

# Better organisation helps farmers to access markets

## Validated RNRRS Output.

Smallholders can find a way out of poverty by increasing the competitiveness of their produce and strengthening public–private sector partnerships. In Uganda, although liberalisation of grain marketing systems empowered maize farmers to sell their produce at competitive prices, they were not prepared to reap the benefits of this reform. Their heavy reliance on traditional practices of handling and storage meant that their produce was poor in quality and their output was low. Today, farmers have improved market access by using appropriate post-harvest technologies and they are producing large volumes and sustainable supplies of high-quality produce. The public sector has helped to catalyse linkages between the private sector, smallholders, agricultural advisors and NGOs to create strategic coalition partnerships. Furthermore, in the 63 pilot districts where the strategy was tested with maize, farmers have been able to apply it to many other crops.

Project Ref: **CPH10**:

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

Lead Organisation: **Kawanda Agricultural Research Institute (KARI), Uganda**

Source: **Crop Post Harvest Programme**

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## Description

### CPH10

#### A. Description of the research output(s)

##### 1. Working title of output or cluster of outputs:

Farmer access to markets

##### Suggested working title:

Improving smallholder farmer market access and profitability through increased productivity, quality, organised storage and participation

##### 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.

Title of output/cluster	R No	Contact persons	Contact of Institutional Partners
Farmer access to markets	R8274	Dr Ambrose Agona, Managing Partner	National Post-Harvest Programme, Kawanda Agricultural Research Institute, P.O. Box 7065, Kampala,

## Research into Use

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## Geographical regions included:

[Uganda](#),

## Target Audiences for this content:

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

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		Chairman, Farmers Association	Loro Farmers Association, Apac
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		Simon Byabagambi Coalition Member	DAO, Kiboga
		David Kalibbala Coalition Member	DAO, Wakiso
		Dr Imelda Kashaija Coalition Member	Centre Manager, Kachwekano ARDC

4. Describe the RNRRS output or cluster of output 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 output, **Farmer access to markets**, is a blend between RNRRS projects "Improvement of maize marketing through adoption of **improved post-harvest technologies** and **farmer group storage**: A case study of **Kiboga** and **Apac** districts" (R 8274) and "Analysis of promotion and **uptake pathways** for post-harvest research outputs in Uganda: Case studies" (R8498). The activities conducted under RNRRS R8274 mainly contributed to the output of **linking farmers** to the markets. RNRRS mainly looked at how farmers, intermediaries and scientists respond to farmers demand articulation in terms of uptake of technologies, information and knowledge that enhance **agricultural productivity** and **marketing**. The output targeted mainly the problem of **low incomes** of **rural-based smallholder farmers** who experienced poor market access because of **poor quality** and **low volumes** of tradable produce due to heavy reliance of traditional practices of grain handling and storage. The output aimed at contributing to poverty reduction by increasing the competitiveness of rural farmers' produce, specifically maize and improved market access due to high quality, large volume and sustainable supply of produce in the marketing chain as a result of sustainable use of appropriate post-harvest technologies and approaches.

Although liberalisation of grain marketing systems in Uganda empowered farmers to sell their produce at **competitive prices**, the smallholder farmers were not well positioned to reap the best benefits. Produce Marketing Board and other cooperative movements who were the main buyers of farmers' produce, did not build the capacity of farmers in taking farming as a business. Before liberalisation, farmers were only encouraged to produce more of what was considered marketable and/or exportable without their direct participation in planning processes, management and sales. There was total lack of their capacities being built in business skills and management, and no efforts were made to link them to institutions with relevant technologies that enhance quality of produce. The government Plan for Modernisation of Agriculture (**PMA**) that espouses shift from subsistence to commercial production, lacks a pragmatic framework that enables smallholder farmers to work in coalitions with providers of post-harvest technologies for improved produce quality, agricultural advisors and/or extension agents, grain buyers and resident non-governmental organisations (NGO). The output was therefore considered timely and it provided the opportunity of trailblazing the role of the public sector in catalysing linkages between the private sector, smallholder farmers, agricultural advisors and NGOs through strategic **coalition partnerships**, especially, in enhancing farmers' access to profitable markets.

