

## **CROP POST-HARVEST PROGRAMME**

Review of project: **Small-scale farmer utilisation of diatomaceous earths during storage**

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# CROP POST-HARVEST PROGRAMME PROJECT REVIEW SHEET

## Project Code and Title

<b>R8179 (ZB 0299) Small-scale farmer utilization of diatomaceous earths during storage</b>
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### Regions and Locations

### Thematic area

<b>Southern &amp; East Africa</b>	<b>Food Security: Reducing losses on-farm</b>
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## Introduction

The 'Small-scale farmer utilisation of diatomaceous earths during storage' project, which builds on work already undertaken in Zimbabwe (project R7034), is being carried out at five locations in three regions of Tanzania, namely Dodoma, Shinyanga and Manyara (formerly under Arusha) and one region in Zimbabwe (Buhera). The **purpose** of the project is to develop strategies that will improve the food security of poor households. To do this the project is developing storage technologies incorporating the use of diatomaceous earths (DEs), which it is anticipated will increase the availability and quality of foods used by small-scale farmers.

The project is being funded by the Crop Post-Harvest Programme (CPHP) of the UK Department for International Development (DFID). As originally conceived the project was designed to be undertaken during the three year period, April 2002 to March 2005. The contract was only however issued in June 2002 and for an initial period of one year, with future activities to be determined by an internal programme review scheduled after this period. During the three year timeframe, the project team anticipate delivering the following six **outputs**:

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| <p>1. Optimal methods for the protection of grain against damage by LGB and other storage insects developed, using commercially available diatomaceous earths (DEs), based on on-farm field trials over two seasons in 3 regions.</p> <p>2. Several different sub-Saharan African deposits of DEs evaluated against storage insect pests and assessed for their potential use as grain protectants.</p> <p>3. Evaluation of user/farmer acceptability of DEs, in terms of efficacy, cost, application method, taste, cooking and brewing characteristics.</p> | <p>4. Extension materials describing DEs and their role, and recommendations for use as a grain storage option by small-scale farmers, developed for the different information systems used by different groups of producers.</p> <p>5. New knowledge about DE storage technologies disseminated and promoted through multiple channels to inform relevant stakeholders at national and regional (i.e. SADC) levels.</p> <p>6. Project procedures evaluated throughout the project cycle, using participatory processes to capture different stakeholders' perspectives.</p> |
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The core project team comprises Ministry of Agriculture and Food Security (MAFS) staff from Plant Health Services, Crop Development Division, and from the Post Harvest Management Services, Food Security Department; together with colleagues from the University of Zimbabwe (UZ) and the Natural Resources Institute (NRI), UK. Staff from the Tropical Pesticides Research Institute (TPRI) also joined the recent field work to establish farmers' assessments of the stored grains (Activity 2.1), and are expected to play an active role in future activities.

Following programme related delays, the work commenced in July 2002, at the beginning of the 2002/2003 storage season. In Tanzania, project team members, including the NRI project leader, headquarters, zonal and/or district staff from MAFS, met with district-level stakeholders and with members of the village communities at the five locations (which had been selected by the MAFS

project team members based on both a high incidence of the larger grain borer and their representation of different agroecologies), to introduce the project and set up the initial storage trials (Activity 1.1), which in the first year was undertaken by researchers. At the end of the storage season farmers were also involved in assessing the quality of the treated stored grains (Activity 1.2). The research findings suggest that the effectiveness of DEs as a protectant for various stored grains against insect damage (particularly that caused by the larger grain borer *Prostephanus truncatus*) compare well with Actellic Super dust (ASD), the predominant commercial product. And this assessment is verified by the farmers' evaluations.

To facilitate implementation, improve dissemination and promotion (outputs 4 & 5) and ultimately uptake, the project continues to seek the active collaboration of organisations with an interest in storage and/or food security issues at all levels. This season, in addition to support work for the researcher-managed trials farmers will also play the central role in farmer-managed trials (Activity 3.4) at the different trial sites. The Tanzanian Ministry of Minerals and Energy was contacted prior to the start of the project to facilitate the process of obtaining samples of raw local DEs. Preliminary studies have shown that local DEs from the Kagera deposit have insecticidal potential (Activity 2.1, 2.2 & 2.3). The Ministry has recently promised to designate an officer to interface with the project.

