewpoint, the following list shows the desirable qualities of parboiled rice:

<i>Description</i>	<i>Desirable Quality</i>
Appearance	light coloured
Odour	pleasant
Grain Size	whole, long and slender
Swelling Capacity	high
Finger feel/texture	sticky
Cooking time	relatively short
Keeping qualities	keep for a long time before going bad
Taste	tasty

Parboilers had very little knowledge regarding the inherent nutritive value of parboiled rice. Consumption of parboiled rice is popular among the people in the communities surveyed, partly due to the traditionally acquired eating habits and also its affordability and availability. Almost all the respondents labelled parboiled rice as a food security commodity. Moreover, in comparison with imported rice they view parboiled rice as being tastier than imported rice and it can be eaten without sauce; it is comparatively less expensive; it best for local dishes like rice balls; it has better keeping quality, particularly when boiled; and it is readily available.

6.7 Gender and Associations

Rice parboiling is exclusively a female activity although some men were attracted into paddy marketing when profit margins were high. Decision making on parboiling was solely made by women without any interference from the men, except perhaps to give advice on paddy availability. Husbands occasionally help with financing and transport. Generally, men are not involved believing that cooking is the responsibility of women, while men are more responsible for food production with relatively little help from women. Hence, daughters help their mothers while sons either go to school and/or work on the farms with their fathers.

The importance of group formation was recognised. Most parboilers were informally organised into groups of 15-20 but invariably processed individually. Parboilers in Navrongo are very well organised and occasionally processed as a group and keep profits in the group bank account; in addition, they also gave credit assistance to members and have started a day care centre. Some of the benefits common to the groups include contributions at social functions (e.g. funerals, naming ceremonies), equipment sharing, occasional collective paddy buying; and helping members to seek medical attention.

6.8 General and Specific Constraints

A number of general constraints were identified during the discussions, including:

- the lack of funds for acquisition of equipment and paddy as well as for drying floor maintenance. Parboilers try to raise capital from other economic activities but this was inadequate to allow for bulk paddy purchases for storage. Also, parboilers who did not own some equipment borrowed from friends.
- high cost of paddy in the lean season and the volatility of prices;
- the drudgery involved in processing; exposure to heat, development of waist and backaches; bending and bleeding of palms when used to stir warm paddy.

In addition, a number of regional specific constraints were identified. Those in the Northern Region (along with possible coping solution in parentheses) included: the poor quality of water, which was mainly dam water (the use of alum could assist in purification);

varietal mixes due to flooding;

the inefficiency of mills;

the high cost of transportation (usually head load, when there is no money but credit assistance to enable groups to purchase their own donkey carts was suggested)

In the Upper East Region the constraints were limited to

drying space (use of roof top floor)

lack of stirring device (use of brooms, broken calabashes, and rakes)

6.9 Prices and Markets

Prices

Although the Ministry of Food and Agriculture collects price data on a regular basis, parboilers had very little knowledge about this. Rather parboilers sought price information from friends and mill operators. Sometimes parboilers visit other markets to obtain information on the existing price. Although prices are dictated by supply and demand conditions, price determination was highly influenced by the cost of paddy rice at any particular period. There were inter-regional and intra-regional differences in prices depending on the paddy price and other costs involved in processing in any given locality. The unimodal nature of rice production in northern Ghana and the lack of storage facilities mean that wide price variations exist between harvesting and lean seasons. During the harvesting season demand for rice is very low because of the availability of other staples such as yams, sorghum and millet

Buyers are willing to pay a premium for good quality parboiled rice, even though it does not have to compete with imported raw rice.

Markets

The majority of parboilers invariably sold at the milling sites, mainly because of high cost of transportation to the market centres. Some was sold at the local market but this was limited, in part because of the marketing expenses involved (e.g. fees, tolls, handling charges) along with the high cost of storage of unsold rice. A few parboilers did trade their rice directly, sometimes augmenting their stocks by purchases from other parboilers.

Local rice is distributed informally to consumers through a number of channels including:

- Direct sales by parboilers themselves; this was uncommon.
- Sales to final consumers through a retailer, a channel commonly used in all the villages visited.
- Itinerant traders visiting markets and assembling rice from parboilers in larger quantities, packaging and truckloading to sub-urban and urban markets. Rice is then being distributed through various intermediaries to final consumers. This channel was mostly used to distribute local rice to consumption centres in Southern Ghana.

