CSIR - FOOD RESEARCH INSTITUTE

FEASIBILITY STUDY ON PARBOILED RICE QUALITY IMPROVEMENT PROGRAMME IN SOME SELECTED COMMUNITIES AROUND TAMALE IN THE NORTHERN REGION OF GHANA

For: FRENCH EMBASSY / FOOD SECURITY AND RICE PRODUCERS ORGANISATION PROJECT

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Summary

The specific purpose of the Lowland Rice Development Project (LRDP) in the Northern Region of Ghana was to establish lowland rice production and processing methods which are economically viable and sufficiently attractive for farmers and women processors responsible for processing and commercializing this production. In furtherance of the above aims (after the project had ended in December 2003), the Embassy of the Republic of France commissioned the Food Research Institute (FRI) to carry out a feasibility study on a shortlist of communities recommended by the FSRPOP in order to design precisely the modalities and budget of this quality improvement programme. A survey was undertaken using structured questionnaires to technically assess the capacity of farmers to produce quality paddy, ability of processors to produce parboiled rice of consistent quality and ability of millers to produce good quality milled rice. The survey established the farming, harvesting and threshing practices, state of rice fields and constraints at the farmer, parboiler and miller levels. It was recommended that the bunds in the field be immediately repaired and the farmers encouraged to maintain them regularly. The rice variety recommended for the pilot project wasTox. This recommendation is based on results of earlier sensory evaluation carried out. Ten (10) processors and two (2) millers were selected for the pilot project. However all processors and millers were recommended for training for future expansion.

Expected paddy output was approximately 70 tons of paddy rice. About 70 farmers in the four communities were proposed for selection. The farmers are expected to cultivate one (1) acre each with expected yield of 1ton per acre. Costing of needed inputs, equipment and/or infrastructure to be introduced was done as well as a description and costing of supervision and monitoring. A budget for the pilot phase was also prepared. In order to determine the quality gap to be filled, physical and sensory evaluation of *Lolandi* and unsorted samples from the LRDP (Tox LRDP was conducted. Panellists commented that *Lolandi* rice had creamy nature when cooked, it had nice rice odour and sweet taste. Sample Tox LRDP had an offensive odour and contained a lot of black specks. For the purposes of this study, profitability analyses were generated for different selling price regimes; paddy in the case of farmers and milled parboiled rice at the processing level. The intention was to settle on a fair profit-sharing system for stakeholders; farmers, processors and millers. As much as possible cost estimates were generated from the analysis of primary data collected from the study area. Using 2003 average selling price of 120,000 cedis per 83-kg bag (Price range between 100,000 and 125,000 cedis per 83-kg paddy considered), profitability analysis results indicated that a farmer makes a net annual income of 139,090 cedis on a total production cost of 1,300,910 cedis per acre of rice farm, with percentage return on revenue of 9.6% and benefit cost ratio of 1.1 while margin per man-day is estimated at 11,898 cedis. For profitability estimates of lowland rice cropping in 2004, different price regimes (ranging between 120,000 Cedis and 140, 000 cedis per 83-kg paddy bag) were used. With an average selling price of 135,000 cedis/83-kg bag, farmers make a net annual income of 82,850 cedis on a total production cost of 1,537,150 cedis per acre of rice farm. Percentage return on revenue is approximately 5%, benefit cost ratio of 1.05 while margins per man-day is estimated at 11,726 cedis.

Background

The Lowland Rice Development Project (LRDP) in the Northern Region of Ghana was funded mainly by the government of the Republic of France and aimed to demonstrate the viability of rice production in the treated lowlands of the Northern Region. The specific purpose of the project was to "establish lowland rice production and processing methods which are economically viable and sufficiently attractive for Farmers and the Women Processors responsible for processing and commercialising this production. The production and processing system must be sufficiently flexible for it to be reproduced and transferable to other regions." The project commenced in February 1999 and ended in December 2003.

The project had the following objectives:

- To develop 1040 ha of lowland in three valleys situated in the vicinity of Tamale.
- To increase rain-fed rice yields from 1 t/ha (using traditional methods) to 3.3 t/ha through planning and intensification (improved varieties, high-quality seeds, use of fertilisers and herbicides, animal traction).
- To improve the quality of parboiled rice in order to command a better price and increase the income of the women involved in processing.
- To organise the producers and into solid, autonomous groups capable of providing input, obtaining and supervising credit, marketing products and ensuring the upkeep and management of the hydraulic infrastructure.
- To implement a micro-credit programme, managed by the Agricultural Development Bank (ADB), capable of providing durable access to credit for small-scale and female transformers through their organisation into mutual guarantee groups.

On the termination of the LRDP, the government of the Republic of France, in furtherance of its commitment to helping the rice sector in Ghana, set up the Food Security and Rice Producers Organisation Project (FSRPOP) which is also hosted by the Ministry of Food and Agriculture (MOFA). FSRPOP has initiated a "Parboiled Rice Quality Improvement Programme" in the northern region with the following objectives:

- To produce on a pilot-basis in 4 selected communities located around Tamale, high quality parboiled and milled rice, using improved equipment and designing appropriate

programmes of schedules (list of good practices) for Producers, and small-scale rice Processors, with close field supervision and technical support.

- Under an additional and adequate FSRPOP marketing support programme, the high quality parboiled and milled rice produced shall then be bought by the Union of Lowland Rice ' cooperatives in order to be bagged in 3-kg sachets, branded, advertised and displayed nationwide at a price equivalent to the Asian imported rice (about ¢4,000 per kilo).

- Extra incomes generated by the sale of this rice shall be distributed equitably among the different stakeholders (Farmers, Parboilers and Millers) and therefore constitutes incentives to follow the designed programmes of schedules.

In furtherance of the above aims, the Embassy of the Republic of France commissioned the Food Research Institute (FRI) to carry out a feasibility study on a shortlist of communities recommended by the FSRPOP in order to design precisely the modalities and budget of this quality improvement programme. The terms of reference of the feasibility study are as follows:

- Final selection of the pilot communities.
- Estimation of the volume of production in Mt (paddy and milled rice) and number of Parboilers and to be part of the programme.
- Design of appropriate programmes of schedules (Specifications) for Farmers, Processors and Millers.
- Costing of the needed inputs, equipments and/or infrastructures to be introduced.
- Description and costing of supervision & monitoring.
- Economic assessment of the sharing of profit (price formation) between Farmers, Women Processors and Millers based on the 2003 sell price.
- Proposal of a new sharing of profit assuming that the selling price of the improved quality rice shall be ¢4,000 per kilo.
- Physical and sensory evaluation of samples of Lolandi and regular samples of rice (variety, TOX) from the LRDP fields in order to determine the quality gap to be filled.

Methodology

A survey was undertaken using structured questionnaires to technically assess the

- capacity of Farmers to produce quality paddy
- ability of Processors to produce parboiled rice of consistent quality and
- ability of Millers to produce good quality milled rice

Survey Findings

Farming

A total of 36 Farmers from the four villages were interviewed. In the Tolon-Kumbugu District two villages were considered namely Kumbugu and Zugu. Total area under cultivation in both areas is 78 acres (Kumbugu – 54 acres, Zugu – 24 acres). In the Savelugu-Nanton District Balshei and Dingoni were farming villages surveyed. Total land area at Balshei is 119 acres while that of Dingoni is 35 acres.

