Better rice for higher incomes

RIU

Validated RNRRS Output.

A set of practical post-harvest technologies has helped the government of Ghana to improve the quality of locally grown rice, reducing imports by 30%. A range of actors along the production chain have improved their incomes while ensuring safety and boosting product quality. Although the use of this knowledge initially focused on the townships where it was developed, training manuals summarizing the fully tested and validated practices are now available. Agricultural extension agents are using the training manuals to transfer the knowledge to more farmers and processors. It could benefit an estimated 400,000 small-scale farmers and 125,000 women parboilers in Ghana alone. New partners from Nigeria, Mali, Burkina Faso, Benin and Togo are finding the outputs relevant to their countries.

Project Ref: **CPH03:**
Topic: **5. Rural Development Boosters: Improved Marketing, Processing & Storage**
Lead Organisation: **Food Research Institute (FRI), Ghana**
Source: **Crop Post Harvest Programme**

Document Contents:

Description, Validation, Current Situation, Current Promotion, Impacts On Poverty, Environmental Impact,

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Description

Research into Use
NR International
Park House
Bradbourne Lane
Aylesford
Kent
ME20 6SN
UK

Geographical regions included:

Benin, Burkina Faso, Ghana, Mali, Nigeria, Togo,

Target Audiences for this content:

Crop farmers, Processors,

CPH03

A. Description of the research output(s)

1. Working title of output or cluster of outputs.
In addition, you are free to suggest a shorter more imaginative working title/acronym of 20 words or less.

- A partnership approach to enhancing rural livelihoods through the development and dissemination of improved post-harvest handling practices: Improving the quality and competitiveness of locally produced rice in Ghana

- Enhancing rural livelihoods through improving post-harvest handling and rice quality in Ghana

2. Name of relevant RNRRS Programme(s) commissioning supporting research and also indicate other funding sources, if applicable.

- Crop Post Harvest Programme

3. Provide relevant R numbers (and/or programme development/dissemination reference numbers covering supporting research) along with the institutional partners (with individual contact persons (if appropriate)) involved in the project activities. As with the question above, this is primarily to allow for the legacy of the RNRRS to be acknowledged during the RIUP activities.

- R6688, R7543, R8263, ZB0378

Partners:

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6. Ministry of Food and Agriculture, Bolgatanga (MOFA); P.O. Box 3, Bolgatanga, Ghana; Tel: +233 72

23465, 23013; Fax: +233 72 22265. Contact; A.R.Z. Salifu; email: lacproj@africaonline.com.gh

4. Describe the RNRRS output or cluster of outputs being proposed and when was it produced? ***(max. 400 words)****. This*
requires a clear and concise description of the output(s) and the problem the output(s) aimed to address. Please incorporate
and highlight (in bold) key words that would/could be used to select your output when held in a database.

This work was identified in 2000 on the basis of the government's stated objective of reducing rice imports by 30%. The improvement of the quality of locally produced rice is the main avenue to achieving this objective. The use of the technologies and approaches developed under the DFID funded rice projects in Ghana contributed towards achieving this objective and conserved foreign exchange for the country.

There was tremendous demand for the technologies and approaches developed under project R7543 (Improving Rice Parboiling Efficiency) by the target beneficiaries.

In 2002, the CPHP West African Regional workshop on project priority setting identified projects R7543 and R6688 as among those that stood a great chance of making maximum impact within the next 2 years if properly packaged and extended to target beneficiaries.

Outputs (2000-2004)

- Effective working groups and mechanisms have been established within the Ministry of Agriculture, enhancing knowledge transfer to relevant end-users.
- Functional links and communication channels between providers and users of improved rice post production technologies have been initiated and promoted in West Africa. The new partners from Nigeria, Mali, Burkina Faso, Benin and Togo found the outputs relevant to their countries.
- Pomotional strategies to introduce suitable technologies and practical solutions for the improvement of locally parboiled rice have been refined and developed, thereby aiming to increase the income of stakeholders in the production chain and improve product quality and safety.
- Five **training manuals** and a **handbook on rice recipes** were produced. The manuals covered the general requirements for good quality rice and explained the expected role of farmers, parboilers, millers and marketers.
- 5 rice mills in northern Ghana were fitted with aspiration systems and upgraded to improve performance.
- Over 150 agricultural extension and development officers, representatives of farmers, parboilers, millers and marketers were trained on the improved rice post harvest handling practices outlined in the training manuals.
- "Best Practice" demonstration sites were established to highlight the linkages between farmers, parboilers and millers in 10 sites in northern Ghana.
- Existing socio-economic baseline data was validated.