## PERFORMANCE OF PROJECT IN RELATION TO OUTPUTS

### ACTIVITIES AND INPUT USE

*Have the agreed activities for year one been implemented?*

#### Progress against outputs

Agreed activities for year one have been fully implemented and results attained have clearly shown the benefits of using DEs as grain protectants. There is evidence that farmers who participated in the trials are "demanding" the technology having had first hand experience with the DEs tested. Dissemination and promotion of the outputs have been good and various uptake pathways identified. Extension materials and information sharing using various mechanisms has already begun but would need further development and consolidation in the next phase.

**Output 1 project activities: Methods for the protection of grain using commercially available diatomaceous earths (DEs) against damage by *Prostephanus truncatus* and other storage insects optimised.**

#### Activity 1.1

First year on-farm field trials of DEs set up in 3 sites in Tanzania (Shinyanga, Dodoma and Manyara regions) in July 2002 to look at the efficacy of the DEs under differing environmental conditions and their acceptability from a range of cultural perspectives was **successfully completed** in June 2003 following a 40 week storage period and farmers' participatory evaluations (see report *Farmer evaluation of diatomaceous earths as grain protectants in Tanzania: Report of a participatory evaluation of the 2002/2003 storage season diatomaceous grain protection trials by farmers in the five trial sites in Shinyanga, Dodoma and Manyara regions of Tanzania*) by Stathers T, *et al.* 2003). The project has adopted farmers' practices at all trial sites. In Shinyanga and Arri (Babati) small vihenge, modelled on improved

local storage structures, have been used. In Mlali (Dodoma) and Singe (Babati) the trial was carried out using bags. The researcher trials were inclusive in as much as were established at particular farmers' homesteads, go-downs and baskets were constructed by the local people, who also supplied much of the grain, and winnowed and mixed the grain. The processes were explained to the farmers throughout.

#### Activity 1.2

Farmer evaluations of the different grain protection treatments at the end of the first storage season have been completed and important lessons learnt on methodology and farmer diversity. Farmers' assessments by the different farmer groups (disaggregated by wealth status and gender) were similar to those of the researcher's data, with the DE and ASD treatments obtaining the highest scores than the traditional protectants and the untreated controls.

The DE treatments have performed well at all sites and insect damage was found to be much lower than in untreated or traditional protectant treatments. The synthetic grain protectant treatment of Actellic Super Dust (the recommended grain protection) was also proven to be highly effective dispelling concerns that the product was no longer effective in Tanzania. Through critical observations and discussions with a wide range of stakeholders it has been established that the widely occurring lack of efficacy of ASD dusts is due to a number of reasons namely, adulteration of the product by unscrupulous traders, incorrect application methods and application rates. There is thus need to **review the extension messages** regarding the correct and efficient usage of grain protectants in Tanzania.

**The field trials for year one have been successfully concluded, data fully analysed, and evaluation by farmers (the end-users) of the treatments tested has been satisfactorily completed.**

**Output 2 project activities: Several different African deposits of diatomaceous earth evaluated against storage insect pest, and assessed for their potential use as grain protectants.**

#### Activity 2.1

Local sources of DEs have been identified in both Tanzania and Zimbabwe and **samples collected** from Kagera and Singida in Tanzania and the Zambezi valley (Chemutsi) and Beitbridge in Zimbabwe. Attempts are still being made to identify other deposits in Tanzania with the assistance of the Ministry of Mining and Energy and Zimbabwe Phosphate Industries in Tanzania and Zimbabwe respectively.

#### Activity 2.2

Laboratory efficacy trials, using a standardised test protocol of raw local DEs have been **completed** at NRI and preliminary evaluations performed at Diatom Research Consult Inc. (Canada) laboratories. The initial screens have shown some activity as grain protectants, however it is important to have pure samples for testing and analysis of physical and chemical characteristics as the efficacy of DEs depends greatly on several physical properties of the diatom particles including particle size distribution, ability of DE particles to reduce bulk grain density, DE tapped and loose

density, the tendency of DE particles to adhere to the grain surface, pH, diatom shape etc. The preliminary results to date are encouraging. However it is important to recognise the differences between deposits from different sources and the need for precise information on the origins of the DEs and their particular qualities.