Farming Practices

Varieties planted over the last three years included GR18, Tox and Mandee. Farmers indicated that the LRDP did supply seeds initially but in subsequent years Farmers had to keep part of their harvest to be used as seed. Majority of the Farmers have small land holdings. About 65% to 78% of Farmers interviewed have over the last few years cultivated an acre each. GR18 seemed to be the preferred variety because according to the Farmers it is able to withstand drought and matures earlier than Tox. In addition GR18 has denser grains than Tox and somehow the Women Processors prefer the GR18. Planting time is around end of May to June but it is largely affected by land preparation and timely supply of other inputs. Apart from rice other crops cultivated include maize, cassava, yam, peanut, sorghum and cowpea. Maize and cassava are mostly for home consumption whilst peanut, yam and sorghum are mostly for sale.

Rice Fields

The rice fields are bunded but are now in a state of disrepair. 21% of respondents indicated that their bunds are in good shape while 33% reported that the bunds are fairly good but need

immediate repair. However 45% indicated that the bunds are in real bad shape and needed attention.

Harvesting

Paddy is harvested manually using a sickle. Gangs of manual labourers or colleague are organised for this exercise. Duration of harvesting however depends on the number of people involved and the size of land. Time for harvesting is mostly by visual examination of the rice plant i.e. when colour of leaves turn brown and panicles bend. 55% of indicated incidences of shattering at harvesting are most probably due to over drying of paddy. There were also incidences of lodging with 58% of the Farmers. As regards field curing, i.e. drying rice before threshing was largely not done since paddy is well dried even before harvesting. After harvesting, the women carry the paddy from the fields and heap on the threshing site.

Threshing

Threshing is carried out manually on all farms. The panicles are heaped on polypropylene sheets and beaten with sticks. The main problem encountered in this process is the tedious nature of the work which often cause arm, waist and back pain. After threshing, winnowing is done and paddy is packed into bags and transported home for storage. No further drying is done at this stage. The bags of paddy are mostly stored in the rooms of Farmers or to a lesser extent in traditional silos for between four to five months. Most Farmers give out part of their harvest to their Landlords.

Associations

Almost all respondents (97%) belonged to a rice growers association for an average of 2.5 years. Among other things Farmers belonging to such associations benefited from the following:

- training on good agricultural practices on rice cultivation
- access to loans and credit facilities
- technical advice and increased income

Constraints (Farmer Level)

Farmers from the four villages had similar constraints which bordered on the following:

- Transportation difficulties
- high cost of labour and farm inputs (weedicides, fertilizers)
- late land preparation and late receipt of inputs such as fertilizers
- Unlevelled field and its attendant water management difficulties
- Small land holdings and unreliable rainfall
- Early sales due to urgent cash needs
- Lack of financial resources
- Marketing problems (low prices, unreliable markets, credit sales)

Parboiling

A total of 35 Women Processors from the four villages were interviewed. 50% of respondents had knowledge of improved parboiling techniques. It is important to however note that majority of them were beneficiaries of trainer of trainees programme under the LRDP and some NGO's. Processors had experience in parboiling ranging from between 2 to 35 years. The Processors had either paid or unpaid personnel working with them who had mostly received on the job training. Eighty-eight percent (88%) of respondents obtain paddy from Farmers in their localities and the surrounding villages while 12% buy from the external markets. The average processing capacity was about 614kg per week, minimum and maximum 83kg and 1660kg per week respectively. Sixty three percent (63%) of the Processors indicated GR18 as their varietal preference to Tox and Mandee. As at time of collecting data the mean price per bag (83kg) of GR18 was 139,000 cedis while that of Mandee was 137,000 cedis (ranges between 100,000 cedis to 140,000 cedis depending on the season). Major equipment used in the parboiling industry is largely iron pots and clay pots. Characteristics of good quality paddy were indicated by; high density of paddy grains, absence of stones and weeds and the presence of less immature grains. All the respondents had no improved parboiling equipment in use.

Parboiling process

The procedure adopted in parboiling is the same in all the localities. Basically the process is made up of washing paddy to remove chaff and other unwanted materials, hot soaking of paddy overnight, steaming and drying. The source of water for the process was predominantly borehole and pipe-borne. Both were for most part of the year reliable. The quality was reported as good and clean.

Drying and Milling

Drying of steamed paddy was mostly done on cemented floors as indicated by 88% of respondents. Paddy was dried for various times depending on the intensity of the sun and often turned for effective and uniform drying. Milling is done in the localities and average milling yield is 60 - 65%.

Factors that affected milling yield included the following;

- Quality of paddy (Immature paddy / low density grains)
- Improper bagging of paddy (i.e. paddy weight less than 83kg)
- Variety of paddy

Characteristics of good quality parboiled rice were given as

- Well dried and shiny appearance
- Absence of stones and weeds
- Less or no black specs
- Less or no mouldy grains
- Less brokens

About 66% of respondents belonged to rice Parboilers association and average number of years for being members was 3 years. Benefits for being in such associations included

- Access to training on improved parboiling techniques
- Access to loans
- Inputs like tarpaulins

Constraints

- Inadequate equipment especially, aluminium pots
- Lack of drying space
- Inadequate capital to buy more raw material
- Inefficient mills /absence of mills in some localities
- Drudgery associated with processing and its health implications
- Irregular supply of paddy
- High production cost
- Marketing – Unattractive selling prices

Milling

Ten Millers (mainly owners) from the four villages were interviewed. Most of the mills were owned by individuals and are more often assisted by two or more employees. In most cases the mills were bought at the second hand level so specific information about the mill such as age were unknown. Respondents stated that it is relatively easy to get spare parts to replace worn out ones. Major equipment replacement on some of the mills included shafts, pistons, bearings and belts. Mean operating milling capacity of the mills is 1473kg paddy per day. This falls far below the installed capacity of 250kg/hr, which is largely due to inadequate paddy supply and to a lesser extent age of mill. Milling is done on custom basis and milled products are mostly sold. Current milling charge per bag of paddy (83kg) is between 8,000 and 10,000 cedis. Milling yield ranges from 60 to 65% with a mean of 62%.

Constraints

- Frequent breakdown of some parts
- High electricity bills
- Inadequate paddy
- High cost of spare parts

Recommendations

General

For the purposes of the pilot scale trial of the project and the fact that planting season is so near, the following specific recommendations may be very helpful.

- That the bunds in the field be immediately repaired and the farmers encouraged to regularly maintain them
- That farmers in good standing i.e. those with a good loan repayment record in the selected areas be regrouped on the farming plots for easy access and monitoring under this pilot scheme. It is proposed that 70 credit-worthy Farmers should be selected from Kumbungu and other three villages where Farmers can be grouped together for effective monitoring. With an average production of one ton of paddy per acre it is expected that seventy (70) tons of paddy could be produced for the pilot project. For purposes of good quality paddy and effective monitoring and supervision the possibility of grouping the selected farmers at one place on the rice fields should be made an obligation. This is to ensure good water management, weed control, variety purity etc.

- That the TOX variety be used for the trial. (This recommendation is based on results of earlier sensory evaluation carried out. It is important however to do a lot of education and sensitisation because form the survey findings, more farmers were growing GR18 as opposed to TOX)
- That ten (10) Processors and two (2) millers be selected for the pilot project. However all Processors and Millers could be re-trained for future expansion.