- Costs and benefits of transferred technologies and practices have been assessed.
- Constraints faced by target beneficiaries in the adoption of transferred technologies were identified and evaluated.
- The effect of transferred technologies on livelihoods of target beneficiaries were assessed.
- The acceptability and price-sensitivity of consumers was assessed and promotion pathways for parboiled rice was evaluated.

5. What is the type of output(s) being described here?
Please tick one or more of the following options.

Product	***Technology***	***Service***	***Process or Methodology***	***Policy***	***Other Please specify***
X	*X*		*X*		

6. What is the main commodity (ies) upon which the output(s) focussed? Could this output be applied to other commodities, if so, please comment

The only commodity under study was **rice**. The systems-approach which was applied to producing these outputs could be applied, with amendments, to other production, processing and marketing systems

7. What production system(s) does/could the output(s) focus upon? Please tick one or more of the following options.
Leave blank if not applicable

Semi-Arid	***High potential***	***Hillsides***	***Forest-Agriculture***	***Peri-urban***	***Land water***	***Tropical moist forest***	***Cross-cutting***
	X						

8. What farming system(s) does the output(s) focus upon?
Please tick one or more of the following options (see Annex B for definitions).
Leave blank if not applicable

Smallholder rainfed humid	***Irrigated***	***Wetland rice based***	***Smallholder rainfed highland***	***Smallholder rainfed dry/cold***	***Dualistic***	***Coastal artisanal fishing***
X	*X*	*X*				

*9. How could value be added to the output or additional constraints faced by poor people addressed by clustering this output with research outputs from other sources (RNRRS and non RNRRS)? (**max. 300 words**).*

Please specify what other outputs your output(s) could be clustered. At this point you should make reference to the circulated list of RNRRS outputs for which proformas are currently being prepared.

Due to the importance of rice in the diet of Ghanaians, several initiatives on the commodity are currently underway (see below) to alleviate constraints and enhance the livelihoods of the farmers involved in the local rice industry. An improved synergy with the outputs of these initiatives would enhance the value of the outputs of the RNRRS-funded research. These initiatives include:

- the Participatory Adaptation and Diffusion of rice-based technologies (PADS) of the Africa Rice Centre (WARDA),
- the Inland Valley Rice Project and the Agriculture Sector Services Investment Project of the Ministry of Agriculture (MoFA),
- the GATSBY rice project managed by the Council for Scientific and Industrial Research (CSIR),
- the activities of the Ghana Rice Inter-professional Body, and
- the promotional and advocacy work of NGOs such as Actionaid and Oxfam.

Scientists from the Nigerian Cereal Research Institute and the Institute of Rural Economy of Mali were invited to Ghana to share their experiences in rice research with the coalition.

At the end of the Rice Technology Dissemination Initiative (ZB0378) funded by the Crop Post harvest programme, representatives of all the project and initiatives listed above were invited to workshops to share experiences and to establish the necessary professional relationships needed to complement each other's outputs.

In order to produce rice of a consistently high quality to compete with imports, our coalition team concluded that strong linkages need to be formed between farmers, parboilers, millers and marketers in any agro-ecological region. Consequently, more value could be added to the outputs of our research by clustering with the outputs from the following RNRRS projects:

- Rice varieties in Ghana projects (R6826, R7657)
- Seed Priming of Rice in West Africa and Asia project (R7438)

Both these projects were funded by the Plant Sciences Research Programme.