The current situation on Zimbabwe has caused considerable constraints to planned project activities despite the team member's best endeavours. In the current project there was no need to repeat researcher efficacy trials, work has focused on assessing local deposits, temporary registration of the DE, Protect-It, as a grain protectant and further farmer-managed acceptability and urban consumer trials, but the success of these is dependent on successful completion of the temporary registration process, as no Protect-It treated grain can be consumed until the product is registered as a grain protectant. The laboratory bioassays have been delayed and now rescheduled for the end of August 2003. The field trials are also scheduled at this date (*a year two activity*).

Activity 2.3; 2.4; 2.5

Samples from Kagera have been included in the 2003/2004 Mlali village (Dodoma) trials.

It is too early for any progress to have been made on these activities at this stage. However, significant progress has been made in identifying and formalising relationships with the key players/stakeholders in the public and private sectors who would be involved in the mining development and marketing of local DE deposits. As per the project memorandum, the project was now generating information to stimulate interest amongst other stakeholders who would have a more central role in developing the local deposits. This was a valid and good use of resources.

People in the Ministry of Mines and Energy (Dodoma) have shown a growing interest in the exploitation of DEs for stored grain protection and have designated an individual staff to formally interface with the project. In Zimbabwe, Chemplex Corporation Ltd. with subsidiaries Zimbabwe Phosphate Industries and Dorowa Mines have shown great interest in exploiting DEs for grain protectants and other industrial uses. Meetings with the marketing manager, chief chemist and a director of the company indicated their awareness of the safety aspects of organophosphate grain protectants and recognising that an 'organic' protectant would provide a market edge, have shown keen interest in the project and willingness to invest in research. Its subsidiary company, Dorowa Mines, has mining rights to one of the deposits in the country. There are thus real opportunities for greater involvement of the private sector in the development of and scaling up of DE technologies (see later section on partnerships and challenges).

**Output 3 project activities: User acceptability of diatomaceous earths in terms of efficacy, cost, application, acceptability, taste cooking and brewing characteristics evaluated.**

Activity 3.1

It is a legal requirement in Zimbabwe to register all pesticides before being allowed to be marketed in the country. In the case of new compounds with insufficient local



data on consumer safety a temporary registration is usually granted to enable research trials on consumer safety to be conducted. The **application for temporary registration** of Protect-It was submitted by Eco-Mark in March 2003. It was anticipated that the application would be approved within 4 months. A letter of acknowledgement indicating that the application is in the process of evaluation was only received by the registrant on 16<sup>th</sup> May. The delay in registration is some cause of concern as the success of the project within the time frame is dependent on the registration. Nevertheless, Eco-Mark (the registering company) is confident that approval will be received in time for the consumer trials.

In Tanzania, the registration authority (TPRI) is now fully integrated into the project activities and registration is not anticipated to be a problem following the first seasons' trials.

**Output 4 project activities: Extension materials describing DEs and their role and recommendations for use as a grain storage option by farmers, developed for the different information systems used by different groups of producers.**

**Output 5 project activities: New knowledge about DE storage technologies disseminated and promoted through multiple channels to inform relevant stakeholders at national and regional levels.**

The development of a variety of extension materials commenced early in the project. During the first year, there has been **good progress** in activities related to outputs 4 and 5.

A "Grain Storage Stakeholder Workshop" held in Shinyanga (Report of a workshop organised by the Plant Protection Services (IPM project), Western/Lake zone, Natural Resources Institute and the University of Zimbabwe, on the 8<sup>th</sup> November 2002, at the IPM project compound, Shinyanga) was an important activity to identify storage/post-harvest stakeholders, pathways of information flows and to systematise storage information linkages (type, frequency and quality).

There is now a switch in emphasis from a research/technology approach (output 1) to a more farmer-centric approach and development of methodologies towards achieving outputs 4 and 5.