SPECIFIC RECOMMENDATIONS TO ADDRESS THE OBJECTIVES IN THE MEMORANDUM OF UNDERSTANDING

i. Final Selection of the Pilot Communities

The communities selected are Kumbungu in the Tolon-Kumbungu District and 3 other villages to be selected by FSRPOP based on the fact that the total production of farmers in good standing in these areas, would be about the 70 tonnes of paddy required for the pilot project. All farmers in these areas have previously received training under the LRDP. All the processors in these areas have access to quality water for parboiling

ii. Estimation of the Volume of Production in Metric Tons

Expected paddy output is approximately 70 tons of paddy rice. About 70 farmers have been selected in the four communities. It is expected that farmers will cultivate one (1) acre each with expected yield of 1ton per acre. Final selection of villages would be made by FSRPOP. FSRPOP should select at least two villages around Tamale, and two villages around Kumbungu. Details on production levels for the respective locations will be done later. Expected amount of paddy to be parboiled is 70 tons. Using 60 to 65% recovery rate, milled parboiled rice is expected to be approximately 42.0 to 45.5 tons.

Number of Farmers: Seventy (70)

Number of Parboilers: Ten (10)

Number of Millers: Two (2)

(Final selection of Women Processors and Millers will be done later).

iii. Costing of Needed Inputs, Equipment and/or Infrastructure to be Introduced

Table i: Training costs for Farmers, Parboilers and Millers:

Item	*Details*	*Amount in Cedis*
Training for Farmers from Kumbungu and 3 other villages	*Lunch @ 20,000 cedis for 70 Farmers*	*1,400,000*
	Transportation @ 20,000 for 70 Farmers	*1,400,000*
Sub Total		***2,800,000***
Training for Millers at Kumbungu	*Lunch @ 20,000 cedis for 2 Millers(2 days)*	*80,000*
	Transportation @ 20,000 / Miller(2 days)	
		80,000
Sub Total		***160,000***
Training for Parboilers from Kumbungu and Zuggu	*Accommodation for 15 participants[#] @ 45,000 cedis * 3 days*	*2,025,000*
	*Transportation @ 20,000 / Processor * 15*	
	*Meals @ 50,000 cedis / day *15 participants * 3 days*	*300,000*
		2,250,000
Sub Total		***4,575,000***
Training of beneficiaries by FRI Staff	*12 man days @ 1,100,000 per day*	***13,200,000***
Miscellaneous (10%)		***2,073,500***
Total		***22,808,500***

[#]Number of Parboilers has been increased to allow for possible drop out.

Table ii: Cost of Technical Inputs

Item	*Details*	*Amount in Cedis*
Farmers	*Technical inputs (land preparation, agro-chemicals supply)Tarpaulins*	*Responsibility by FSRPOP*
Parboilers	*2 bags of cement @ 65,000 + 100,000 cedis * 10*	*2,300,000*
	Parboilers for repair and maintenance of drying floors	
	*1 Improved Vessel @ 1,800,000 * 10*	*18,000,000*
	1 Aluminium Pot @ 200,000 10*	*2,000,000*
Sub total		***22,300,000***
Millers	*Rehabilitation of 2 mills @ 5 million cedis /mill*	*10,000,000*
	Supply of spare parts (shafts, sieves, blades, bearings, belts and housing)	
Sub total		***10,000,000***
Contingencies (10%)		***3,230,000***
Total		***35,530,000***

iv. Description and Costing of Supervision and Monitoring

Food Research Institute will train Field Assistants for monitoring. These Assistants are already into similar activities and therefore have the needed experience to carry out the monitoring activities. These Assistants would be contracted by Food Research Institute to supervise Farmers during the planting season, during all the agronomic practices that need to be done and also harvesting and threshing. In much the same way, the Field Assistants will supervise the Women Processors and Millers.

Table iii: Cost of Supervision and Monitoring

Item	*Amount*
Field Assistants (Farmers) @ 2,000,000/month for 7 effective months Inc. Fuel allowance	*22,000,000*
Supervisor (for processing) 2,000,000/month for 4 months Inc. Fuel allowance	
Field monitoring by FRI staff: 20 man days @ 1,100,000/day	*22,000,000*
Travel costs: 6 trips @ 2,000,000/trip	*12,000,000*
Sensory Evaluation: 5 man days@1,000,000/day	*5,000,000*
Institutional overheads: (30% of total cost)	*18,300,000*
Total	***79,300,000***

Table iv: Pilot Phase Budget

Item	*Amount*
Training	*22,808,500*
Technical Inputs	*35,530,000*
Paddy Procurement @ 135,000 Cedis/83-KG Bag	*113,805,000*
*Parboiling service charges @46,000/bag * 843 bags*	*38,778,000*
Transportation and Packaging	*20,000,000*
Supervision and Monitoring	*79,300,000*
Total	***310,221,500***

v. Physical and Sensory Evaluation of Samples of *Lolandi* and Unsorted Samples from the LRDP (Tox LRDP)

In order to determine the quality gap to be filled, physical and sensory evaluation of the samples below were conducted.

Table v: Results of Colour Determination

Sample	L	a(+)	b (+)
Lolandi	64.59	1.18	10.81
Tox (LRDP)	66.11	1.39	11.86
Control	68.29	1.35	13.6

The Hunter (L, a, b) colour scale is one of the most widely used by the food Industry. It is based on the opponent-colours theory that states that the red, green and blue human eye cone responses are re-mixed into black-white, red-green, and yellow-blue, opponent coders as they move up the optic nerve to the brain. The **L**, a, b type of scale simulate this as:

- **L** (lightness) axis – 0 is black, 100 is white
- **a** (red-green) axis – positive values are red; negative values are green and 0 is neutral
- **b** (yellow-blue) axis – positive values are yellow; negative values are blue and 0 is neutral

Whiteness is a colour index by which a sample is judged to approach the preferred white. It is important because in many cases observer ratings of whiteness correspond to consumer preferences for products such as rice and flour. Our visual judgement of whiteness is primarily dependent on how light a sample is and the presence or absence of blue or yellow tint.

The 'a' values representing red colour were very low for all the three samples and can therefore be approximated to neutral. The 'b' values also indicate that there was a slight yellow taint with all the samples. The L value refers to the degree of lightness (whiteness) and as can be seen from the results the *Lolandi* and Tox samples did not vary significantly from the control. This means that the appearances of all the samples were quite attractive.

Table vi: Results of Physical Quality Analysis

sample	*% brokens*	*% stones*	*%immature grains*	*% paddy*	*% red rice*	*% mouldy*	*% heat damaged*	*% dis-coloured*	*%white centred*
Lolandi	*10.37*	*0*	*0*	*0*	*0*	*2.36*	*0*	*0*	*0*
Tox (LRDP)	*39.46*	*0.08*	*0.05*	*0*	*0.66*	*2.34*	*0.78*	*0.79*	*0*
Control	*13.63*	*0.35*	*0.3*	*0*	*0.05*	*2.9*	*0*	*0*	*0*

The control sample used was obtained from Women Processors trained by the Food Research Institute in the Upper-East Region and had not been hand sorted as in the case of Lolandi. Though the value for Lolandi under % brokens is less than that for the control, it is important to note that sorting has been done and for that matter it is expected to be quite lower than it is. Depending on the degree of sorting done the amount involved can constitute losses. The results on the other parameters did not show much difference.