Validation

B. Validation of the research output(s)

*10**. How** were the output(s) validated and **who** validated them?*

Please provide brief description of method(s) used and consider application, replication, adaptation and/or adoption in the context of any partner organisation and user groups involved. In addressing the "who" component detail which group(s) did the validation e.g. end users, intermediary organisation, government department, aid organisation,

private company etc... This section should also be used to detail, if applicable, to which social group, gender, income category the validation was applied and any increases in productivity observed during validation ***(max. 500 words)****.*

In all cases, the pilot-scale processes being operated under normal field conditions, the market and economic surveys, and technical and socio-economic aspects were each validated by differing teams drawn from all collaborating institutions:

- Food Research Institute of Ghana (FRI);
- Natural Resources Institute, UK (NRI);
- Department of Agricultural Economics (DAE);
- Adventist Development and Relief Agency (ADRA);
- Technoserve (TNS)
- Ghana Ministry of Food and Agriculture, Bolgatanga (MOFA).

In northern Ghana, paddy rice is parboiled to reduce breakage on milling. Most rice produced in these regions is parboiled in 40kg batches, by rural women using traditional technologies (and using common resources such as metal cooking pots, open fires of wood or other biomass fuel, and earth drying floors). The paddy is grown by small-scale farmers who, typically, cultivate only 1-2 acres of rice. Consequently, rice production and processing makes a significant contribution to the livelihoods of the rural poor in these regions. However, the quality of the parboiled rice has been shown to be very variable and not competitive with imported milled rice. Furthermore, the traditional parboiling process is time-consuming, laborious, and utilises large quantities of firewood and water. Outputs from the projects have included the design, development and installation and commissioning of a prototype parboiling vessel. The developed parboiling process:

- produces a high quality product from good quality paddy,
- doubles the processing rate,
- halves the fuel consumption,
- reduces the water consumption by 30 per cent and
- considerably reduces the drudgery involved in the process.

There has been an upward trend in the price margin of imported rice over local rice. Government policy on rice is to reduce imports by 30%. Interventions to achieve this however are concentrated at the farm level.

The following aspects of the parboiling process were highlighted in a project assessment of the system:

- Parboiling as an income generation activity is undertaken solely by women, the majority of whom are in their thirties and forties.
- Production is on small scale averaging 160kg of paddy per week.
- The main cost item is paddy.
- Lack of liquidity to purchase paddy is the limiting factor on the scale of production.
- Profitability estimates vary across communities; some estimates are negative when labour costs are imputed as part of costs. Householders tend not to impute an opportunity cost to their labour inputs.
- The average age of millers in study sites was about 44 years with an average of 9 years experience in

the business.

- Mills are old, powered mostly by electricity with motors of between 6hp to 25hp.
- Average daily output of mills was about 2.3Mt.

*11. **Where and when** have the output(s) been validated?*
*Please indicate the places(s) and country(ies), any particular social group targeted and also indicate in which production system and farming system, using the options provided in questions 7 and 8 respectively, above **(max 300 words)**.*

The outputs were applicable to High Potential Production Systems and were targeted towards Smallholder Rainfed Humid; Irrigated; and Wetland Rice-Based farming systems in Ghana.

Validation was carried out between 2000 and 2005 in the Northern, Upper East and West regions of Ghana. The projects were targeted toward providing outputs which could be used through the agricultural extension services . and local NGOs. These were judged to provide the best pathways to knowledge which could be used in technological interventions in the postharvest rice production chain
Consumer preference testing was validated in Accra and Tamale and showed that rice from the prototype was equally acceptable as high value imported parboiled rice.

Price sensitivity studies in Accra suggested that groups who least could afford rice from the prototype were low income workers, particularly female. Conversely, those who could most afford were those on high incomes, mainly male, and were the most aware of promotion advertising the benefits of parboiled rice.

Outputs specific to selected beneficiaries:

Small-scale entrepreneurs:

- An aspiration system fabricated at FRI was fitted to a demonstrational mill at Navrongo to improve efficiency in July 2003.
- Four existing mills were upgraded in Tamale, Nyankpala and Kumbungu to improve milling efficiency and 7 new demonstrational mills were installed in Garu, Zebilla, Bolgatanga, Navrongo, Tamale, Kumbungu and Wa to enhance improved milling potential.
- The prototype parboiling vessel was evaluated in Tamale, Navrongo, Zebilla and Bawku. The processors confirmed the advantages outlined in question 10 above and expressed the desire to switch from the traditional process.

