What's new under the sun? Partnerships for poor fruit and vegetable farmers

RIU

Validated RNRRS Output.

Poor farmers are avoiding the waste and low returns associated with overproduction of fruits and vegetables thanks to simple solar-drying techniques. Processing in this way helps preserve the quality of produce and provides opportunities for farmers to add value for local, regional and international markets. Enterprises known as primary marketing organisations (PMOs) are taking the lead in creating a commercially viable value chain, helping farmers to introduce the new technologies and access markets. In Uganda, more than 700 fruit farmers at 85 sites—mainly women—are using 110 solar dryers. The equipment, and the associated business model, are also being used by poor smallholders in a range of other developing countries, including Burkina Faso, Colombia, Ghana, India, Pakistan, Sri Lanka, and Zambia.

Project Ref: **CPH31:**
Topic: **5. Rural Development Boosters: Improved Marketing, Processing & Storage**
Lead Organisation: **Natural Resources Institute (NRI), UK**
Source: **Crop Post Harvest Programme**

Document Contents:

Description

CPH31

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

Geographical regions included:

Burkina Faso, Colombia, Ghana, India, Pakistan, Sri Lanka, Uganda, Zambia, Zimbabwe,

Target Audiences for this content:

Crop farmers, Processors, Traders,

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.

Commercialisation of solar drying technologies for micro- and small-scale rural enterprise development.

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.

R 5539: Fruits of the Nile (U) Ltd, Uganda – Angello Ndyaguma and Adam Brett.
Kwanda Agricultural Research Institute, Uganda.
Tropical Wholefoods, UK (later merged with FM Foods) – Kate Sebag and Adam Brett.
Natural Resources Institute, University of Greenwich, UK (Contact person: John Orchard, Natural Resources Institute, University of Greenwich. 44 1634 883741; j.e.orchard@gre.ac.uk).

*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.*

Overproduction of **fruits** and **vegetables** can lead to waste, depressed prices and lower returns to farmers. **Processing** is seen as a means of preserving product quality and providing opportunities for **value addition** and **income** from marketing produce in **local**, **regional** and **international markets**. Although there are several methods of preservation e.g. canning and freezing, simple **solar drying** technologies are the most appropriate for application in rural farming areas which have poor infrastructure and limited technical, financial and management resources. However, for processing technology to provide sustainable returns requires careful development and placement of the appropriate technology in a fully integrated **value chain** stretching from producer to consumer. This is important in accessing high value, distant markets. A particular feature of success is the development of a nodal organisation, such as a **primary marketing organisation** (PMO) which can support and co-ordinate the value chain, often playing a key role in technology innovation and adoption, and market penetration.

The key for success of this project was the creation of an **innovation platform** for **partnerships** between:

- **small-scale farmers/processors** to provide quality raw materials and to make use of **solar drying** technologies to produce good **quality dried fruits and vegetables**,
- private sector, including **primary marketing organisations** and importers such as **Fruits of the**

Nile and **Tropical Wholefoods**, to take the lead and develop and maintain a commercially viable value chain that provides sustainable returns for all stakeholders;

- service providers e.g. the Natural Resources Institute to support innovation in **processing** and **technology transfer**, and **NGOs** for group development.

This platform produced partnerships which were instrumental in producing the following range of outputs over a period from 1993 to 2006:

- commercially viable, integrated and long lasting value chains producing and marketing dried fruits and vegetables for local and international markets that continue to give returns for all participants;
- viable small and medium enterprises;
- locally-adapted and verified solar drying technologies;
- a range of dissemination material including a series of four booklets on:
  1. Assessing opportunities for a fruit drying business – explaining the more important factors to set up a solar drying operation.
  2. **Dryer construction** – illustrates detailed construction of a solar dryer suitable for drying a range of raw materials.
  3. Processing aspects – describes important aspects of processing and ways to produce good quality.
  4. **Business profitability** – examines key factors in running profitably a solar drying business.

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*	*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

Solar drying can be used for a range of horticultural products (and meats and fish) including:

- Fruit: banana, mango, apricots, pineapple, star fruit.
- Vegetables: chilli peppers, garden egg, okra, tomatoes, leafy vegetables.
- Mushrooms.

Although solar drying can be used for a range of fruit and vegetable, each product must be assessed for the rate of drying to ensure relatively rapid drying without loss of quality that can be caused by excessive browning or fungal contamination. For example, acceptable dried tomato could be produced only during dry months when there were sufficient long hours of sunshine with high temperature and low relative humidity

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			

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.