Table vii: Mean Sensory Scores of Raw Rice Varieties

Attributes	Tox (LRDP)	Lolandi	Control
Uniform colour	51.27	77.63	86.46
Black specks	47.45	16.27	3.45
White specks	2.64	2.54	1.63
Yellowish colour	17.36	11.45	75.54
Brown Colour	12.45	15.45	1.09
Brightness	28.45	37.00	78.18
Cleanliness	42.82	68.18	90.09
Translucent	29.91	48.82	80.73
Creamy colour	41.91	42.55	76.63
Chalky grains	9.73	6.63	1.91
Unshelled paddy	8.27	2.36	1.90
Whole grain shaped	51.45	78.91	88.45
Long shaped	56.45	78.9	67.55
Size	40.72	40.72	60.18
Slender	23.00	20.54	28.27
Overall acceptability	38. 24	54.72	82.64

For the raw rice samples, there were no significant differences ($p.>0.05$) in white specks, size, and slender among control and the two cultivars but there were significant differences

(p >0.05) in uniform colour, black specks, yellowish colour, brown colour, translucent , cleanliness, creamy colour, chalky grains, unshelled paddy, whole grains, and overall acceptability. Specifically, Variety TOX LRDP had the least uniform colour, least clean, blacker specks, more unshelled paddy grains, and least overall acceptability.

Table viii: Mean Sensory Scores of Cooked Rice Cultivars

Attribute	Tox (LRDP)	Lolandi	Control
Rice Odour	40.82	72.54	78.00
Strength of odour	72.27	53.09	68.18
Sweet Taste	49.72	62.73	56.09
Sour Taste	5.91	5.82	6.18
Creamy Taste	54.91	61.82	66.09
Sticky Texture	79.18	41.09	27.90
Gritty/Sandy	18.82	17.27	7.18
Hard texture	12.00	17.27	26.36
White Appearance	62.09	72.72	66.82
Yellowish Colour	7.36	9.73	38.72
Brown colour	15.45	6.00	4.64
Black specks	39.27	7.73	2.00
uniform Appearance	44.73	73.00	84.45
Overall Acceptability	32.09	67.00	72.82

Table 8 shows the sensory attributes of cooked rice cultivars. There were no differences (p>0.05) in sweet taste, creamy taste, hard texture, white appearance, brown colour and sour taste among control and two cultivars when rice samples were cooked. However there were significant differences in sticky texture, yellowish colour, black specks, uniform appearance and overall acceptability among the three cultivars. Specifically, cultivar TOX LRDP showed significantly higher sticky texture, more black specks, less uniform appearance and least overall acceptability. Cultivar Lolandi when cooked had uniform appearance and overall acceptability similar to the control sample.

Comments from Panellists

Panellists commented that the control sample was very attractive, very clean and can be used for plain rice, rice water. Lolandi rice had creamy nature when cooked, it had nice rice odour and

sweet taste Sample TOX LRDP had offensive odour and contained a lot of black specks. The unshelled paddy makes eating of this rice difficult.

Conclusion on Sensory Evaluation

Cultivar Lolandi can be released to the market but more work needs to be done on **Tox (LRDP)** cultivar. The objective of this quality program is therefore to significantly improve the quality of paddy rice produced by lowland rice farmers. Through improved parboiling techniques it is expected that the quality of the processed rice would be to be similar to the control sample so that sorting the rice (which is an expensive work) would not be necessary.

vi. Proposal of a new sharing of profit assuming that selling price of the improved quality rice will be sold at 4,000 cedis a kilogram.

Profitability Analysis

For the purposes of this study, profitability analyses are generated for different selling price regimes; paddy in the case of farmers and milled parboiled rice at the processing level. The intention is to settle on a fair profit-sharing system for stakeholders; farmers, processors and millers. As much as possible cost estimates are generated from the analysis of primary data collected from the study area. The following assumptions are made in the analyses;

Assumptions

Farming

1. Though farmers used family labour for most of the farming activities, cost is imputed using the on-going labour cost of c10,000/man-day and c9,000/man-day for 2004 and 2003 in the study area respectively.
2. Cost of credit used is 29% per anuum.
3. Average acreage of rice cultivated is 1 acre with an average yield of 996kgs paddy per acre assuming Tox variety is cultivated.
4. No storage cost is assumed at the farmer level

Parboiling

1. Processing capacity of 288 bags of paddy per year per processor is assumed; 1bag/batch/processor, 6 batches per week, 48 weeks /year (4wks allowance for festivity breaks).
2. Recovery rate (paddy to milled parboiled rice) of 62% is used.
3. No credit facility for parboilers
4. Considering the ideal situation where an average processor is being assisted by 2 people to process 3 bags per batch and 2 batches per week, it is assumed that a total of 288 man-days are involved in processing 288 bags of paddy (23904 kg paddy) per year.
5. Straight-line method of depreciation is used.
6. Use of improved vessel will contribute to 50% reduction in fuel, water and labour cost. ***However for the purposes of this study full labour cost is assumed.***
7. No byproducts sales.
8. No marketing charges (i.e. transportation to market, packaging, market toll and storage cost) are assumed. Therefore selling prices are considered to be ex-factory prices.

Estimates of financial profitability analysis of LRDP cropping and rice parboiling enterprise for 2003 and 2004 using Margin/Man-day, Benefit Cost Ratio and Return on Revenue/Sales are presented as follows;

Table1. Estimation of the Profitability of Lowland Rice Cropping in year 2003.

PER YEAR (1 ACRE CROPPED)				
INCOME PER YEAR (average yield = 1 tonne per acre)				
Number of 83-kg paddy bags per acre	12	12	12	12
Selling price (cedis/paddy bag)	100,000	110,000	120,000	125,000
A=Revenue per acre	1,200,000	1,320,000	1,440,000	1,500,000
EXPENSES (per acre) part of credit				
Land preparation with tractor				
Ploughing	95,000	95,000	95,000	95,000
Harrowing	47,000	47,000	47,000	47,000
Fertilizer				

2 bags of NPK (@ 145000/bag	290,000	290,000	290,000	290,000
0.5 bag of sulf. A @ 116000 per bag	58,000	58,000	58,000	58,000
Other chemicals				
Sacks for water control (spill-ways, breaks)				
3 polysacks @ 2300 per bag	6,900	6,900	6,900	6,900
B=total expenses on credit	496,900	496,900	496,900	496,900
C=Cost of 10 months credit (29% flat per annum = 24.2% of 2004 loans	120,250	120,250	120,250	120,250
D= B+C= total debt	617,150	617,150	617,150	617,150
EXPENSES AND COST NOT PART OF CREDIT				
Bunding of fields				
Depreciation at 20% per annum (bonding cost = 48 euros per acre				
1 = 9600 cedis), being 460800 cedis per acre	92,160	92,160	92,160	92,160
Improved seed (TOX 3107)				
one 40kg bag/acre @ 90000 per bag	90,000	90,000	90,000	90,000
Harvesting and threshing				
12 polysacks @ 3,300 cedis per bag	39,600	39,600	39,600	39,600
1 tarpaulin @ 90,000 cedis per bag, with depreciation @ 33% / annum	30,000	30,000	30,000	30,000
E=Total expenses and costs not part of credit inclu. Bunding	251,760	251,760	251,760	251,760
F=D+E=TOTAL COSTS AND EXPENSES excl cost of labour	868,910	868,910	868,910	868,910
G=A-F=Margin after deduction of all costs excluding labour	331,090	451,090	571,090	631,090
Cost of labour				
Number of Man-days/acre				
Land preparation	1	1	1	1
Planting in line	6	6	6	6
Weeding 1	6	6	6	6
Weeding 2	4	4	4	4
Localised application of fertilizer	5	5	5	5

Water management and bond maintenance	8	8	8	8
Harvesting	10	10	10	10
Threshing, winnowing and bagging	8	8	8	8
H= Total Man-Days/acre	48	48	48	48
I=Total cost of labour @9000 cedis/Man-day	432,000	432,000	432,000	432,000
J=F+I = TOTAL COST OF PRODUCTION	1,300,910	1,300,910	1,300,910	1,300,910
K=G/H = MARGIN/MAN-DAY	6,898	9,398	11,898	13,148
L=A-J=NET INCOME	(100,910)	19,090	139,090	199,090
M=L/A x 100 = NET INCOME/REVENUE	(8.41)	1.45	9.66	13.27
N=A/J=Benefit: Cost Ratio	0.92	1.01	1.11	1.15

Using 2003 average selling price of 120,000 cedis per 83-kg bag (Price range between 100,000 and 125,000 Cedis per 83-kg paddy considered), profitability analysis results indicated that a farmer makes a net annual income of 139,090 cedis on a total production cost of 1,300,910 cedis per acre of rice farm, with percentage return on revenue of 9.6% and benefit cost ratio of 1.1 while margin per man-day is estimated at 11,898 cedis

Table2. Estimation of the Profitability of Lowland Rice Processing in 2003.