**Output 6 project activities: Project procedures evaluated throughout the project cycle, using participatory processes to capture different stakeholders' perspectives.**

The participatory monitoring and evaluation processes are evolving with some progress already being made. Three of the six project outputs involve participatory evaluation.

*What is your assessment of efficiency of input use for the implementation of activities?*

The project has **efficiently and effectively** used the inputs for the implementation of activities. Year two activities have commenced as per PMR despite the uncertainty of funding for the year.

*Were the agreed procedures for implementation laid out in the PMF adhered to?*

The procedures for implementation laid out in the PMF have been closely adhered to and all activities outlined in the PMR has been carried out in Tanzania for year one. Furthermore, trials for year two are by and large on schedule in Tanzania. The constraints in Zimbabwe have meant a rescheduling of some activities, but I am confident that these will be on course by the end August/early September 2003. Preparatory work (e.g. acquisition of grain, identification of farmers, preparation of farmer's granaries) have been completed in readiness for the year two field trials in Zimbabwe.

**The commitment, enthusiasm and professional approach of the core project partners in implementing the said activities is highly commended.**

*What is your assessment of technical soundness of project methodology?*

The field trials are **well designed** (including researcher managed and farmer participatory) and being accurately implemented. All experiments are designed to be statistically analysed. The results of the first seasons trials have been statistically analysed and interpretation of the results good. To better develop understanding and to improve the opportunities for the research findings to be put to good use, the project team has identified a diversity of organisational stakeholders from state, civil society and private sector. Methodologies for farmer and intermediary stakeholder identification and involvement are evolving and significant progress has been made in systematising information dissemination and uptake pathways. The project methodologies are sound, and schedules **realistic** to achieve the outputs.

## **MILESTONES REACHED IN RELATION TO INDICATORS**

*Have the agreed milestones for year one been attained?*

The agreed milestones for year one have by and large been attained. Quarterly, annual and workshop reports have presented in detail the year's activities and critically analysed the progress and achievements.

Listed below are what I consider to be the most important milestones for the year under review:

<b>A. Successful completion of community based first storage season trials</b>
<ol style="list-style-type: none"> <li>1. timely collection and processing of samples</li> <li>2. data statistically analysed and interpreted</li> <li>3. technical reports on the results presented</li> <li>4. farmer evaluation (disaggregated by wealth and gender) of the trials and grain treatments based on their own criteria (draft <i>Report of the participatory farmer evaluation of diatomaceous earths as grain protectants in Tanzania</i>) completed. Publication of the final report for dissemination anticipated in Sept. 2003</li> </ol>
<b>B. Identification of local deposits and collection of samples</b>
<ol style="list-style-type: none"> <li>1. Two samples from Tanzania, 2 from Zimbabwe, 1 each, from Kenya, Zambia and South Africa have been collected; the qualities of these are however variable and need to be established in detail.</li> </ol>
<b>C. Laboratory bioassays of local DEs</b>
<ol style="list-style-type: none"> <li>1. DE samples bioassayed at NRI against the maize weevil</li> <li>2. Preliminary characterisation of the local DEs</li> <li>3. Awareness and an active interest in exploiting local DE deposits by a private company</li> </ol>
<b>D. Temporary registration application of a commercial DE preparation (Protect-It)</b>
<ol style="list-style-type: none"> <li>1. An application for temporary registration of Protect-It has been submitted in Zimbabwe by EcoMark (an agrochemical company).</li> <li>2. In Tanzania there is keen interest by two agrochemical companies to register DE products. Based on the field trials TPRI will assist and facilitate registration. (Both Zimbabwe and Tanzania have active private agrochemical companies with whom partnerships could develop beyond the project)</li> </ol>
<b>E. Year 2 on-farm trials set up at 3 sites in Tanzania.</b>
<ol style="list-style-type: none"> <li>1. Researcher managed trials</li> <li>2. Farmer managed trials (shift in emphasis now focusing on farmers)</li> <li>3. Awareness created amongst stakeholders regarding the trials</li> </ol>
<b>F. Farmer evaluation of treated grain</b>
<ol style="list-style-type: none"> <li>1. Year one trials evaluated by farmers using their own criteria</li> <li>2. The final version of the evaluation of diatomaceous earths as grain protectants in Tanzania report should be available by September 2003 and would be circulated to stakeholders.</li> </ol>
<b>G. Grain Storage Stakeholders' Workshop</b>



