The impacts of post-harvest crop research on poverty alleviation:

Two case studies from Northern Ghana

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Abstract

This paper is based on an interim evaluation exercise carried out in 1998 for research projects funded by the Department for International Development Crop Post-Harvest Research Programme. Field visits were made to applied research projects on cowpeas and cassava in the Northern Region of Ghana and informal discussions were held with a range of stakeholders. The cowpea project has developed safer, more effective methods of fumigating stored grain than those previously practised by farmers and traders. The advantages include improved grain quality and reduced risks to human health and a grant has been obtained to construct a large-scale fumigation facility, which will benefit many more individuals. The cassava project has produced high quality dried cassava chips without the insect damage and mould contamination problems experienced using traditional processing methods. The technique reduces women's workloads by eliminating the need to pound the chips before milling. There is also greater potential for market expansion, and the project is now linking farmers with potential consumers. Both case studies illustrate the substantial impacts on poverty alleviation that crop post-harvest research can achieve, through the provision of appropriate technologies and the development of linkages to facilitate their uptake.

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Introduction

The Department for International Development (DFID) Crop Post-Harvest Programme (CPHP)[1] has always supported strategic and applied research designed to improve food quality, add value to food products and reduce losses of important food crops for the poorest sections of the community (Poulter, 1998). However, the British Government's White Paper on International Development published in November 1997 re-emphasised the elimination of abject poverty as a primary developmental objective. The CPHP thus needs to consider how the various projects within the programme portfolio are contributing, or will in future contribute, to this objective and the associated focus on developmental impacts and sustainable livelihood strategies for poor people. Project interim (or mid-term) evaluations are one method of assessing the progress that projects are making towards achieving impact. This paper is based on an interim evaluation exercise carried out in 1998 for CPHP research projects in the Northern Region of Ghana.

The objectives of the evaluation exercise were to assess progress against the objectively verifiable indicators contained in the project logical frameworks and to consider the current and future poverty impacts of the projects. In order to meet these objectives field visits were made to a sample of projects, including one on grain legume (cowpea and bambara nut) storage[2] and one on cassava chip production and marketing[3]. Informal discussions were held to elicit the perceptions and opinions of the different project stakeholders, both collaborators (four government ministry staff) and beneficiaries (three farmers and five traders). The discussions were conducted around the following topics:

- The respondent's knowledge of and involvement with the project.
- Their expectations of the project and the extent to which these have been realised.
- The significance and sustainability of the project results.
- The future options for research and development arising from the project.
- The present and future impacts of the project on poverty alleviation.

The CPHP in Ghana

Poverty is widespread in rural areas of Ghana, with the depth and incidence of poverty greatest in the north (DFID, 1998). Food security in the Northern Region is also problematic, and the average household size of 10 limits the family's ability to produce or buy sufficient food to meet its dietary needs (MOFA, 1998). Considerable efforts have been made to ensure that CPHP projects in the Northern Region are consistent with national agricultural research priorities and to foster linkages with Non-Governmental Organisations (NGOs), the private sector and the extension services of the Ministry of Food and Agriculture (MOFA). The top three agricultural priorities of MOFA in the Northern Region are:

1. Grain storage for human and livestock consumption.
2. Post-harvest pest management.
3. Improving the income status of farmers through increased produce sales.

The CPHP also recognises storage facilities as the principal post-harvest physical asset of small-scale farmers. Efficient and effective storage methods contribute to improved livelihoods for poor people, including higher incomes, increased well-being, reduced vulnerability and improved food security (Hindmarsh, 1998).

The Northern Region has a comparative advantage in the production of grain legumes (cowpea and bambara nut), which are a staple food in Ghana, but quality is a constraint to both household consumption and market sales due to insect damage during storage. Farmers use traditional methods for protecting their stored grain but prior to the CPHP project, little was known about the efficacy of these techniques. Cassava, on the other hand, is considered to be a food of the rural poor. A CPHP needs assessment study identified the development of new market opportunities for cassava as a priority area for research. Higher income earners in metropolitan areas would like to eat traditional foods prepared from dried cassava chips (kokonte), but are deterred by the unhygienic conditions under which the cassava is processed. They would be willing to pay for a higher quality product, without the problems of insect damage and mould contamination resulting from traditional processing methods.