Improvements to the quality of raw material are seen as a key requirement in the production of produce acceptable to high-value markets. It is therefore increasingly important to put in place appropriate quality assurance systems such as those developed for small-scale horticulture growers in Africa in the following projects:

- Management & Control - Continued access by small-scale growers to EU fresh produce markets (R8431);
- Improved quality assurance systems for fresh fruit and vegetables produced by resource poor farmers (R7528).

Specifically for bananas it would useful to use the outputs from the cluster of Banana IPM projects (R8342, R7567, R7529, and R7972).

A key to enhancing market access is the development of market information systems, an area developed by R8250: Decentralised Market Information Service in Lira District, Uganda.

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)****.*

The validation of the outputs encompassed both assessment of the drying technology to enable small-scale processors to produce products able to meet the market demand and the ability and sustainability of the value chain to deliver long-lasting economic returns to the participants. The project was set up in Uganda as an innovation platform with the active participation in testing and decision making by all stakeholders. The end-users groups were predominantly women and women's groups. Although solar drying was a well established technology, it was necessary to undertake location specific participatory technical, financial and socio-economic evaluation of a range of existing and adapted dryers. This was led by technical staff from the Natural Resources Institute in collaboration with Fruits of the Nile, Kawanda Agricultural Research Institute and end user dryer groups, with additional support from various NGOs and Government Departments.

Three locally-built and one modified dryer were evaluated for their technical and financial viability using dryer groups, mostly household and women's groups selected by local NGOs. This enabled the project to select the most favourable design, the optimal processing methods and throughputs and the resultant profitability.

Following this initial project validation, a further evaluation was undertaken by the Natural Resources Institute to assess its continued financial viability (Blowfield and Malins, 2000). One of the issues highlighted was the opportunity for the processors to further increase profitability if they could produce the fresh fruit on their own land.

The Project was also evaluated in 1999 by a research project by the London School of Economics for its financial success and poverty impact on the supply chain participants.

In 2005, a study commissioned by DFID and International Labour Organisation (Ribbink, *et al*., 2005) evaluated the existing dried fruits supply chain in Uganda and found that " it has definitely had a positive impact on all those involved in the supply chain, from the fruit producer, via the solar dryer, to the people involved at the packaging and export level. Probably the most favoured group in this case are the solar dryers who can increase their cash income".

The solar drying technology and partnerships approach was also validated and adapted for the production of dried vegetables for national markets as part of two CPHP-funded projects in Ghana (R6630: Integrated Food Crops Systems Project: 1996 - 1999) and Zimbabwe (R 7487: Improving the livelihoods of peri-urban vegetable growers: 1999 - 2003). In Zimbabwe, women are key players in the production, processing and marketing (mainly retailing) of vegetables. Solar drying was assessed through on-farm trials determining the profitability of drying indigenous vegetables. In the Ghana validations, case study farmers (mostly women in rural areas) assessed the dryers over two years providing evaluations on conduct of the trials, efficiency and drying rate of dryers, quality and price returns of product, long term product storage and quality, and dryer maintenance, and, at the end, the dissemination process. Evaluations were undertaken by other farmers, local NGOs (particularly focussing on women), Ministry of Agriculture, and GTZ.

*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 commercialisation of the solar drying technologies were first validated in Uganda from 1993 to 1997 in a project that targeted rural farmers/processors and in particular women and women's groups because solar drying technologies are relatively simple, not labour intensive and integrate well with the household responsibilities of women. These groups were part of the rain-fed farming system in the Forest Agriculture interface. In addition to the validation undertaken as part of the project, three further studies in 1999, 2000 and 2005 evaluated the progress and continuing benefits of the project in Uganda.

The technologies and integrated value chain approach were further evaluated as part of two CPHP-funded projects in Ghana and Zimbabwe to produce solar-dried products targeting women's groups as beneficiaries. The project in Ghana was successfully promoted and validated between 1997 and 1999 in the Forest Agriculture Interface in the Brong Ahafo region with smallholder undertaking rain-fed cropping. The processor groups were predominantly (over 80%) composed of women and evaluation workshops where conducted with the participation of Ghanaian women's NGOs.

From 1999 to 2003, solar drying solar drying trials were undertaken in Mashonaland West and Matabeleland South provinces of Zimbabwe to adapt the technology for farmers (over 60% women) in peri-urban areas cultivating indigenous leafy vegetables.

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 commercial partnerships and solar drying technology established in Uganda have continued to expand with 110 solar dryers located at 85 different sites supplied by more than 700 fruit farmers, based on an economically successful supply chain between farmer/dryer groups, Fruits of the Nile (Uganda) and Tropical Wholefoods/FM (UK). The participants in the dryer groups are mostly women who also employ women to assist in produce preparation and drying.