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 output mainly focussed on maize enterprise. The strategy was mainly on grain quality improvement through adoption of improved post-harvest technologies, volumes assurance through collective storage and sustainable market supplies through linkages with major grain buyers. This entailed a shift from individualistic storage and marketing to collective storage and marketing. This required building of farmers' capacity in group dynamics, leadership and entrepreneurial skills as initial step for greater cohesion amongst them. The strategy helped in changing farmers attitudinal problems and trust building from the very beginning. Once the farmers have experienced the benefits of working together, they adapted and applied the same approach gained from maize marketing on other enterprises: sunflower, beans, sorghum and/or beans that are cultivated besides maize, in the districts the output was trail blazed.

7. What production system(s) does/could the outputs focus upon?

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

8. What farming system(s) does the output(s) focus upon?

Smallholder rainfed humid	Irrigated	Wetland rice based	Smallholder rainfed highland	Smallholder rainfed dry/cold	Dualistic	Coastal artisanal fishing
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)?

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

One of the challenges that prevailed during the output implementation was the small volume of production of maize by individual farmers. Most farmers produced less than 1,000 kg during each cropping season. This was attributed to reliance on the hand-hoe in opening land, planting and weeding; lack of improved of high yielding seeds, lack of fertilisers, field pests and disease pressures. It is envisaged that RNRRS outputs: R7401, R8480, R8219, R7405, R 8452, R8215, R6311, R6684, R7486, R8265, R8429 and R8281 that target production technologies could add value to the current output.

Although farmers noted that they got better prices after withholding their produce to the time when there was market dearth, some farmers due to domestic requirements e.g. school fees, medical treatment, labour costs etc. felt the time was too long. Within the output portfolio however, there was no provision for credit scheme that could allow borrowing based on the stock held and deductions once the produce has been sold. Lessons from RNRRS outputs R8113, R6344, R7013, R7013, R7668, R7496, R8114 could add value to the current output.

Most farmers also felt that there was need to diversify their market base, other than Afro-Kai Ltd., the grain buyer that was in the coalition partnership. This occurred especially, when there were delays in payments by Afro-Kai. Provisions for alternative markets, market information tools and tools for ethical trading (RNRRS outputs R8275, R8182, 8418, R7151, R7502, R6306, R7168, R7468, R8422 and R8250) are considered relevant for value addition.

## Validation

### B. Validation of the research output(s)

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

Please provide a brief description of method(s) used and consider application, replication, adaptation and/or adoption in the context of any partner organisation and user group involved. In addressing "who" component details 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)