Grain legume storage project

The project started in February 1996 with the development of a rapid method for estimating storage losses. An on-farm loss assessment was then conducted in two Districts of Northern Region during the storage season (December to May). Seventy farmers in each District were visited once per month and damage levels of up to 60% for cowpea and 15-20% for bambara nut were observed over this period, with corresponding weight losses of up to 10%. Trials of traditional insect control methods for stored grains revealed that the application of either shea nut butter or a mixture of ash and chilli powder can reduce damage levels to 5% (equivalent to a weight loss of only 1%), thus making a significant contribution to household food security.

In the second year of the project, research was extended to include market studies with cowpea traders in Tamale, who were experiencing significant quality losses in stored cowpeas. Traders traditionally use various chemicals to treat their sacks of grain, including rat poison, pesticide sprays and phosphine tablets, but their application methods are neither safe nor effective for maintaining grain quality. Seven traders contributed a total of 70 bags of cowpeas for phosphine fumigation and storage by the project, which carried out monthly loss assessments of the grain. Six other traders also benefited from fumigation treatment of their cowpeas by the project but then stored the treated grains themselves in the market.

All five cowpea traders interviewed in Tamale market during the project evaluation said that the quality and selling price of treated cowpeas was higher than for untreated grain. The shelf life was also longer, allowing them to benefit from increases of up to 200% in the market price (Hindmarsh, 1998) between harvest and the start of the next rainy season. Buyers sought out the higher quality treated cowpeas and traders were thus unable to sell any untreated grain until all the treated stock had been sold. The CPHP has now received a grant of £10,000 from the Special Project Fund of the British High Commission in Accra to construct a large-scale fumigation facility in Tamale market. MOFA will operate the facility for two years while traders are trained in the fumigation technique. The Traders Association will then take over the operation and ownership will pass to the municipal authority, which is supplying the land for construction. The facility will benefit a much larger number of traders than it was possible for the project alone to assist. It is warmly welcomed, both by traders who were involved with the project and by others who, having seen the benefits of fumigation, are keen to try it for themselves.

Although traders are not usually the poorest members of the community, many rely on cowpeas as their most profitable commodity. Safer and more effective grain treatments will benefit them both in terms of reduced health risks and higher less seasonal incomes due to an increased viable trading period. Improved grain quality and a longer storage period will also benefit consumers by improving the supply of grain legumes and hence food security during the dry season. Moreover, there may be a knock-on effect of increased demand for cowpeas amongst traders, enabling small-scale resource poor farmers to sell more of their crop in good seasons.

Cassava chip production and marketing project

Since its inception in January 1996 the project has focused on reducing dried cassava chip size to produce a higher quality product for both the internal livestock feed market and for kokonte. On-station storage trials of two traditional types of dried cassava chips (short and long) and a new mini-chip are monitored monthly by project staff for weight, quality, moisture content and insect infestation. Traders also carry out a monthly participatory assessment of the cassava chips, ranking them according to colour, mould growth, insect damage and overall quality. In addition, a taste panel of traders, MOFA staff and members of the public meets bimonthly to sample traditional dishes prepared using the different types of kokonte. An improved adjustable mini-chipper, developed through an interactive on-farm design and testing process, was found to reduce the physiological strain on the operator, allowing a 68% improvement in work rate. These new chippers have been lent to groups of farmers, who are comparing processing and storage of the mini-chips with the traditional long and short chips.

Farmers affirm that the new mini-chips take only 3 days to dry, as opposed to 10 days for traditional short chips and 14 days for long chips. The consensus was that mini-chips could therefore help to ensure food security in times of drought when grain supplies are insufficient, since the time lag between production and consumption of the kokonte is much shorter than when using traditional processing methods. The processing period for traditional chips is usually restricted to January/February when the harmattan winds speed drying, whereas the mini-chips can be processed at any time of year. The shorter drying period of the mini-chips also leads to a higher starch content than in traditional kokonte and many farmers prefer the taste and colour of dishes prepared using mini-chips to those made from traditional chips.