PER YEAR (288 Bags Processed; 6bags per week, 48weeks/year)	Profitability Of 2004 Rice processing, in Cedis			
INCOME PER YEAR				
Quantity of paddy processed per year(kg)	23,904	23,904	23,904	23,904
Number of 83-kg paddy bags processed per year	288	288	288	288
Quantity of & parboiled milled rice per year (kg) @62% recovery	14,820	14,820	14,820	14,820
Number of parboiled &milled rice per year (bowls)	5,489	5,489	5,489	5,489
Price of milled rice (Cedis/bowl, 1 bowl =2.7kg)	7,830	8,100	8,640	8,910
Price of milled rice (Cedis/kg)	2,900	3,000	3,200	3,300
A = Income per year (23904kg paddy / 288bags processed)	42,979,392	44,461,440	47,425,536	48,907,584

EXPENSES (No credit)				
Cost of 83-kg paddy bags				
Price of 83-kg paddy bag (@ 120,000/bag	120,000	120,000	120,000	120,000
Consumables				
Firewood (per 83-kg paddy bag)	7,360	7,360	7,360	7,360
Water (per 83-kg paddy bag)	4,000	4,000	4,000	4,000
Trasportation				
Paddy rice (warehouse or selling point to processing site)	2,500	2,500	2,500	2,500
Parboiled paddy (processing site to milling site)	1,200	1,200	1,200	1,200
Milled rice (milling site to warehouse or selling point)	2,500	2,500	2,500	2,500
Milling				
Milling cost (per parboiled paddy bag)	10,000	10,000	10,000	10,000
B= Total exp. Excl. Equip. (per 83kg-paddy bag)	147,560	147,560	147,560	147,560
C= Total exp, excl. Equip. per year	42,497,280	42,497,280	42,497,280	42,497,280
Processing Equipment				
D= Depreciation per annum (total cost of processing equipment / processor)	170,833	170,833	170,833	170,833
E=C + D= Total Cost & expenses excl. cost of labour	42,668,113	42,668,113	42,668,113	42,668,113
F=A-E= Margin after deduction of all costs excl. cost of labour	311,279	1,793,327	4,757,423	6,239,471
Cost of labour (6 person process 6 bags/week)				
G= Total Man-Days per year	288	288	288	288
H= total cost of labour (@ 9,000 cedis /man-day)	2,592,000	2,592,000	2,592,000	2,592,000
I=E+ H = Total Cost of Production	45,260,113	45,260,113	45,260,113	45,260,113
J=A/ G= Margin /man-day	1,081	6,227	16,519	21,665
K=A-I=Net Income / Year	(2,280,721)	(798,673)	2,165,423	3,647,471
L=K/A * 100 = Net Income/Revenue (%)	-5	-2	5	7
M=A/I=Benefit: Cost Ratio	0.95	0.98	1.05	1.08

With paddy bought at 120,000 cedis/83-kg bag, milling charge of 10,000 cedis/83-kg bag and average selling price of milled parboiled rice of 3,200 cedis/kg (price range between 2,900 Cedis and 3,300 Cedis /kg of milled parboiled rice considered), the profitability analysis showed that a processor makes a net income of 2,165,423 Cedis on a total production cost of 45,260,113 Cedis per year. A margin per man-day for processing is approximately 16,519 cedis, 5% return on revenue while benefit cost ratio is 1.05.

Table3. Estimation of the Profitability of Lowland Rice Cropping in 2004.

PER YEAR (1 ACRE CROPPED)						
INCOME PER YEAR (average yield = 1 tonne per acre)						
Number of 83-kg paddy bags per acre	12	12	12	12	12	12
Selling price (cedis/paddy bag)	120,000	125,000	130,000	135,000	140,000	150,000
A=Revenue per acre	1,440,000	1,500,000	1,560,000	1,620,000	1,680,000	1,800,000
PRODUCTION COST PER YEAR						
EXPENSES (per acre) part of credit						
Land preparation with tractor						
Ploughing	100,000	100,000	100,000	100,000	100,000	100,000
Harrowing	50,000	50,000	50,000	50,000	50,000	50,000
Fertilizer						
2 bags of NPK (@ 185000/bag	370,000	370,000	370,000	370,000	370,000	370,000
0.5 bag of sulf. A @ 116000 per bag	70,000	70,000	70,000	70,000	70,000	70,000
Other chemicals						
Sacks for water control (spill-ways, breaks)						
3 polysacks @ 4000 cedis per bag; 33% per annum	4,000	4,000	4,000	4,000	4,000	4,000
B=Total expenses on credit	594,000	594,000	594,000	594,000	594,000	594,000
C=Cost of 10 months credit (29% flat per annum = 24.2% of 2004 loans	143,550	143,550	143,550	143,550	143,550	143,550
D= B+C= Total debt	737,550	737,550	737,550	737,550	737,550	737,550
EXPENSES AND COST not part of credit						
Bunding of fields						

Bunding cost; 500,000cedis per acre						
Depreciation @ 25% per annum	125,000	125,000	125,000	125,000	125,000	125,000
Improved seed (TOX 3107)						
one 40kg bag/acre @ 110,000 per bag	110,000	110,000	110,000	110,000	110,000	110,000
Harvesting and treshing						
12 polysacks @ 3,300 cedis per bag	39,600	39,600	39,600	39,600	39,600	39,600
1 tarpaulin @ 135,000 cedis per bag, with depreciation @ 33% / annum	45,000	45,000	45,000	45,000	45,000	45,000
E=Total expenses and costs not part of credit inclu. Bunding	319,600	319,600	319,600	319,600	319,600	319,600
F=D+E=TOTAL COSTS AND EXPENSES excl cost of labour	1,057,150	1,057,150	1,057,150	1,057,150	1,057,150	1,057,150
G=A-F=Margin after deduction of all costs excluding labour	382,850	442,850	502,850	562,850	622,850	742,850

Profitability estimates of lowland Rice Cropping in 2004 for different price regimes (ranging between 120,000 Cedis and 140, 000 Cedis per 83-kg paddy bag) are presented in table3. Using an average selling price of 135,000 cedis/83-kg bag, farmers make a net annual income of 82,850 cedis on a total production cost of 1,537,150 Cedis per acre of rice farm. Percentage return on revenue is approximately 5%, benefit cost ratio of 1.05 while margins per man-day is estimated at 11,726 Cedis.

Table4. Estimation of the Profitability of Lowland Rice Processing in 2004.