<ol style="list-style-type: none"> <li>1. Workshop proceedings published</li> <li>2. Stakeholders systematised</li> <li>3. Relationships between stakeholders and farming households established</li> <li>4. Uptake pathways identified</li> <li>5. Promotion of the technology</li> <li>6. Understanding of post harvest knowledge and information systems</li> </ol>
<p><b>H. Draft Extension materials developed</b> Extension materials and posters in English, Swahili and Sukuma languages</p>
<p><b>I. Promotion of technology and project activities</b></p>
<ol style="list-style-type: none"> <li>1. Fliers &amp; Newsletters disseminated to stakeholders</li> <li>2. DE website</li> <li>3. International/regional conference papers</li> <li>4. Local television (Star TV) documentary</li> <li>5. Participation in workshops/conferences and publication of presentations</li> </ol>
<p><b>J. Data base/inventory of grain storage stakeholders (draft)</b></p>
<p><b>K. Intermediate stakeholder questionnaire (draft)</b></p>
<p><b>L. Other:</b>  <b>Development of group identity types for farmer selection purposes</b>  <b>Development of tools to learn about different farmers' information contexts</b>  <b>Development of appropriate extension material</b>  <b>Review of monitoring and evaluation (PM&amp;E) methodologies</b></p>

*What is the reviewer's assessment of progress made to the attainment of the agreed project deliverables?*

In Tanzania, **excellent progress has been made in the first year** of the project and several year two activities have already commenced as outlined in the project memorandum, despite the uncertainty of funding continuing.

In Zimbabwe, progress has been limited given the circumstances and economic situation (frequent strikes, hyperinflation, staff movement, critical fuel shortages). Attainment of the project deliverables will take longer than planned and activities have been rescheduled. Approval of the temporary registration permit for Protect-It is still awaited (application submitted in March 2003). Trials planned in Binga will not be undertaken because of fuel shortages and the unavailability of grain in the area.

### **Tasks at hand**

Major items include the following (non-exhaustive) list (the relevant activities or outputs as per the project memorandum are in brackets, but many items will have relevance to multiple activities):

- finalising 2nd issue of newsletter (Activity 5.3)
- review and revision of outputs (relates to Output 6)
- review of participatory monitoring and evaluation (PM&E)(Activities 1.2; 3.2 & 3.4; Output 6)
- development and pre-testing of intermediate stakeholder questionnaire (Activity 5.1)
- development of group identity types for farmer selection purposes (Activities 3.2 & 3.4)
- development of tools to learn about different farmers' information contexts (Activity 4.1)
- development of extension material (Activity 4.2)

### Outstanding activities and outputs

- management of 2003/2004 storage season trial, analysis of the samples and data (Activity 1.10 and farmer evaluation of these trials building on the first seasons evaluation (Activity 1.2)
- analysis of crystalline silica content of local DE samples, to facilitate inclusion of local DEs in new trials (Activity )
- farmer managed trials - study of 'user acceptability' (Activity 3.4, 3.2 )
- urban consumer acceptability of DE treated stored grains (Activity 3.2)
- understanding of farmer information pathways, and what dissemination materials would most effectively meet their requirements and the development and of appropriate dissemination materials (Activity 4.1, 4.2, 4.3)
- follow up of registration processes in both Tanzania and Zimbabwe (Activity 3.1, 3.3)
- completion of grain storage stakeholder contact database (Activity 5.1)
- continuation of updating of websites, new issues of newsletters, dissemination articles for different media (as identified as appropriate for different types stakeholders) (Activity 4.2, 4.3, 5.3)
- regional and national information workshops (Activity 5.4, 4.4)
- incorporating experiences and learning to date, and negotiating revisions in the project logframe (Activity 6.1, 6.2, 6.3))
- quarterly and annual reports to CPHP (next one due 15<sup>th</sup> September 2003) (Activity 6.4)