For markets to be effective, market days are normally co-ordinated at the district level so that neighbouring markets take place on different days in order to attract business. Most markets visited were organised at three-day intervals. Space allocation was done such that traders selling the same commodities were concentrated in a particular area. Rice was displayed openly in basins and sold on a cash and carry basis. There were no barriers to market entry.

Rice is sold by volume rather than weight, using a combination of bags, basins and bowls as a means of measurement. There are no formal grading and measuring systems but price differentials in relation to quality existed in all the markets visited. Also, there were variations in volumes due to "arm walls" (in the Upper East Region); the measuring bowl without the "arm wall" weighs about 2.5 kg but with the "arm

wall" weighs about 3.0-3.1 kg. Such techniques, which were introduced by traders, lead to inefficiencies in the pricing system

A number of marketing constraints were identified

<u>Constraints</u>	<u>Possible Solution/Coping Strategies</u>
Use of "arm walls"	Some parboilers avoid selling to traders who measure with arm walls
Less demand at harvesting	Parboilers explore markets outside the localities when there is excess supply of rice in the local market.
Traders sometimes default in paying for rice bought on credit	Majority do not sell on credit anymore
Buyers dictating price when there is excess supply	-

6.10 Concluding Comments

Despite trade liberalisation since 1983 and the resultant flooding of the Ghanaian market with imported rice, the consumption of locally parboiled rice is rising. In part, this can be explained by the Cedis devaluation and the resultant relative price rise for imported rice. Generally, rice has become a staple in the diets of most Ghanaians and demand has grown rapidly, especially among the urban middle classes, due to its convenience in cooking. Within this market there is a growing demand for higher quality rice with long slender grains attracting a premium price. In order to take advantage of this new emerging domestic market it is necessary that detailed consumer acceptability studies be conducted in the urban areas the results incorporated into the quality improvement programme. Demand for parboiled rice, especially the better quality rice produced in the Upper East Region, is high in northern and, to a lesser extent, in southern Ghana.

On the supply side, production of local rice is trending upwards leading to an expansion of rice parboiling. The upward trend in the number of parboilers in recent years has been encouraging as more female adults enter into the business and young females are groomed to take over from older ones. Parboiling techniques are invariably passed on from generation to generation and this ensures its sustainability over the years. Since some 75,000 to 120,000 women are estimated to be currently involved in rice processing it obviously makes a significant contribution to the sustainability of women's livelihoods in northern Ghana. However, the work is time-consuming, laborious, and utilises large quantities of firewood and water. Any improvement in rice parboiling activity and techniques should be recognised as an effective strategy of poverty alleviation for women in northern Ghana. The dissemination of current best practices combined with the development of a technology (or technologies) which improve the competitiveness of local rice through quality improvement, would increase profit margins and increase income levels of the women involved in the sector. Since women parboilers have their parboiled paddy milled on a custom basis, any increase in profits due to improved quality would accrue directly to them. Not only would women parboilers benefit from the increased

price received and expanded demand for their product but also other primary beneficiaries would include smallholder rice farmers, since their rice would be more marketable. Secondary beneficiaries would include rice millers and consumers, who would have better quality rice on the market.

ACRONYMS AND ABBREVIATIONS

CPHP	Crop Post Harvest Programme, DFID, UK
CEPA	Centre for Economic Policy Analysis
DFID	Department for International Development, UK
FRI	Food Research Institute, Accra, Ghana
ICOUR	The Irrigation Company of the Upper Regions
IFAD	International Fund for Agricultural Development
MOFA	Ministry of Food and Agriculture
NRI	Natural Resources Institute, University of Greenwich, UK
PPMED	Ministry of Food and Agriculture (Policy Planning, Monitoring and Evaluation Division)
PRA	Participatory Rural Appraisal
RPRDC	Rice Processing Research and Development Centre (Sri Lanka)

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NRI and the Rice Processing Research and Development Centre (RPRDC) in Sri Lanka were established in 1996 under a project funded by the CPHP.