Smallholder farmers, parboilers and traders

- 40 extension staff and 50 representatives of farmers, parboilers, millers and marketers were trained at 5 separate workshops in the Northern, Upper East and Upper West regions on the prescribed practices in the training manuals in September 2003.

Current Situation

C. Current situation

12. ***How and by whom*** *are the outputs currently being used? Please give a brief description* ***(max. 250 words****).*

- The outputs are being used by smallholder rice farmers, women rice processors who parboil paddy before milling, and owners of small rice mills. Together, these end-users of the technologies have improved the quality of parboiled rice. Training manuals produced as part of the project outputs are also being used Agricultural extension agents of the Ghana Ministry of Food and Agriculture and other Agricultural NGOs to continue transfer of the rice post-harvest technologies to more farmers and processors.

- Members of the Northern Region Intensive Lowland Rice Farmers Cooperative Union, with more than 300 members have adopted the use of the tarpaulin to produce quality paddy as a result of training provided to them by the coalition.

- The Ghana Rice Inter-Professional Body (GRIB): – scientists who worked on the DFID funded rice projects serve as resource persons to this body and provide training and consultancy services to its members.

- The Food Security and Rice Producers Organisation Project (FSRPOP),
- funded by the French Government sub-contracted scientists of the coalition to train a total of 250 farmers, parboilers and millers. They have been working within the Northern and Volta regions. This group included 10 women processors who were supplied with the rice parboiling vessel developed under the DFID-funded projects after their training.

- The coalition provided technical backstopping to a rice project in Ghana funded by the GATSBY foundation of the UK and managed by the Ghana Council for Scientific and Industrial Research.

13. ***Where*** *are the outputs currently being used? As with Question 11 please indicate place(s) and countries where the outputs are being used* ***(max. 250 words).***

Mainly Ghana (Tamale, Nyankpala, Savelugu and Kumbungu in the Northern region; Bolgatanga, Navrongo, Paga, Bawku, Zebilla, Garu and Sandema in the Upper East region and Wa, Jirapa, Lawra and Nandom in the Upper West region). The Ministry of Food and Agriculture has set up a rice processing centre in Tamale where groups of women processors are using parboiling and milling technologies developed by the coalition to process good quality paddy produced by the farmers of the cooperative union. The centre also serves as a demonstration centre for the production of high quality parboiled rice.

The coalition has received expressions of interests in the developed technologies from the African Rice Centre (WARDA) and scientists from Mali, Benin and Nigeria. WARDA has programmes in most countries in West Africa and has contacted the managing partner to develop modules on post harvest handling of rice for their Participatory Adaptation and Diffusion of rice-based technologies (PADS) programme. WARDA has also expressed the desire to have the Training Manual developed by this team translated into French to be used in francophone West African countries.

The managing partner has recently received a communication from the DFID funded PrOpCom project in Nigeria expressing an interest in the outputs of the projects.

14. What is the scale of current use? Indicating how quickly use was established and whether usage is still spreading ***(max 250 words).***

The outputs of the DFID funded rice projects in Ghana were very quickly accepted by the target beneficiaries as they were involved at all stages of the production of the outputs. The current usage of the knowledge is mainly in the townships mentioned under question 13 above in Ghana. These towns are the major locations where the project worked. Outside these areas, there are others such as Hohoe, Apafu-Odomi, Lolobi-Kumasi, Likpe-Bakwa, Fodome-Helu Santrokofi, Gbalahi, Kukuo, and Sahakpaligu where the outputs are currently being used as a result of training and dissemination programme carried out for the French government funded FSRPOP project. The use of the outputs is still spreading with interest in the technologies developed being expressed by other rice improvement programmes as outlined under question 12 above.

The intense interest in the output is due to the fact that there is no other appropriate intermediate processing technology for parboiled rice in Ghana where nearly 60% of the national rice output is parboiled. An estimated 400,000 peasant farmers and 125,000 women parboilers can potentially be reached with these outputs in Ghana alone if the necessary support is available.