Prior to the output validation, a Needs Assessment survey was conducted by the National Post-Harvest Programme of the National Agricultural Research Organisation (NARO) to determine the post-harvest and marketing constraints in Kiboga district, and a comprehensive literature review based on earlier studies was also conducted to determine similar constraints in Apac district. The lack of suitable post-harvest technologies (dryers, shellers, stores, pest management packages) that optimise grain quality and quantity; lack of organised farmer groups involved in collective storage and marketing; poor market access and information flow; poor pricing; lack of credit access and saving culture were identified as some of the major challenges contributing to poverty especially, of the smallholder farmers in the two districts. The second stage involved the identification of the coalition partners, depending on their core competencies, especially, in technology generation and dissemination (NARO), agricultural knowledge and provision (DAO), pro-poor rural development (NGOs: ASDI and BUCADEV), market information and pricing system provision (Afro-Kai); and output end-users (Farmer groups). Stakeholders meeting in which the roles and responsibilities of each of the core coalition partners were defined. NARO trained farmers on the use and maintenance of the post-harvest technologies, importance of grain quality standards and maintenance, provided primary processing equipment (shellers, dryers, sieves, moisture meters, weighing scales, fumigation kit including sheets, protective clothing, fumigants) and conducted technical backstopping. The district agricultural officers of Apac and Kiboga, and the two non-government organisations helped in farmer group mobilisation, sensitisation and monitoring of activities. Afro-Kai Ltd. provided market information as well as the market for the farmers produce. The end-users: smallholder farmers, classified as poor, having less than 2 ha of land and living on less than US \$1.00 per day, produced and supplied the maize for collective storage and marketing. Other partners included National Council of Uganda Small Business Organisations that provided training on entrepreneurship, leadership, credit access and utilisation. One of the training recommendations was at least a 30-% representation of women in the group leadership. The Local governments participated through the local councils whose interests were on the tax regimes of produce leaving the sub-counties, and sales of land for increased production. At district level, District Coordination Committees were constituted between NGO, Farmer group representatives and DAO to monitor project implementation process and challenges for rapid response and feedback. The project outputs were monitored/evaluated by independent facilitators assigned by DFID-CPHP Regional Office. A study "An assessment of the profitability of maize grain in Kiboga district through the farmer storage approach" was conducted by Mr T. Okot-Chono in partial fulfilment of the requirements for the award of MSc degree in Agricultural Economics of Makerere University was conducted. The summary results showed higher mean profits for farmers who were in groups as opposed to those who stored and marketed maize individually.

**11. Where and when have the output(s) been validated?**

*Please indicate the place(s) and country(ies), any particular social group targeted and 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 Apac and Kiboga districts in Uganda in the years 2003 and 2004. The target beneficiaries were rural-based low income smallholder farmers who cultivated less than 2 ha of maize, and experienced poor market access because of the poor quality and low volumes of tradable produce due to heavy reliance on traditional practices of grain handling and storage. Apac district is located in the Northern Moist Farmlands agro-ecological zone (AEZ) of Uganda, whilst Kiboga district has two AEZs: Central Wooded Savannah and Western Mid-Altitude Farmlands. These AEZs suggestively fit within the high potential and tropical moist production systems, and smallholder rainfed humid and/or smallholder rainfed dry/cold farming systems.

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**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 output strategy is currently being tested by most of the research and development actors in the public domain, as well as the private sector in Uganda. The nexus of the linkage between R&D actors and the farmers is the National Agricultural Advisory Services (NAADS), and to a lesser extent agricultural extension services (i.e. in districts and sub-counties in which NAADS is absent) and NGOs. In Uganda the majority of producers are smallholder farmers who form more than 80%, of the total population and their method of production is predominated by traditional practices. Apart from Apac and Kiboga districts in which the outputs were trail blazed, a similar approach was undertaken by the National Post-Harvest Programme of NARO in Kibaale district under the EU Support to NARO Programme. In the pilot districts, the farmer groups have extended the strategy beyond maize and are applying it in the marketing of sunflower, simsim, rice and beans. NAADS commissioned consultancies on how to link farmers to the markets, the group storage and marketing concept has been endorsed to go beyond stored grains but also produce like fruits, milk, honey and goats in the 63 districts they are operating in. Although the government is trying to revitalize the defunct cooperative movement, it is observed that it will fail if the current output approach of building farmers capacities in the different dimensions of business skills and management, technology access and sustainable usage, and strengthening of coalition partnerships in the marketing chain is not adopted.

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

The outputs are being used in Uganda especially, in Apac, Kiboga, Kibaale, Pallisa, Bukedea and Masindi districts: districts in which the National Post-Harvest Programme targeted specifically for crops like maize, beans, dried cassava chips for human food or vertical integration into animal feeds. In some of the 63 districts e.g. Soroti, Arua, Lira, Luwero, Kabale, Bushenyi, Mbarara and Sembabule NAADS has recommended mature farmer groups to form marketing associations to improve market access and enhanced profitability. NAADS is also in coalition partnerships with the private sector e.g. Mukwano Group of Companies (for sunflower), Tilda (U) Ltd (for rice), Bee Natural Products (for honey, propolis and beeswax) and Sembeguya Livestock farm (for goats) that are linked to farmer groups in the different districts.