PER YEAR (23,904kg paddy rice processed; 498kg per week, 48weeks/year)				
INCOME PER YEAR				
Quantity of paddy processed per year (kg)	23,904	23,904	23,904	23,904
Number of 83-kg paddy bags per year	288	288	288	288
Quantity of parboiled & milled rice per year (kg) @ 62% recovery	14,820	14,820	14,820	14,820
Number of parboiled &milled rice per year (bowls)	5,489	5,489	5,489	5,489
Price of milled rice (Cedis/bowl, 1 bowl =2.7kg)	9,450	9,990	10,260	10,800
Price of milled rice (Cedis/kg)	3,500	3,700	3,800	4,000
A = Income per year (23,904kg paddy rice processed)	51,871,680	54,835,776	56,317,824	59,281,920

EXPENSES & COST(No credit)				
Cost of 83-kg paddy bags				
Price of 83-kg paddy bag (@ 135,000/bag	135,000	135,000	135,000	135,000
Consumables				
Firewood (per 83-kg paddy bag)	3,680	3,680	3,680	3,680
Water (per 83-kg paddy bag)	2,000	2,000	2,000	2,000
Trasportation				
Paddy rice (warehouse or selling point to processing site)	2,500	2,500	2,500	2,500
Parboiled paddy (processing site to milling site)	1,200	1,200	1,200	1,200
Milled rice (milling site to warehouse or selling point)	2,500	2,500	2,500	2,500
Milling				
Milling cost (per parboiled paddy bag)	12,500	12,500	12,500	12,500
Processing Equipment & Cemented Floor				
Depreciation per annum (per processor)	467,500	467,500	467,500	467,500
Depreciation per 83-kg paddy bag	1,623	1,623	1,623	1,623
B = Total Expenses & Costs excl. cost of labour	161,003	161,003	161,003	161,003
C= Total Expenses & Costs per year excl. labour	46,368,940	46,368,940	46,368,940	46,368,940
D= Margin after deduction of all costs excl. cost of labour	5,502,740	8,466,836	9,948,884	12,912,980
Cost of labour (1 processor per 83-kg bag)				
E= Total Man-Days per year	288	288	288	288
F= Total cost of labour (@ 10,000 cedis /man-day)	2,880,000	2,880,000	2,880,000	2,880,000
G= Total Cost of Production per year	49,248,940	49,248,940	49,248,940	49,248,940
H=D/E= Margin /man-day	19,107	29,399	34,545	44,837
I=A-G=Net income	2,622,740	5,586,836	7,068,884	10,032,980
J=I/A* 100 = Net Income/Revenue (%)	5	10	13	17
K= A/G = Benefit : Cost Ratio	1.05	1.11	1.14	1.20

Given a scenario where paddy is custom processed (i.e. parboilers using their own resources), ex-factory price of parboiled milled rice is estimated at 3,500 cedis/kg with paddy bought at 135,000 cedis/83-kg bag and milling charge of 12,500 cedis/83-kg bag. At these prices, the profitability analysis showed a net annual income per processor of 2,622,740 Cedis and total production cost of 49,248,940 Cedis per year. A margin per man-day for processing is approximately 20,000 Cedis, percentage return on revenue is 5% while benefit cost ratio is 1.05.

Alternatively, if women processors are contracted to process raw paddy using the proposed improved technology (with no cleaning and sorting option after processing) for a fee, the labour charge should not be less than 20,000 cedis per 83-kg bag (which is equivalent to the feasible margin/man-day obtained from the profitability analysis). The service charge is therefore estimated at 46,000-cedis/ 83-kg bag as shown below;

Estimation of the Cost of Parboiling and Milling on Service Basis

Item	Cost (Cedis)
Consumables	
Firewood (per 83-Kg paddy bag)	3,680
Water (per 83-Kg paddy bag)	2,000
Transportation	
Paddy rice (Warehouse to processing point)	2,500
Parboiled Paddy (Processing site to Milling site)	1,200
Milled Rice (Milling site to Warehouse)	2,500
Milling	12,500
Cost per 83-Kg parboiled paddy bag	
Processing Equipment	
Depreciation (per 83-Kg paddy bag processed	1,623
Labour	20,000
one person per day per bag	
Total Service Charge per 83-Kg paddy bag	46,003

Table5. Estimation of the Profitability of Apex Body Activities.

NO CLEANNING AND SORTING ARE NECESSARY	QUANTITY	UNIT PRICE	TOTAL AMOUNT	
INCOMES				
BAGS OF 3 KGS	14467	12000	**173,600,000.00**	
EXPEDITURES				
PADDY	843	135,000	113,805,000.00	
PARBOILING	843	46,000	38,778,000.00	
			152,583,000.00	
PACKAGING AND TRANSPORT PROVISION			**20,000,000.00**	
BALANCE			**1,017,000.00**	
STORAGE (use of collective exesting stucture)?				
TRANSPORT TO PACKAGING SITE	523	4000	2,090,640.00	TO BE CONFIRMED
PURCHASE SACHETS	14467	500	7,233,500.00	TO BE CONFIRMED
PACK IN 3 KG			10,000,000.00	TO BE CONFIRMED
TRANSPORT TAMALE/ACCRA			PM	
SALE PROMOTION			PM	

Profitability analysis of the Apex Body activities showed that using average selling price of paddy of 135,000 cedis per 83-kg and service charge of 46,000cedis per 83-kg results in a production cost of 152,583,000 per year (for 843bags of paddy processed). Assuming packaging and other marketing charges of 20,000,000 per year, Apex Body will be relatively breaking even at a selling price of milled packaged rice of 4,000/kg, with expected total income per year of 173,600,000cedis (43401Kgs of milled parboiled rice - @ 62% recovery rate).

vii. Economic assessment of the sharing of profit (price formation) between Farmers, Women Processors and Millers based on the year 2003 selling price.

Economic Assessment

The viability of the proposed remuneration or profit sharing system for 2004 (sharing of profit between Farmers, Women Processors and Millers) is assessed vis-à-vis the profit sharing system for 2003.

Summary of Economic Assessment

Stakeholders	Situational Analysis in 2003	Situational Analysis in 2004
Farmers	Using the average selling price of 120,000 cedis per 83-kg paddy, Margin/Man-day is estimated at approx. 11,900 cedis. Net income per acre of 139'000 % of Net income/Revenue of 9.6% Benefit Cost Ratio of 1.1 Marketing is a major constraint	Using the average selling price of 135,000 cedis per 83-kg paddy Margin /Man-day is estimated at approx. 11,700 cedis Net income per acre of 82,900 % of Net income/Revenue of 5% Benefit Cost Ratio of 1.05 Although there is no direct improvement over last year in terms of financial gains due to significant increase in production cost, marketing is assured. Farmers will be exposed to technical training programs, which are more related to quality improvement.
Parboilers	Using the average selling price of 3,200cedis / kg of milled parboiled rice, Margin/Man-day is estimated at approx. 16,500 cedis Net income per year of 2,165,423 % of Net income/Revenue of 5% Benefit Cost Ratio of 1.05	Using the average selling price of 3,500cedis/kg of milled parboiled rice, Margin/Man-day is estimated at approx. 20,000cedis. This results in 21% increase over last year's margin/man-day of 16,500 cedis. Net income per year of 2,622,740 % of Net income/Revenue of 5% Benefit Cost Ratio of 1.05. Other benefits include training in improved processing, access to improved vessel, production of high quality rice that can compete favorably with imported rice and access to a bigger consumer market supported with effective promotional activities. However, it is

		important to note that ensuring high parboiling quality is critical to the success of this quality program.
Millers	Milling Charge of 10,000 cedis per 83-kg parboiled paddy bag	Milling Charge of 12,500 cedis per 83-kg parboiled paddy bag. Resulting in 25% increase in milling charges. It is anticipated that the increase in milling charges would be enough incentive to compensate for extra cost involved in double passing.
Apex Body	-	Access to Spare parts Using average selling price of 135,000 cedis per 83-kg paddy and a service charge of 46,000 cedis per processor, the Apex body makes a total production cost of 181,000cedis per 83-kg paddy bag processed. Using an average recovery rate of 62% results in cost of 3,550 cedis per Kilo of milled parboiled rice. At a selling price of 4,000/kg of packaged milled parboiled rice means Apex body has 450 cedis per kilo to cover packaging and marketing charges.