15. In your experience what programmes, platforms, policy, institutional structures exist that have assisted with the promotion and/or adoption of the output(s) proposed here and in terms of capacity strengthening what do you see as the key facts of success? ***(max 350 words).***

The Regional and District Directorates of the Ministry of Food and Agriculture, the Ghana Rice Inter-professional Body and NGOs with interests in agriculture such as OXFAM, ADRA and ACTIONAID are the main institutional structures that have assisted with the promotion of the technologies. Some of these organisations have actively argued that tariffs on imported rice be increased and the revenues accruing invested in the local rice industry. This debate is currently ongoing. Both the print and electronic media (radio and television) have provided platforms for the promotion of locally produced rice generally and in particular the parboiled rice. The government of Ghana has a stated policy of reducing the volume of imported rice by at least 30% within the shortest possible time. Consequently, it is now officially accepted that this can only be possible by not only increasing the quantity of rice produced but also to improve the quality and enhance its competitiveness on the local market. The government has also actively encouraged institutions such as hospitals, schools and prisons to purchase locally produced rice. The promotion has also been carried out through exchange of ideas with other knowledge producers and users at national and international workshops.

The coalition partners, particularly the managing partner, need strengthening to further develop their human resource and information dissemination capability. This will make it possible for them to put all reports they have generated onto the internet and make them easily attainable to interested parties. The monitoring and evaluation capability of the relevant departments of the Ministry of Food and Agriculture involved in this coalition needs to be strengthened to be better able to follow up the progress and adoption of the technologies developed.

The work carried out under these projects were essentially research but with an adaptive bias. The outputs are sought-after but institutional strengthening and regular re-iteration of the project outputs in fora such as workshops and through the media are essential. This implies regular injections of resources dedicated to these tasks. Technology-transfer will be enhanced if such a process were to be put into operation over the next five years.

Current Promotion

D. Current promotion/uptake pathways

*16. **Where** is promotion currently taking place? Please indicate for each country specified detail what promotion is taking place, by whom and indicate the scale of current promotion **(max 200 words).***

Project ZB0378 was concerned with consolidating and sustaining the uptake of improved rice post production and marketing technologies in Northern Ghana. The project trained over 60 more agricultural extension and development officers within the Ministry of Food and Agriculture and agriculture oriented NGOs. These extension agents are currently taking part in the promotion of the technologies by training various operatives within the industry, namely, farmers, parboilers, rice mill operators and rice marketers in improved rice post production handling practices with the view of ensuring a consistently high quality of locally produced parboiled rice. Some of the towns in which the promotion is taking place are Tamale, Nyankpala, Savelugu and Kumbungu in the Northern region; Bolgatanga, Navrongo, Paga, Bawku, Zebilla, Garu and Sandema in the Upper East region and Wa, Jirapa, Lawra and Nandom in the Upper West region.

Researchers working on rice quality improvement and technology transfer in other countries such as Nigeria, Mali, Benin and the Africa Rice Center, WARDA were identified and brought together in a workshop to exchange ideas and experiences in their respective countries in this area. This also provided for the promotion of the outputs in these countries

*17. What are the current barriers preventing or slowing the adoption of the output(s)? Cover here institutional issues, those relating to policy, marketing, infrastructure, social exclusion etc. **(max 200 words)**.*

The material used in constructing the parboiling vessel is aluminium and specific welding skills are required to weld this material. Most local welders do not have aluminium welding skills. This is major barrier to the mass production of the vessel.

Another barrier to the widespread adoption of the vessel is the difficulty in the processors obtaining credit to purchase it. Efforts are however being made by the Ministries of Food and Agriculture and Women and Children's Affairs in extending relatively cheap credit to women in the agricultural sector. The debate to increase the tariffs on imported rice is ongoing and it is unclear what the conclusion will be.

The relevant Regional Directorates of MOFA have not been able to translate the training materials into local languages as expected on termination of the projects. This is an essential part of the programme and resources

need to be made available for it to happen.

Institutions like WARDA that have recently expressed interest in the outputs do not have most of the reports generated during the projects. These, together with training manuals, need to be made available to them for translation into French for the benefit of rice processors in francophone countries.