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

The paradigm shift of linking production to markets, and market-oriented research, provides opportunities for linking smallholder farmers to the different commodity markets. Although still in its infancy, the approach has enabled the scaling up of the outputs. In facilitating the different farmer groups in enterprise selection, one of the most fundamental criteria used by NAADS is market access besides marketability and profitability of the produce. Also in the reformed NARO (Ref. National Agricultural Research Policy, 2003), one of the cardinal objects is to provide a research system that addresses in a sustainable manner, the needs and opportunities of the poor in a market-driven environment, as espoused by PMA. As such the scale of use the outputs is considered high both in the short and long run, and will continue to spread as long as R&D activities and public-private sector partnerships are strengthened in an enabling environment.

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 medium- to long-term development goal of Uganda is to reduce absolute poverty to less than 10% by 2017. The Poverty Eradication Action Plan (PEAP) is the government's main planning framework, establishing the principles to guide investment plans and manage the economy in order for its overall development goal to be realised. PMA espouses the shift from subsistence to commercial production in order to raise the incomes, quality of life, food security and gainful employment of the rural poor, and addresses one of the pillars of PEAP (*i.e. Directly increasing the ability of the people to their incomes*). PMA provides the template for agricultural development programmes and has developed "The Marketing and Agro-processing Strategy" that outlines stimulation of investments by the private sector in agricultural processing and in increasing access to input and output markets by poor producers. Also in place is "A Plan for Zonal Agricultural Production, Agro-processing and Marketing" that aims at addressing low household incomes by increasing the production, value and profitability of household agricultural production, and emphasis is on building capacities of smallholder farmers to access good market opportunities. The NAADS Programme empowers, particularly the poor and women, to demand and control agricultural advisory services. It is grounded into the overarching government policies of decentralisation, liberalisation, privatisation and increased participation of the people in decision-making, key among which is involvement in technology development and market linkages. The National Agricultural Research Policy of 2003 aims at focusing the NARS on providing research services that address in a sustainable manner, the needs and opportunities of the poor in a market driven environment. The cardinal principles on which the policy is based include Responding to market opportunities, Empowerment of stakeholders, Promoting participation of private sector, civil society and farmers, Mainstreaming gender into agricultural research, Social, human and environmental concerns, among others. At Programme level, there have been buy-in projects including CFC projects on commercialising cassava, ASARECA/EARRNET funded project of promoting cassava processing technologies, and NARO/DFID COARD Project of Promotion of improved handling, processing, utilisation and marketing of pigeon pea.

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## **Current Promotion**

### **D. Current promotion/uptake pathways**

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

The promotion of *Farmer access to markets* outputs is currently taking place in several districts of Uganda. NAADS Programme is at the forefront of promoting the output through its enterprise development programme in districts it is operating. Although the initial strategy was based on the improvement of maize marketing, a number of commodities/ enterprises that include beans, dried cassava chips, simsim, sunflower, fruits, milk, honey and improved goats are successfully being marketed by farmer groups. The promoters include initial farmer groups in Apac and Kiboga who have divested into other enterprises on top of maize; NAADS Programme whose promotion of the output is based on the enterprises selected by farmer groups in the different districts it is operating and different private sector partners they have agreements with; the National Post-Harvest Programme of NARO in Kibaale district through Bugangaizi United Farmers Association, and projects commissioned by ASARECA/EARRNET and CFC on small-scale cassava processing for vertical integration into the feed industry in Bukedea and Masindi districts, and dried cassava chips for composite flour in Pallisa and Mbale districts in Uganda. The scale of promotion is medium to high in all the districts because of the ease of market access and profits made.

