

Innovation reduces inputs and drudgery for shea butter processors

RIU

Validated RNRRS Output.

A new press for extracting shea butter reduces processing time by more than a third, cuts water consumption drastically and eliminates the need for fuel wood. This is important for many rural women in northern Ghana who depend on shea butter for income. It represents a huge improvement over the traditional method of processing, which is extremely arduous and time-consuming, and uses large quantities of scarce natural resources such as water and firewood. The press is operated manually with minimal effort, alleviating the drudgery associated with traditional processing techniques, and the extracted butter meets the quality specifications of major European buyers. The new technology has been transferred to 400 rural-based community groups in Uganda, benefiting 10,000 people.

Project Ref: **CPH36:**

Topic: **5. Rural Development Boosters: Improved Marketing, Processing & Storage**

Lead Organisation: **Natural Resources Institute (NRI), UK**

Source: **Crop Post Harvest Programme**

Document Contents:

[Description](#), [Validation](#), [Current Situation](#), [Environmental Impact](#),

Description

CPH36

Research into Use

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Geographical regions included:

[Ghana](#), [Sudan](#), [Uganda](#),

Target Audiences for this content:

[Crop farmers](#), [Processors](#),

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.

Improved processing of shea nuts in northern 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.

R6631

This research project was led by the Natural Resources Institute, United Kingdom (Contact person: John Orchard, Natural Resources Institute, University of Greenwich. 44 1634 883741; j.e.orchard@gre.ac.uk), in partnership with the Technology Consultancy Centre (TCC) of the University of Science and Technology (UST) in Kumasi, Ghana and the Intermediate Technology Transfer Unit (ITTU).

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.

The Shea tree grows across a wide swathe of Sahelian Africa, from Senegal to Ethiopia. Its fruit is gathered from the wild and is highly valued by local communities, not only for the economic and dietary value of the **cooking oil**, but also for the fruit pulp, bark, roots and leaves, which are used in traditional medicines and for the wood and charcoal, used for building and cooking.

The production of **shea butter** is an important income earning activity for many **rural women** in northern **Ghana** and for some it is their only source of income. However, the traditional method of **processing** is an extremely arduous and time consuming activity, which uses large quantities of water and firewood, scarce natural resources in northern Ghana and other shea production areas.

The project developed and evaluated an improved extraction process using a **bridge press**, which offers a reduction in processing time for 25kg shea kernels from 9.5 hours to 3.25 hours; water use is reduced from 90 litres to 1.7 litres; and the need for fuelwood is completely eliminated.

The press is operated manually and requires minimal effort to operate. Labour productivity is certainly increased, and the drudgery associated with the traditional process is, at least, partially alleviated. After the oil has been

extracted the residue is removed from the press as solid blocks which can be sun-dried and used as a fuel. No further processing of the oil is necessary.

The quality of the extracted butter, in terms of moisture content and free fatty acid levels, was independently verified by a number of manufacturers, both domestic and international, and found to be well within the quality specifications of major European buyers. However, financial analysis of the bridge press technology showed that despite significant increases in labour productivity over traditional methods of extraction, the profitability derived from the current scale and technical efficiency of the technology is dependent on market prices for the butter.

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		

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

Shea nuts. The technology is applicable to many oilseed kernels and oil-bearing nuts such as groundnuts, sunflower kernels, and macadamia.

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	X	X	X	X	X	X	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		

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.

There are a number of key constraints preventing poor communities in the exploitation of shea trees.

There is a need to understand the various products that can be produced from processing the nuts, their respective compositional characteristics and the ensuing market opportunities. A useful source of information is the report from the Foodnet study to evaluate the market, economic and environmental prospects for a range of low value, traditional products and high value export Shea products in the local, national and international markets (R.S.B Ferris, C. Collinson, K. Wanda, J. Jagwe and P. Wright, 2001. Foodnet. http://www.foodnet.cgiar.org/Projects/Sheanut_Rep.pdf).

One of the big problems in ensuring returns for the poorest stakeholders in the supply chain is their lack of management skills and entrepreneurship to manage the processing operation as a small-scale business. Approaches to resolving these failures are addressed in the CPHP project '*Managing For Value – A Management Model For Accessing Markets For Agro-Based Industrial Products (The Community-Owned Professionally-Managed [Coprom] System*' - R8432.

To support the commercialisation process the following aspects and their respective projects should be considered.

- **Access to credit:**

R6344/R7013/R7668 – Inventory Credit Schemes (G. Onumah, NRI); R7496 - (A. Goodland); R8114 (U. Kleih, NRI)

- **Market access:**

Making informed choices: facilitating farmers' enterprise selection processes in Uganda, R8421 (B Pound, NRI) Market Information tools, R8520 (U. Kleih, NRI) and R7494/R8422 (Nsemwa, Uyole Agricultural Research Institute, Tanzania)

- **Throughput and efficiency:**

R6087 – Improving small-scale extraction of coconut (J. Orchard, NRI)

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).

Field trials of the press were undertaken in suitable villages and organised by the Tamale Archdiocesan Agricultural Programme (TAAP). Two villages in the Tamale area, Chanzegu and Kanfehiyili, were selected as they had women's groups producing shea butter by traditional means for sale in local markets. A third press was installed in Tabiase and monitored by Technoserve (an American NGO).

The presses were made by the Intermediate Technology Transfer Unit (ITTU) based on a prototype produced by Technology Consultancy Centre (TCC) of the University of Science and Technology (UST). Subsequently TAAP commissioned a third press made by an independent engineer. Training women processors in the use of the press was carried out by NRI and TCC staff.