18. What changes are needed to remove/reduce these barriers to adoption? This section could be used to identify perceived capacity related issues ***(max 200 words).***

The relevant Regional Directorates of MOFA need assistance to translate into the various local languages and reproduce greater numbers of the training materials to facilitate more effective dissemination and adoption.

The monitoring and evaluation skills of the coalition members and the relevant extension agents of MOFA and interested agricultural NGOs need to be improved to ensure more effective adoption of the outputs

Contacts with WARDA and other interested national institutions and scientists in the West African sub-region need to be strengthened to provide for greater access to the reports and outputs of the projects.

Greater collaborative relations need to be cultivated among the generators and users of the outputs as well as the relevant policy makers. This strategy and subsequent lobbying for greater support for the local rice industry will aid the aim of improving the competitiveness of local rice.

19. What lessons have you learnt about the best ways to get the outputs used by the largest number of poor people? ***(max 300 words).***

The outputs generated by the DFID funded rice quality improvement projects stand a good chance of widespread use because they projects were formulated as a direct response to a stated government policy of reducing rice imports, improving the competitiveness and price of locally produced rice and improving the livelihoods of poor rice farmers and processors.

Ownership
Project R6688 (Improving the competitiveness of locally produced rice) was a problem identification project that worked directly with the peasant farmers, women parboilers and mill operators in northern Ghana. The constraints identified and the intervention proposed came directly from the target beneficiaries so they saw the coalition members as working in their interest and readily accepted the outputs. This is in contrast to other research projects that did not involve the target beneficiaries in the formulation of activities to be undertaken.

Local partners
The involvement of local staff of the Ministry of Agriculture and other Agricultural NGOs who are indigenous and lived in the same communities as the target beneficiaries enhanced the belief of the beneficiaries to the fact that the main aim of the project was to work towards improving their livelihoods.

Local customs and traditions
In northern Ghana, cooking is the preserve of women and the operation of machines, a man’s job. Knowledge of

this encouraged the coalition members to keep the design of the parboiling vessel as a “cooking pot” and preserve the “cooking” steps involved in the process. This is was a basic demand from the women parboilers who feared that the parboiling activity will be taken over by men if the eventual design looked more like a “man’s machine”

The transparency and cordial relationship that existed among the coalition members and the target beneficiaries was crucial for output uptake and use.

Impacts On Poverty

E. Impacts on poverty to date

20. Where have impact studies on poverty in relation to this output or cluster of outputs taken place? This should include any formal poverty impact studies (and it is appreciated that these will not be commonplace) and any less formal studies including any poverty mapping-type or monitoring work which allow for some analysis on impact on poverty to be made. Details of any cost-benefit analyses may also be detailed at this point. Please list studies here.

To date no post-project impact studies have been carried out. Listed below are the benefits and constraints to the adoption of improved practices faced by target beneficiaries that were documented and evaluated as part of the project.

According to the Ghana Living Standards Survey report (Ghana Statistical Service 2000), the Northern, Upper East and Upper West regions are amongst the poorest regions in terms of both incidence and depth of poverty. In general, these regions appear poorer than the others, consistently falling below the national average although relative ranking of these regions may change from one index to the other. These regions are also among the remotest areas of the country, large sections of which are inaccessible during the rainy season.

The project fell under the “focused” category of poverty reduction. The project addressed issues relating to adding value to locally produced parboiled rice which is exclusively a rural occupation in northern Ghana and is carried out by the poor. The higher quality product subsequently sold for a premium price on the local market. The project set up “best practice sites” where Good Agricultural Practice and Good Manufacturing Practice were adhered to. The designated best practice sites were located in rural, poor communities. The target beneficiaries were farmers, parboilers, rice mill operators and rice marketers as well as agricultural extension workers of the Ministry of Food and Agriculture and agricultural oriented NGOs.

- Cost-Benefits of transferred technologies and practices assessed by October 2003. Qualitative and quantitative assessment of the benefits and costs of the parboiling vessel were carried out. For the use of tarpaulins in threshing by farmers and the use of improved mills, only qualitative assessments were made.