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 barriers preventing or slowing down adoption of the outputs are multifaceted: ranging from farmers' attitudinal mindsets, dependency syndrome, low outputs, low producer prices, lack of premium pricing, lack of trust in group storage and marketing, poor access to credits and micro finance, high interest rates, poor infrastructures in terms of road networks, storage facilities, information and communication networks, and lack of pragmatic policies, especially, on land ownership by women who are the major contributors to agricultural productivity. It is also observed that most of the actors on the ground who should have formed into strong dynamic and cohesive coalition partners and be the major promoters of the outputs have non-synchronised but similar activities and often target same end-users who end-up being sinks of attrition. There are elements of competition instead of complementarity among them. The concept of targeting the poorest of the poor is considered a misnomer in enhancing agricultural productivity and livelihoods improvement through economic empowerment.

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).*

Facilitation, promotion and/or sustenance of farmer groups into viable business entities are considered major keys to the removal of the barriers to the adoption of the outputs. Operating in registered groups or associations enables farmers to take advantage of economies of scale that can be obtained from the input and output markets, credit and microfinance institutions, lobbying support in terms capacity building, information, knowledge and technology access, and favourable policies that enhance agricultural production and marketing. It is the

economically active poor who are ready to invest in agriculture: procuring goods and services, that should be the primary target group, and the successes registered can then diffuse downstream to the poorest, upstream to the other actors within the value-added market chain. Government must invest in the construction and maintenance of roads linking farming communities with markets, and in information and communication technologies for rapid market access. There should be platforms/fora that brings together the different stakeholders (farmer groups, NAADS, extension agents, service providers, NGOs, NARO, private sector and local governments) who have similar agenda in improving agricultural productivity and marketing for increased earnings to articulate their agenda, plan and implement joint activities in their different domains of operation.

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).*

Linking farmers to market requires a consortium of experts, expertise and stakeholders to effectively produce results. No single group working independently and in isolation can generate, utilise or promote effective utilisation of the required technologies, knowledge and approaches. The output focussed primarily on the post-harvest sub-sector with the assumption that large volumes of maize were available. It was however, learnt that the demands of the grain buyer (Afro-Kai) far outstripped supply, and this called for investments production inputs e.g. more land, improved seeds, fertilisers and pesticides. Therefore in linking farmers to markets it is important that production as well as post-harvest technology packages are considered in totality rather than segmenting them between different actors. Apart from encouraging farmers to produce for the markets, it is also important they are given the latitude to decide on how much they should keep for domestic food consumption otherwise there is no guarantee that financial security would ensure food security at home. Involvement of women in the group leadership in decision making processes and sharing the proceeds was considered a very positive lesson by first empowering the marginalized and secondly ensuring transparency and accountability by men to their families on incomes from produce sales.

## **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.*

A number of studies were conducted in Apac and Kiboga districts to determine the outcomes of the project/output intervention in relation to changes in the social, economic and household profiles of the primary stakeholders. An assessment of profitability of maize grain in Kiboga district through the farmer group storage approach and the results showed the economic and social merits group approach vis-à-vis individualism. The cost-benefits analysis of the study showed that farmers operating in groups had mean profits as opposed to those who stored and marketed individually. It is noted however, that during scarcity there was no price differential based on quality, and good quality maize was used for blending the poor ones. One advantage of group marketing was attributed to elimination of piecemeal marketing that always result poor accountability and lack of planning of how to use the incomes meaningfully. Specifically the studies conducted included:

- An assessment of maize production and marketing in Apac and Kiboga districts: Implications for farmer group storage and marketing
- An assessment of profitability of maize grain in Kiboga district through the farmer group storage approach
- Grain quality determination, maintenance and implication on marketing: A case of maize in Uganda
- Improvement of maize marketing through adoption of improved post-harvest technologies and farmer group storage: Quarter three (October-December 2003) Farmer monitoring and project evaluation in Apac district
- Improvement of maize marketing through adoption of improved post-harvest technologies and farmer group storage: Quarter three (October-December 2003) Farmer monitoring and project evaluation in Kiboga district
- Report on post-harvest activities in Kiboga district (July-September, 2003).