viii. Design of appropriate programmes of schedules for Farmers, Processors and Millers

Description of pilot scheme

The pilot scheme will be managed by an Apex Body (This body is to be made up of the executive members of the Farmer Based Organizations within the pilot project sites) with supervisory support from FRI and FSRPOP. The responsibilities of the Apex body would include the following:

- To set up contracts with the selected rice farmers cooperatives spelling out the obligations for farmers and the quantity and the price to be paid for paddy
- To follow up the respect of the contracts signed by the rice farmers Cooperatives
  - To procure and store paddy from the selected Farmers under the pilot phase project at an agreed price (135,000 Cedis per 83-kg bag) at harvest and stored in a warehouse. Expected amount of paddy to be procured is 70 tons

- To set up contracts with 10 Parboilers to parboil the 70 tons of paddy on service charge basis (48,000 cedis/83-kg bag of paddy processed), spelling out the obligations for the processors
- To follow up the respect of the contracts signed by the women processors
- To set up contract with 2 millers spelling out their obligation and follow up the respect of the contracts
- To package and market the milled rice.

It is interesting to note that great competition exist on the rice market in Ghana and for the project to succeed the quality of both the raw material and the final product should be of paramount interest. In the light of this, Farmers, Parboilers and Millers would have to commit themselves to certain conditions if they wish to be part of the project. Memorandum of Understanding to be designed for stakeholders should cover the under listed obligations;

Farmers Obligation

i. Selected Farmers must be lowland Farmers having bunded fields
ii. Farmers must be ready to plant Tox variety
iii. Farmers must be ready to be grouped on the same field to allow for effective monitoring and production of good quality paddy (water management, weeds control, variety purity)
iv. Farmers must be ready to plant in rows and follow other recommended agronomic practices
v. Farmers must be ready to apply fertilizer at the right time and in the right quantities
vi. Farmers must be ready to do two times weeding before harvesting
vii. Farmers must be ready to harvest at the right time
viii. Farmers must be ready to thresh on tarpaulins and package paddy in 83-kg bags

It is only when Farmers have agreed to these terms and followed them to the latter that the Apex body would be committed to buy the paddy produced at 135, 000 Cedis after harvest.

FRI will appoint field Assistants to closely monitor the Farmers and feedback in respect of Farmers' obligations communicated to APEX body.

Parboilers

i. Ten parboilers would be selected to parboil the 70 tons of paddy on service charge basis. The Apex body will be responsible for supplying paddy to the processors and taking back the milled rice

ii. Parboilers must be ready to adhere to good manufacturing practices

- thoroughly wash paddy to remove residual dirt and stones
- Wash paddy to remove organic impurities especially immature grains so as not to generate black specs in the final product
- use clean water for the soaking period

drying should be done on a on cemented floors with no cracks. It must be as well maintained as possible and swept clean before each use. Constant turning to allow even drying of the paddy is important. Children and animals should be discouraged from walking on drying paddy both for reasons of hygiene and to prevent further introduction of stones.

- It is expected that the rice parboiled and milled must have a milling yield falling between 60% to 65 %. (Anything short of this would not attract any service charge)

It is expected that if the processors adhere to these good manufacturing practices there would be virtually no need for sorting the milled rice. However in the event of a Processor failing to observe these obligations the one in question would be responsible for sorting the milled rice at no extra cost. In this regard Processors should be prepared to cooperate fully with Field Assistants who would closely monitor/supervise their activities

FRI will appoint field Assistants to closely monitor the Women Processors and feedback in respect of Women Processors obligations communicated to APEX body. As an incentive a service charge of 48,000 cedis per bag would be paid and processors who adhere to the obligations would own the improved parboiling equipment at the end of the project.

Millers Obligation

- Make sure mills are well maintained and safely operated
- operate in a safe, hygienic environment
- Wear appropriate clothing, safety equipment such as dust masks
- Carry out routine maintenance and safety checks
- Check quality of grain milling

- Make sure grain is fed to mill at a suitable rate
- Adjust the mill to produce the required product
- Ensure appropriate disposal of by-products
- Pass the paddy twice at 12,500 cedis /83-kg bag

FRI will appoint field Assistants to closely monitor the Millers and feedback in respect of Millers obligations communicated to APEX body.

Program of Schedules for Pilot Scale Project

DATE	ACTIVITY	RESPONSIBLE
May, 2004	• Presentation of report • Meeting with Farmers to agree on obligations • Selection of Farmers to work with • Selection of communities • Contract between selected Cooperatives and Apex	FSRPOP,FRI, APEX
End of May – June, 2004	• Planting season for Farmers • Field Supervision (reshaping of bunds, Farmers grouped on the same plot, land preparation	FRI/Field Assistants
June, 2004	• Training for Farmers and Field Assistants • Field Supervision continues (planting techniques, variety used)	FRI/Field Assistants
June– September, 2004	• Field monitoring of Farmers to ensure that good agronomic practices are adhered to • Weeding, fertilizer application, good water management, etc	FRI/Field Assistants
November – December, 2004	• Field monitoring of harvesting • Field monitoring of threshing paddy • Field monitoring of bagging paddy	FRI/Field Assistants
November – December, 2004	• Apex body to start paddy procurement (70 tons)	FSRPOP/FRI/Apex body

January, 2004	• Training of Parboilers , Field assistants	FRI
January – February, 2004	• Apex body to contract Parboilers to parboil paddy (70 tons) • Field Assistants to supervise parboiling process • Apex body to contract Millers to mill parboiled rice	FSRPOP/ FRI/Apex
January – February, 2005	• Apex body to work on packaging materials: design, printing of plastic bags, sealers etc.	FSRPOP/Apex body/FRI
February/March, 2005	• Packaging into various quantities • Distribution of packaged rice to Total shops and other brokers	FSRPOP/Apex body
March, 2005	• Monitoring of marketing	FSRPOP/Apex body

Manuals for training the various stakeholders involved in this pilot scheme are attached. This training would involve the Farmers, Processors and Millers as well as Field Assistants who would be carrying out follow-up monitoring exercises.