Findings on the assessments of benefits of parboiling vessel are as follows:

- The cost of the vessel at the time of the survey was about 1,500,000cedis. Financial analysis of

parboiling by the women processors with the improved vessel, acquired with a loan at 20% interest, gave a monthly margin of 71,000cedis while at the same prices, the processor using traditional technology earned about 38,000cedis per month.

The following problems were identified by the women processors: Some of these were actually due to the improper use of the vessel.

- Weak handles (This means that the women tried to lift the vessel when it is filled despite having been advised against this by the technologists).

- Vessel is too deep and this makes it difficult to scoop heated paddy from it.

Constraints faced by target beneficiaries in adoption of transferred technologies evaluated by May 2004.

An analysis of the Strengths, Weaknesses, Opportunities and Threats (SWOT) of the use of tarpaulins in threshing and prototype parboiling vessel was carried out.

For the Parboiling Vessel;

- **Strengths:** Capacity is consistent with current batch size; provides superior product quality; saves fuel; reduces drudgery associated with the traditional system
- **Weaknesses:** It is expensive; only a limited number is available; a few technical problems are still associated with the vessel
- **Opportunities:** High local demand for quality parboiled rice (there is a general preference for parboiled rice over white rice in the rural areas.
- **Threats:** Limited availability of the vessel; lack of price premium for the higher quality rice produced with the vessel; lack of access to credit; high interest rates where credit is available; limited duration of the project.

For the use of tarpaulins in threshing;

- **Strengths:** The main strength of the tarpaulin technology is that farmers recognise that it improves the quality of paddy.
- **Weaknesses:** The main weaknesses are that it has a life span of about 3 farming seasons and some farmers prefer to have larger size tarpaulin than what is available now.
- **Opportunities:** The growing awareness of the need to produce good quality paddy is an opportunity for use of tarpaulins.
- **Threats:** However the threat is that it is generally not available locally and farmers are not committed to purchasing the product without some kind of external support

The effect of transferred technologies on livelihoods of target beneficiaries was assessed by October 2004. Proxy indicators of livelihood effects were identified during discussions with users of modified technologies. These indicators have an indirect effect on livelihoods through their effects on net income and time.

- Changes in rates of production (processors doubled batch size with the vessel and sold milled rice faster because of the better quality)
- Cost savings in fuel wood of up to 50%
- Cost savings in water use of between 20 and 30%.

- Drudgery in processing is reduced significantly and less time is spent attending to the process.

21. Based on the evidence in the studies listed above, for each country detail how the poor have benefited from the application and/or adoption of the output(s) ***(max. 500 words):***

- *What positive impacts on livelihoods have been recorded and over what time period have these impacts been observed? These impacts should be recorded against the capital assets (human, social, natural, physical and, financial) of the livelihoods framework;*
- *For whom i.e. which type of person (gender, poverty group (see glossary for definitions) has there been a positive impact;*
- *Indicate the number of people who have realised a positive impact on their livelihood;*
- *Using whatever appropriate indicator was used detail what was the average percentage increase recorded*

Due to the limited scope in interventions, in terms of numbers of equipment and duration of projects, and bearing in mind that this was essentially not a technology-transfer project but a research project, the extent of diffusion of the technologies was not sufficient to have a widespread impact on livelihoods within the duration of the project. However the following proxy indicators of livelihood effects were identified with users of the technologies. These indicators have an indirect effect on livelihoods through their effects on income and time. The beneficiaries of these projects were mainly in the extreme vulnerable group of poor people.

- Training

Over 150 agricultural extension and development officers, representatives of farmers, processors, millers and marketers were trained. They were supposed to in turn train more members of the rice production chain within their localities and areas of operation. Although the exact number of beneficiaries trained by the original trainees is not available, there is evidence to the fact that this diffusion is continuing.

- Establishment of “best-practice” sites

The group framework used to deliver the technologies to processors enhanced social capital because the women’s groups worked together and benefited from mutual support of members. Some groups in Navrongo were taught how to save and access funds from the formal credit institutions. The “best practice” sites helped to link processors with farmers producing good quality paddy and mill operators turning out an acceptable product. This linkage ensured that the eventual product quality was high and potentially attracted a premium price thereby increasing the profit margins of the processors.