Study carried out in Indonesia (NRI Bulletin 55)

APPENDIX 1:

TERMS OF REFERENCE FOR THE SOCIO-ECONOMIC INPUT TO THE RICE PARBOILING PROJECT IN GHANA

Parboiled rice produced in the northern regions of Ghana is of variable quality, which contributes to its inability to compete with imported rice. Rural women using traditional small-scale technologies undertake all the parboiling. The project aims to assess the current rice parboiling processes, evaluate alternative techniques and identify interventions to improve quality and thus market price. The project will identify specific rice parboiling practices that affect rice quality in Northern Ghana. Best practices for optimal quality using existing technologies will be identified. Possibilities for introducing more efficient and less arduous new technologies will be examined. The project will determine whether the parboiled rice produced after appropriate interventions have been made is more acceptable to consumers than that currently produced. The socio-economic analysis to be undertaken by the NRI/Ghanaian partners will contribute to this process.

Data to be collected and analysed during the socio-economic survey by the NRI/Ghanaian partners includes:

- the importance of parboiling to poor households, particularly to womens' incomes; and its role in poverty alleviation;
- typical prices for parboiled rice (both temporal and spatial); comparisons with imported rice;
- potential for sustainability of current and introduced methods of parboiling;
- costs and profits associated with the current and introduced methods of parboiling; including costs of establishing parboiling operations;
- number and gender of those involved in rice parboiling;
- women's perceptions of income generated through parboiling;
- initial views of producers, parboilers, traders and consumers on the quality of the parboiled rice produced by different processes;
- credit needs, availability and cost of credit to small scale enterprises;
- level and type of support (if any) given to rice parboilers by extension services;
- availability and costs of various inputs, including water and wood; and possible alternatives;
- constraints to the introduction of alternative practices (e.g. money, time, gender, social issues, water and energy availability)
- impact of increasing the scale of parboiling technology on costs, savings in time, water and fuel consumption

The findings will be summarised in a report to be completed as soon as possible on arrival back in the UK.

APPENDIX 2: RICE PARBOILING – CHECKLIST OF QUESTIONS

General Information

1. Location
2. Participants in discussions, number and gender
3. Main economic activities – relative importance of rice parboiling
4. Is it solely women involved in rice parboiling and marketing

Parboiling of rice – processing, equipment and costs

5. How much paddy do you process each day/week/year – seasonal changes
6. Source of paddy rice supplies - farmer, other traders – describe marketing channels. Is it bought on credit; how transported
7. How much parboiled rice do you produce from paddy
8. Discussion of weight and measures – size of bag, basin, buckets etc
9. Equipment needed and cost: pots, basins, buckets, calabash, stirring spoons, concrete floor, bags
10. How do you pay for this equipment – credit, own money
11. Fuel used and cost
12. Water used and cost
13. Brief discussion of process used – quantities, techniques, why, by whom and how long; labour required
10. Any losses during processing and storage – how, where and how long do store; storage losses and why
14. How many people work with you – group or individual
15. Constraints to processing – capital/credit; availability and access of paddy and other inputs; time taken to process; techniques, processing, marketing – suggestions to overcome these problems /coping strategies if any
16. Any external processing (and marketing) advice – if so, from whom, what kind of information, how often.
17. Social and cultural aspects – can anyone enter the business, age structure, young people attracted to the business, perceptions of rice parboiling etc.

Milling, Transport and Marketing

18. Transport methods and costs
19. How is your parboiled rice milled – what is cost of milling
20. Marketing of parboiled rice – who markets, what, when, quantities
21. Costs of marketing; any packaging or grading before selling, transport, loading, taxes/tolls.
22. How much do you consume yourself/family
23. Price levels and fluctuations in parboiled/milled rice during day/week/month; any price information on imported rice; any sources of price information
24. Do differences in quality, colour, taste, etc. influence price?
25. Season of trading or throughout the year
26. Quantities traded – day/week/month
27. Has your trade increased, decreased or been stable over last 3 years.
28. Trends in demand for parboiled rice;
29. Customers/gender/age

30. Other products traded – compare with rice (synergies/substitution)
31. Rank major constraints to marketing – any suggestions to overcome them.
32. Social and cultural aspects related to processing and consumption



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