21. *Base 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.*

Although agriculture is the backbone of Uganda's economy, it is relegated to the smallholder poor farmers who are ill equipped to access technical information, knowledge and technologies. Smallholder production is mainly for domestic consumption and any accrued excess is sold to meet domestic requirements. The *Farmers access to market* output entailed

building capacities of different farmer group in entrepreneurship, group leadership and management, store and stock management, bargaining skills, importance of storage of quality and large volumes of tradable commodities, provided assurance to farmers that farming is a profitable venture. Through group storage and marketing farmers were able to receive premium prices that ranged from 20 to 50% because of good quality maize and economies of scale. Some of the social changes that occurred included the spirit of togetherness among the group members, positive attitudinal change and belief that women are important in planning and decision making processes and income generation; nutritional status of especially, the children improved due ability to access balanced diet, and standard of living of the formerly poorest farmers increased significantly. From the maize incomes some farmers were able to put up permanent houses; buy bicycles, more land, livestock especially, oxen for ploughing; meet cost of medical treatments and send their children to better schools, and buy better clothes. The active participation of the youth enabled some of them to add more stock to their small retail businesses, while others were able to pay bride price of their wives in terms of cows, goat and cultural requirements for marriage and have gained respect in the society. The elimination of middlemen, and sales by volume and the introduction of weighing scales fostered the element of trust between farmers and Afro-Kai Ltd. A total of 18 farmer groups with average membership of 30 farmers per group and each farmer on average had 7 members per family, (i.e. >3700 people) directly participated and/or shared the benefits from the trailblazing of the output. The beneficiaries of the positive impact are described as extreme vulnerable poor in the rural areas. Average percentage increase of premium prices of 20 to 50% per kg of maize sold strongly suggest what households that participated in the groups enjoyed over other farmers who operated individually. The requirement of at least each farmer group leadership having a 30-% women representation involved in decision-making processes, signify the elevation of women status in community affairs.

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## **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*

Prior to the output intervention in the target areas, most farmers stored their produce in residential houses that were used as sleeping and/or living rooms. Apart from the dusts of stored produce, occupants were exposed also to disease causing organisms like mites, moulds and mycotoxins (allergies, asthma, dermatitis, rashes), and disease carrying vectors like rats and mice (plague, rickettsial pox, typhus fever, leptospirosis, salmonellosis). Secondly, some farmers used pest control methods, especially chemicals, of which they had no knowledge of use, application and handling. These greatly exposed them, especially, children, to hazardous materials that could cause chronic illnesses/death. However, the project intervention of collective storage in a modern store, and pest management using fumigation were considered major breakthroughs in ensuring good health and security for their produce. The non-usage of other pesticides helped in preventing dumping of used containers in water bodies or their re-usage as domestic utensils. The use of shelled maize cobs as source of fuel for biomass dryers in some areas was considered positive in energy recycling rather than cutting down trees to provide bio-fuel. The cobs were also used, in some instances, as mulching materials and this helped in soil and moisture conservation.

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

No. To avert eminent problems like accidental poisoning due to exposure to fumigants used in pest control, and dusts resulting from the cleaning of maize, several strategies were put in place. The capacity of the farmer groups in principles and practice of fumigation was built. Five people per group were trained in the principles and practice of fumigation, safety precautions and were equipped with fumigation kits that included coveralls, gumboots, gloves, goggles and aspirators to prevent accidental poisoning. Farmers are encouraged to use dust masks at all times while cleaning maize.

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

Yes, but not in totality. Climate change and/or occurrence of natural disasters may result in famine, food insecurity, malnutrition and health-related problems, which greatly affect the most vulnerable groups of the society. The output empowers smallholder farmers economically, and on how best they can save or utilise their incomes; and women who are considered custodians of household affairs are actively involved. It is therefore anticipated that with improved incomes and savings culture, the farmers can respond effectively to at least some of the disasters that do not require massive state interventions. For instance access to adequate food both in terms of quantity and nutrition may enable the economically empowered farmers to avert health and/or nutrition related problems that result in apathy and morbidity for increased production.

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