- Mill operators

The training helped the mill operators to determine the correct sizes of electric motors to install (many of them were using motors with capacities far in excess of what was required). They were also taught the right ways to align the pulleys and belts of the motors to cut down on power consumption. This directly reduced their expenditure on electricity and increased their margins with potential implications for improved livelihoods

- Changes in rates of production (processors doubled batch size with the vessel and this released time for other activities. The milled rice also sold faster because of the better quality)

This increased significantly the turnover of the processors using the outputs of the projects and subsequently their disposable incomes with probable long term improvements to their livelihoods.

- Cost savings in water and fuel wood (processors reported reductions of up to 50% in the cost of fuel wood and 20% to 30% in the quantity of water used).

These saving meant an even high margin for those using the outputs. This also meant a conservation of water and trees, both of which are highly valuable natural assets in the dry savannah environment of northern Ghana.

- Drudgery in processing is reduced significantly and less time is spent attending to the process.

In the longer term, reduced drudgery could have a positive effect on their health resulting in reduced frequency of hospital visits and improved livelihoods.

Environmental Impact

H. Environmental impact

24. What are the direct and indirect environmental benefits related to the output(s) and their outcome(s)? ***(max 300 words)***

This could include direct benefits from the application of the technology or policy action with local governments or multinational agencies to create environmentally sound policies or programmes. Any supporting and appropriate evidence can be provided in the form of an annex.

Rice mill operators were encouraged to fit aspirators to their mill to produce cleaner rice on milling. In this process, the rice bran was separated from the husk and the former used as animal feed. In cases where bran is not separated from husk, the resultant by-product is difficult to dispose off and has posed environmental problems. The millers were also trained in the correct installation and adjustment of their electric motors and belts to reduce power consumption and increase profit margins.

50% less fuel wood and 20 to 30% less water are being used by parboilers using the improved vessel. This goes a considerable way in reducing deforestation in the rice parboiling areas as wood is the main fuel source in this rather ecologically fragile environment.

Tree saplings were provided to some of the parboilers to plant around their homes and harvest them for fuel instead of collecting wood from the forests. The planted saplings grew much faster, making biomass easily obtainable in a sustainable way, as the waste water from parboiling was used to water them in the drier months of the year.

The parboilers in communities that did not have access to pipe-borne water were given saplings of the *Moringa* plant to cultivate. The seed of this plant, which is common in Ghana, has been .found to have sedimentation and water purifying properties. Some of these women were trained in the use of the *Moringa* seeds to purify otherwise dirty water for parboiling and reduce the competition between parboiling and humans for potable water in these areas.

25. Are there any adverse environmental impacts related to the output(s) and their outcome(s)? ***(max 100 words)***

There are no adverse environmental impacts from the parboiling paddy process. Most by-products are usefully disposed of.

However, the husks from paddy milling continue to be a problem in terms of disposal. Large amounts are left outside mill-site as discarded waste. They are normally left to rot or burnt. The low current value of this material (in terms of cash and utility) coupled with its low bulk density makes the cost of transporting it away from the mill-site prohibitive. This is true of all paddy-processing operations.

Research into finding a suitable use or disposal system needs to be investigated.

26. Do the outputs increase the capacity of poor people to cope with the effects of climate change, reduce the risks of natural disasters and increase their resilience? ***(max 200 words)***

The outputs of the DFID funded rice projects in Ghana have many components that increase the capacity of the poor target beneficiaries to positively affect environmental changes. These include the following:

The use the parboiling vessel reduces the amount of fuel wood used to parboil a unit quantity of paddy by 50%. This has a direct positive effect in reducing the amount of wood which is constantly being cut from the forest for use as fuel.

The encouragement of the parboilers to grow their own trees around their homes to be harvested for fuel is another major positive step in this regard. Apart from providing fuel wood, the trees can also serve as wind breaks to reduce damage to lives and property during storms

The amount of water used in parboiling is also reduced by 20 to 30% which is a significant saving on this rather finite resource.