## PROCESS

### *Did the project give sufficient consideration to socio-economic issues?*

The role of the social scientist in this project cannot be over-emphasised. The inclusion of a social scientist as a core team member has added value to the project by identifying target groups, facilitating effective partnerships between farmers, researchers and intermediary stakeholders, adding to interdisciplinarity by informing the research process at the planning phase, influencing the project during its operation, as necessary, and providing monitoring and evaluation assessment. The role of social scientist is key to uptake and dissemination of technology. *See section on: Recognising farmer diversity, mainlining and optimising their different inputs.*

### *Did the project give sufficient consideration to environmental issues?*

Currently the most effect method for protecting grain during storage against insect attack is to apply synthetic organophosphate or organophosphate-pyrethroid mixtures. Both countries in which the project is being implemented have to import the insecticides, using valuable foreign exchange. Nevertheless, the compounds are frequently unavailable, too expensive or adulterated. Their misuse (which is common) can be a health hazard. Many farmers are reluctant to use these approved synthetic pesticides as food additives because they are afraid of their toxicity. Although synthetic insecticides are effective, constraints regarding human and environmental safety and insect resistance, have lead to increased international regulation that has reduced the number of 'safe' pesticides available for use. One solution to these problems is to introduce more sustainable methods of pest

management through low-cost techniques that are more in tune with the needs of the population and the environment. Inert dusts, particular diatomaceous earths, offer a safer alternative to pesticides currently in use.

Integrated Pest Management (IPM) is the acknowledged approach to pest management policies in both countries. IPM integrates different technologies and practices to optimise their effect and benefits. In this context of integrated stored grain management these include, store hygiene, use of improved granaries, use of botanicals, selective and judicious use of pesticides. DEs are therefore suited to the IPM approach. DEs have extremely low toxicity to mammals and are considered "Generally Regarded As Safe" by the USA Environmental Protection Authority. The US Food and Drug Agency has exempted DE from requirements of fixed residue levels when added to stored grain.

During farmer field days, demonstrations workshops, IPM training courses etc. the correct use (application method, application rate, protective and safety measures) of DEs and Actellic Super Dust (ASD) (which is the only grain protectant in use in Tanzania) were discussed in some detail with participants. The apparent lack of efficacy of ASD articulated by several farmers has been demonstrated by the project to be due to improper use of the grain protectant and the need for clear extension message regarding rational usage.

*Did the project give sufficient consideration to policy/ institutional environment?*

### **Institutional context<sup>1</sup>**

#### **Project linkages**

These have been built up and reinforced over the period of the project and encompass a wide variety of stakeholders. Stakeholder identification has been carried out locally and nationally and various typologies used to analyse the relevance of different stakeholders i.e. to dissemination and promotion strategies

<sup>1</sup> Institutions here are defined according to North's (1995) definition as: "the rules of the game of a society, or, more formally, are the humanly devised constraints that structure human interaction". They include formal rules (statute law, common law, regulations), informal constraints (conventions, norms of behaviour and self-imposed modes of conduct), and the enforcement characteristics of both. Organisations are the structures associated with many institutions within which people work. They include government agencies (e.g. line ministries), administrative bodies (e.g. village councils), projects, NGOs and networks, associations (e.g. farmers associations, cooperatives), and private companies.

(see for example: Grain Storage Stakeholder Workshop report, November '02; DE project website <http://www.nri.org/de/>).

An intermediate stakeholder profile questionnaire is under development to identify the sector (state, private, voluntary), main functions (e.g. policy maker, funding agency, lobbyist, training, marketing etc), operational areas and scale, communication context, contact and operational perception of the farming community (i.e. are farmers differentiated by group identities or gender). The questionnaire, for which pre-testing was planned during the setting up of the present trials (August 2003), attempts to differentiate between 'actors' (/agents) and their agencies. The information will be added to an existing initial inventory/database of intermediate stakeholders, and will be used to inform the project's interface with farmers' groups, and its dissemination and promotional activities.

Parallel activities to explore farmers' information networks (but of a more participatory nature e.g. focus groups, time-lines, diagramming) are planned, but await finalisation and the rationale for group identification and selection.