Tropical Wholefoods has continued to successfully promote and transfer the solar drying technology and the business model to poor groups in a range of developing countries, including Burkina Faso, Pakistan, Sri Lanka, Colombia and Zambia.

Trading partnerships are formed with those groups able to maintain the aim of Tropical Wholefoods to establish safe and equitable working conditions for those in the supply chain. For example, expansion has been achieved by establishing trading partnerships targeting co-operatives and groups of co-operatives e.g. Cercle de Secheurs in Burkina Faso. CDS has the responsibility of marketing the dried products of a consortium of co-operatives of small-scale rural producers. Farmers in the Karakorum Mountains of Pakistan are supported by the Agah Khan Rural Support Programme which formed a trading partnership with Tropical Wholefoods who, in addition to buying produce, provide technical advice.

In Ghana, solar drying technology is disseminated through Ministry organisations, NGOs and GTZ to farmers as means of preserving their produce and having added value products for sale in local markets and for home consumption.

*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).***

Tropical Wholefoods has continued to expand the approach and has successfully promoted and transferred the solar drying technology and the business model to poor groups in:

- Mbarara and Kayunga in Uganda;
- Ouahigouya, Bobo-dioulasso, Berekedougou, Toussiana and Bubo Town in Burkina Faso;
- Two women's co-operatives in Quibido Columbia;
- Eleven villages in the Kullu of Himachal Pradesh, India;
- Northern areas of Pakistan;
- Avissawella in central Sri Lanka;
- Zambia and, most recently in 2006, Afghanistan (subject to some start-up investment).

Solar drying continues to be used by farmers/processors in the Brong Ahafo region of Ghana.

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

In Uganda, the number of solar drying groups has expanded from the very beginning of the project so that in 2006, 110 solar dryers located at 85 different sites dry bananas, pineapples and other produce with approximately 700 farmers providing raw materials. This usage could continue to expand since demand is greater than supply.

In Zambia, 150 kg of dried mushrooms are exported annually, involving 4,000 pickers (90% women). In Burkina Faso, a co-operative of 2800 mango growers supplies fresh fruit to a central drying station run by 100 women;

The drying project run by the Agah Khan Rural Support Programme Dried Fruit Project in partnership with Tropical Wholefoods supports 1500 farmers in 106 different men and women's organisation from 1997.

In Ghana, during the project, there was great demand for solar dryers and taken up by 72 farmers in the second year of the project and the dryers continue to be disseminated by GTZ.

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 key factor in the continued promotion and adoption of solar dryers is the commercialisation and governance of the value chain by a nodal organisation, normally in the private sector, to act as a primary marketing organisation that will be able to understand develop and manage the value chains addressing the following tasks:

- market analysis to assess product demand, market size and market conduct;
- identify opportunities for raw material supply;
- organisation of groups of processors to create economies of scale and sufficient volume to allow market access;
- provide business and technical training and continuing advice of dryer construction, fresh material preparation and drying, product quality and packaging;
- establish market linkages and the quality assurance systems necessary for market access.

Experience in Uganda has shown the importance of a lead firm at different levels (national and international) to maintain integration in the supply chain and long-term sustainability. Successful access to international high value markets requires long-term linkages with an importer sympathetic to the needs of the supply chain.

Institutional support, often supplied through NGOs, in the formation of co-operatives/associations has also been shown to provide a productive platform for processors. However, the formation and running of co-operatives has to be managed carefully to avoid the usual problems associated with this type of association. In Ghana, co-operatives have been shown to be less important for processor producing dried produce for household use and local markets, although having some types of association have been shown to assist in trade negotiations with more distant markets or itinerant traders.

Promotion of fair trade and organic polices has provided the platform for improved returns to dried fruit processors and should be seen as an integral part of the commercialisation process where market opportunities exist.

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.

Solar drying technology fits in well with the development of processing opportunities that can use local resources to construct the dryer and uses a renewable energy resource. This ideally suits rural development programmes.

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

There are no adverse direct environmental impacts of solar drying since it is using a renewable resource. However, care has to be taken in selecting appropriate materials for constructing the frame of the dryers. In addition, the plastic materials covering the dryer frame must be disposed of in appropriate manner when they need replacing.

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 technologies do not have inherent coping strategies beyond income-earning opportunities using a renewable natural resource. This technology may become more usable and more efficient in areas that experience increased drier conditions.