Mini-chips are storable for a period of up to eight months without any deterioration in quality, so unlike traditional chips they do not have to be sold soon after processing when market prices are at their lowest and could potentially increase the incomes of cassava chip producers. Women's workloads are also reduced because mini-chips can be milled directly into cassava flour whereas traditional kokonte first needs to be pounded, an activity undertaken only by women. The three farmers from Gbugn village interviewed during the project evaluation all stated that if a market for the mini-chip could be assured, they would cultivate much larger quantities of cassava. Currently, they produce mini-chips for household consumption and traditional kokonte for sale, because although traders like the white colour of the mini-chip, they have a problem with pricing this new market commodity. A trial attempt at marketing in Accra was not very successful, but if a commercial market for industrial use of the mini-chip can be established this would also help traders to determine a market price for the sale of mini-chips for human consumption

The NGO TechnoServe had previously linked farmer groups producing traditional kokonte to a commercial poultry feed company, but after a number of bird deaths due to a high coliform microbial load in the cassava chips, the company ended the arrangement. However, analysis of the mini-chip has shown that the new product meets the quality standards of the poultry industry and the project, with the assistance of collaborating NGOs, is now attempting to forge new links between cassava farmers and feed millers. The needs assessment study also indicated that great potential exists for exploiting other new market opportunities, for example, the use of cassava in alcohol and glue production and as a substitute for wheat flour in bakery products.

Conclusions

The grain legume project has shown that some traditional pest control methods can significantly reduce post-harvest losses of cowpea and bambara nut. Farmers using these methods are able to store their grain for longer, thus increasing household food security. They can also gain higher incomes by selling their surplus grain later in the season, when market prices are higher. The fumigation technique developed by the project provides safer, more effective pest control, benefiting consumers by ensuring a higher quality product and traders by reducing health risks and increasing demand for their grain. Large numbers of traders will benefit from the new large-scale fumigation facility and farmers may also profit from an increased trading interest in their grain legume crops. Seasonal fluctuations in income for both farmers and traders should therefore be reduced. The fact that operation of the fumigation facility will eventually be handed over to the market traders means that they feel some degree of ownership of the venture, which should help to ensure its longer term success.

The mini-chips developed by the cassava project require a much shorter processing time than traditional kokonte and can be stored for a longer period without any deterioration in quality, leading to increased food security and potential increases in income for cassava farmers. The preparation of traditional foods from the mini-chip is also simpler and quicker, thus reducing women's workloads. The mini-chipper has been improved to reduce the discomfort and increase the work rate of the operator and is very popular with farmers. Now that the technology is proven, the project is working on the development of markets for the mini-chip amongst consumers and the industrial sector and is attempting to link farmers to possible purchasers of their product.

The two project case studies above illustrate that appropriate crop post-harvest research efforts can achieve substantial impacts on poverty alleviation. However, this is only true if the project focuses attention not just on the provision of technologies but also on the development of linkages to facilitate their uptake. Consideration of the means by which research outputs are translated into impact on the target beneficiaries should be one of the most important aspects of project planning and implementation. Instead, many agricultural research projects assume that collaborating institutions and individuals will automatically take up and promote their outputs. Unfortunately this is not always the case, either because they do not have the capacity to do so or because they do not feel sufficient ownership of the project. Key collaborators therefore need to carefully chosen, involved at all stages of the project cycle and assisted with the adoption and dissemination of outputs.

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[1] The CPHP is one of the 12 research programmes under the DFID Renewable Natural Resources Knowledge Strategy.

[2] CPHP Project R6503: Improvements in the storage and marketing quality of grain legumes.

[3] CPHP Project R6506: Development and orientation of cassava chip production in relation to national and international markets for food consumption and animal feed.