Monitoring of field trials to evaluate the acceptability of the processing technology and the product, and to determine the yield of oil obtained was initiated by NRI and subsequently carried out by TAAP. Results indicated that the monitoring exercise was successful and that the women were able to operate the press efficiently.

Financial analysis of the bridge press technology was undertaken by NRI and showed that the processing cost using the bridge press is not significantly lower than that for the traditional press. Using 1997 figures, for an annual turnover of 5 tonnes of nuts, the net present value of the bridge press was positive and the internal rate of return of 26% was higher than the estimated opportunity cost of capital (20%).

Although costs of processing by improved and traditional methods were comparable, benefits of the bridge press technology were found to be:

- environmental: the need for firewood was completely eliminated therefore saving on a scarce resource;
- time-saving: use of the press would release time for other household and income activities, especially for women;
- process simplification: the process of butter processing becomes simpler and quicker to use to reach higher volumes of processed shea butter for larger markets.

A further validation of the press was carried in 1999 (ZB0150: Shea butter processing and marketing pilot project in northern Ghana) by NRI. This confirmed that the bridge press did not significantly increase the oil extraction rate compared to the traditional process. Both methods have similar oil extraction efficiencies, typically in the region of 31% (butter yield based on kernel weight) under field conditions. As oil content of the shea kernel is in the region of 54%, it is clear that a large proportion of the oil remains unavailable. After conducting a quality assessment on several trial samples, a local cosmetics company ascertained that the bridge press butter possesses a higher quality and a smoother texture than traditionally processed butter. However, overall the viability of small-scale processing businesses was under question because of new large scale processing interests in Ghana.

Another finding from the validation trials was that small-scale equipment manufactured by local fabricators was not produced according to standard specifications and lacked uniformity. Wide variations in design and quality

were observed which may have affected the efficiency of butter extraction.

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 validated in Ghana in two villages in the Tamale area, Chanzegu and Kanfehiyili (1996) also Tabiase near Wa (1997). The production areas were semi-arid production systems and smallholder rain-fed dry farming systems. These validated tests were aimed at rural poor women villagers.

A further validation of the ram press was undertaken in 1999 at two villages, Kanfehiyili and Chanzegu, located some 25 km from Tamale in Northern region. The villages were chosen on account of their previous participation in the shea butter processing trials conducted by NRI, TCC and ITTU, in which the bridge press technology was first appraised.

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 still being used by women's groups in Ghana to produce shea butter co-ordinated by the Gender Responsive Renewable Energy Systems Development and Application (GRESDA) shea butter processing project with support from United Nations Development Fund for Women (UNIFEM). To complement this project, the Ministry of Women and Children's Affairs in Ghana has provided 25 shea butter processing machines produced by Ghana Regional Appropriate Technology Industrial Service (GRATIS) to assist shea nut processors in three northern regions.

A recent report by Technoserve indicates that few women's groups use this press in West Africa due to low butter yields: the most commonly utilised 'improved' technology is the plate-grinder, powered either by electricity or diesel engines, now seen throughout Northern Ghana and used for grinding a range of agricultural products. A modified version of the Ghanaian design was transferred by ITTU to east Africa and has proved popular in Uganda and Sudan where varieties produce oil with a lower melting point.

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).

The bridge presses are being used in the villages of Vitim and Savelegu in and other parts of northern Ghana.

A modified version of the Ghanaian design has proved popular in Uganda and Sudan where varieties produce oil with a lower melting point.

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

Although use of the ram press is not high in Ghana due to low market prices, the technology was transferred by ITTU to an NGO, COVOL, to support their fair trade shea butter project in Uganda. Here it has been transferred to 400 rural-based community groups containing 10,000 members as part of a programme to improve the quality and marketability of their shea butter.

The GRESDA has targeted 200 women in four groups in West Mamprusi District, Northern Ghana and the Ministry of Women and Children's Affairs in Ghana has provided 25 shea butter processing machines to assist shea nut processors in three northern regions.

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).

An important element of success in uptake is the formation of a commercial coalition between producers and end-users of the product in order to develop the appropriate level of processing and product quality and volume required by the market, with inputs, on demand, by service providers to develop any appropriate technologies to meet market requirements. Supporting organisations such as NGOs are important in forming groups e.g. gatherers and processors and in providing training and extension?

The partnerships will vary according to the market place. For instance, production of shea butter for the cocoa butter substitute market can be undertaken by large-scale companies, with an economy of scale, to produce the high volumes of low value butter. However, when it comes to producing for the cosmetic sector a different picture emerges. A women's cooperative in Tamale has direct links with a soap manufacturer in USA who visited the group to assist in developing the exact processing techniques (using the press technology which eliminates rancidity and improves quality and shelf-life) to produce the butter needed for their product. The US company provide a loan for equipment against future sales.

The service providers and NGOs have important parts to play in technology development and transfer but it is important that this is not undertaken without an understanding of market requirements. In the past NGOs have encouraged women's groups to take out loans to purchase shea processing equipment and the markets have not been large enough to absorb the extra supply which has further impoverished the processors.

The development of fair trade is seen as an approach giving greater benefits for gathers and processors but there is need for slow growth and continued evaluation to ensure that effective sustainable relationships are developed.

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 improved process offers direct environmental benefits in:

- a reduction in processing time for a 25kg batch of shea kernels from 9.5 to 3.25 hours,
- water use is reduced from 90 litres to 1.7 litres per batch,
- the need for fuelwood is completely eliminated.

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.

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

None

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)

Yes – the use of firewood is completely eliminated in the developed shea processing method. The deforestation of semi-arid areas will be reduced if less firewood is cut.