APPENDICES

APPENDIX 1

Socioeconomic Profile of TOWNS (AREAS VISITED)

Characteristics	Kumbungu	Zuggu	Dingoni	Balshei	Overall
Sex					
Male	100%	100%	100%	100%	100%
Female	-	-	-	-	-
Age					
Minimum	28	25	28	24	24
Maximum	74	55	70	48	74
Mean	48.7	35.2	41.9	33.7	38.9
Std. Dev.	15.8	8.7	16.4	9.52	13.3
Educational Level					
No formal Education	66.7%	90.0%	100%	70.0%	83.3%
Primary/JSS/Middle	16.7%	10.0%	-	20.0%	11.1%
Secondary	16.7%	-	-	-	2.8%
Others	-	-	-	10.0%	2.8%
Marital Status					
Married	100%	100%	100%	100%	100%
Family Size					
Minimum	3	3	4	2	2
Maximum	40	27	40	22	40
Mean	16	8	12	12	11
Std. Dev	13	7	11	7	9
Main Occupation					
Farming	100%	80.0%	100%	80.0%	88.9%
Trading	-	20.0%	-	20.0%	11.1%
Sec. Occupation					
Farming	16.7%	-	-	-	2.8%
Trading	-	10.0%	-	-	2.8%
Others	33.3%	60.0%	10.0%	30.0%	33.3%
Not Applicable	50.0%	30.0%	90.0%	70.0%	61.1%
Acreage of Rice Cultivated					
Minimum	1	1	1	1	1
Maximum	4	5	1	3	5
Mean	1.5	1.6	1	1.5	1.39
Std. Dev	1.22	1.26	0	0.71	0.9
Variety Cultivated					
Tox	66.7%	-	-	-	11.1%
GR18	16.7%	100%	100%	100%	86.1%
Both	16.7%	-	-	-	2.8%

Socioeconomic Profile of

Characteristics	TOWNS (AREAS VISITED)				
	Kumbungu	Zuggu	Dingoni	Balshei	Overall
Sex					
Female	100%	100%	100%	100%	100%
Age					
Minimum	25	40	25	35	25
Maximum	60	53	56	60	60
Mean	43.75	47.67	38.2	40.7	41.9
Std. Dev.	11.57	4.93	8.96	7.15	8.9
Educational Level					
No formal Education	100%	100%	100%	100%	100%
Marital Status					
Married	100%	83.3%	100%	100%	97.1%
Widowed	-	16.7%	-	-	2.9%
Years of Parboiling					
Minimum	4	3	5	2	2
Maximum	35	26	35	30	35
Mean	13.7	11.5	19.7	9.4	13.8
Std. Dev	12.8	7	9.4	8.46	10.2
Training in Parboiling					
Yes	62.5%	83.3%	10.0%	60%	50%
No	37.5%	16.7%	90.0%	40%	50%
Main Occupation					
Parboiling	87.5%	100%	100%	100%	97.1%
Trading	12.5%	-	-	-	2.9%
Sec. Occupation					
G'nut Oil & Sheabuter Extraction	62.5%	-	50.0%	70.0%	50.0%
Parboiling	12.5	-	-	-	2.8%
Trading & farming	12.5%	100%	30.0%	10%	32.4%
Not Applicable	12.5%	-	20.0%	20.0%	14.8%
Processing capacity(kg/wk)					
Minimum	83	498	166	332	83
Maximum	1660	1162	1660	498	1660
Mean	622.5	771.9	722.1	363.5	614.2
Std. Dev	518.7	224.1	556.1	61.4	431.6
Milling Yield/Bag of Paddy					
Minimum	59%	65%	65%	55%	55%
Maximum	65%	72%	65%	72%	72%
Mean	64%	66%	65%	64%	65%
Std. Dev.	2%	3%	0	4%	3%

Appendix 2: Technical coefficient for Parboiling (Using traditional method)

Prices

Item	unit price	quantity	Amount
NPK	145000	2	290000
H3NO4	116000	0.5	58000
Polysacks water mgt	2300	3	6900
euro	9600	1	9600
Polysacks threshing	3300	12	39600
Tarpaulin	90000	1	90000
Tarpaulin dep	90000	0.333333	30000
Cost of 10mth crd	0.242	496900	120249.8
bonding cost (cedis)	9600	48	460800
boding dep	0.2	460800	92160
improved seed	90000	1	90000
cost of labour	9000	48	432000

Appendix 2: Technical Coefficient for Parboiling (Using traditional method)

FIXED COST

Processing Equipment

Item	Ave. Unit Cost	Ave. No. Units /Processor	Total Cost	Useful life(years)	Depreciation (Per anuum)
Aliminium Pot	200,000	2	400,000	20	20,000
Clay Pot	70,000	2	140,000	4	35,000
Aliminium Bucket	70,000	2	140,000	10	14,000
Aluminium Basin	80,000	2	160,000	8	20,000
'koko' bowl	25,000	2	50,000	4	12,500
Sieve	4,000	2	8,000	0.5	16,000
Calabash	4,000	2	8,000	0.4	20,000
Basket	5,000	2	10,000	0.3	33,333
Total Cost/annum					170,833

PROCESSING CAPACITY

Average Per Processor

Quantity processed per batch(Kg)	83
No. of batches per week	6
Qty processed per week(Kg)	498
No. weeks/year	48
Qty processed per year(Kg)	23904

YIELD	14820
Qty of 83-kg paddy processed	23904
Recovery rate	0.62

LABOUR

Ave No. of people /batch	1
No. of batches/week	6
Total man-days/week	6
No. of weeks of processing /year	48
Total man-days/year	288

Appendix 3. Technical Coefficient for the Profitability of 2004 Lowland Rice Cropping

Prices (Cedis)

Item	unit price	quantity	Amount
NPK	185000	2	370000
H3NO4	140000	0.5	70000
Polysacks water mgt	4000	3	12000
Euro	10500	1	10500
Polysacks treshing	3300	12	39600
Tarpaulin	135,000	1	135000
Tarpaulin dep	135,000	0.333333	45000
Cost of 10mth crd	0.241666	594000	143550
Bunding cost (cedis/acre)	500,000	1	500000
Bunding depreciation @ 25% per anuum	0.25	500000	125000
improved seed (TOX 3107)	110000	1	110000
cost of labour	10000	48	480000

Technical Coefficient (Parboiling)

FIXED COST (Cedis)

Processing Equipment & Drying Space

Item	Ave. Unit Cost	Ave. No. Units /Processor	Total Cost	Useful life(years)	Depreciation (Per anuum)
Aliminium Pot	200,000	1	200,000	20	10,000
Clay Pot	70,000	2	140,000	4	35,000
Aliminium Bucket	70,000	2	140,000	10	14,000
Aluminium Basin	80,000	2	160,000	8	20,000
'koko' bowl	25,000	2	50,000	4	12,500
Sieve	4,000	2	8,000	0.5	16,000
Calabash	4,000	2	8,000	0.4	20,000
Basket	5,000	2	10,000	0.3	33,333
Improved Vessel	1,600,000	1	1,600,000	6	266,667
Cemented floor	60,000	2	120,000	3	40,000
Total Fixed Cost /Year					467,500

PROCESSING CAPACITY & YIELD	
Average Per Processor	
Quantity processed per batch	1
No. of Batches per week	6
Qty processed per week	6
No. weeks/year	48
Qty processed per year 83-kg bag	288
Qty processed per year (Kg)	23904
YIELD	
Qty of parboiled milled rice per year (kg)	14820
Number of bowls of milled rice per year	5489
Qty of paddy processed per year (kg)	23904
Recovery rate	0.62
LABOUR	
Ave No. of people /batch	1
No. of batches/week	6
Total man-days/week	6
No. of weeks of processing /year	48
Total man-days/year	288

PROCESSING CAPACITY & YIELD	
Average Per Processor	
Quantity processed per batch	1
No. of Batches per week	6
Qty processed per week	6
No. weeks/year	48
Qty processed per year 83-kg bag	288
Qty processed per year (Kg)	23904
YIELD	
Qty of parboiled milled rice per year (kg)	14820
Number of bowls of milled rice per year	5489
Qty of paddy processed per year (kg)	23904
Recovery rate	0.62
LABOUR	
Ave No. of people /batch	1
No. of batches/week	6
Total man-days/week	6
No. of weeks of processing /year	48
Total man-days/year	288