**Institutional factors** of importance to the project include:

- Continued financial support from the CPHP for the project and for its timetable as originally planned.
- Continuity of key staff in partner agencies.
- Competency and capacity of partner agencies with respect to addressing social and institutional components (i.e. in addition to scientific components).
- Incentives and implicit subsidies in the interaction with villages and farmers' groups do not corrupt findings i.e. team must appreciate need for sufficiently robust methodology.
- Time and resources of partner agencies to undertake social and institutional component work.
- Availability of competent local organisations at district and village level to facilitate dissemination.
- Competency of staff in targeted intermediate agencies (e.g. policy advisers, educators, communicators etc), to promote - develop and disseminate - the research findings.
- Sufficient interest, incentives (and absence of disincentives) and resources for registration authority to respond promptly to registration initiatives.
- Commercial interest in importing, and/or mining and processing, marketing and distributing DEs is maintained, and initiatives promptly follow.
- Market price of DEs less than or equal to ASD.
- Complementary resources available for initiative (public private partnership) to develop local deposits.

The initial thrust of the project related to testing whether DEs are effective grain protectants. The trials were set-up and supervised by scientists, with local extension staff and farmers facilitating their establishment and running at village sites. In the second year of the trials, a small number of farmers at each site will also carry out parallel trials at their own homes to more rigorously test specific aspects of their acceptability to small-scale producers for on-farm storage.

With all the experience obtained in the first year, and the efficacy results looking very promising, the activities and the project team's focus are inevitably shifting towards farmers' perceptions and beyond that to dissemination and promotional activities. Mainlining the role of farmers in the project and developing communication strategies move the centre of gravity of the project away from pure science into the realm of extension, social and institutional considerations.

While these different dimensions were touched upon at the project design and planning stage, they represent a different sort of challenge to that of the scientific

research. Moreover new approaches have been emerging<sup>2</sup> to counter the failure of much recent research with respect to these aspects i.e. to lead to benefits for poorer farmers. Taking these new developments into account, the project memorandum places some emphasis on **pluralism** (i.e. diverse stakeholders e.g. producers, policy actors, development agencies, state, voluntary and private sector service providers), and on **inclusion** (e.g. demand-led research, mainlining farmers in the process) - but only indirectly to **empowerment**. In addition the livelihoods and poverty format adopted in the CPHP project memorandum ensures that 'farmers' are viewed not in monolithic terms but as having diverse heterogeneous identities.

The challenges posed by these new dimensions and movements in the project's centre of gravity will place new demands on the competencies, capacities and resources of the project team and its partner agencies.

### **Project ownership**

The preliminary design phase (funded by the CPHP) afforded a number of potential stakeholders the opportunity to be involved in the design of the project. The alienating aspects of the logframe approach (e.g. the concept itself, the jargon) meant that some partners and intermediate stakeholders were distanced by the process. Iterations in the design process were also inevitably shared by e-mail (to meet time constraints), which again precluded those not on-line and/or literately challenged. Ownership amongst core team members continued to develop as the project progressed and various issues were the subjects of on-going discourses (e.g. PM&E, farmer identity selection). Other storage stakeholders had as yet only watching briefs, but were being kept informed of progress via various communications and activities (e.g. stakeholder workshop, site visits).

With respect to farmers, in addition to the thrust of the project being very much in keeping with needs already articulated by diverse farmers, the project was now entering a phase - the farmer-managed trials - where the role of farmers would be mainlined. Moreover, farmers at the trial villages who had already worked with the project in a contractual sense, were very much 'on-side'.

While this is not a 'social development' project with empowerment writ large, it strives to be inclusive and pluralistic with respect to all post stakeholders, and with the degree of participation in decision-making varying according to the activity. Output 6, which refers to participatory monitoring and evaluation by stakeholders will also cast light on the ownership issue.

*How do you assess the project implementation with respect to addressing poverty and gender issues?*

### **Recognising farmer diversity, mainlining and optimising their different inputs**

**Farmers as beneficiaries:** The Project Memorandum identifies various rural households as the potential beneficiaries of the project. These include small-scale farmers in semi-arid areas in general and poorer households and individuals in particular.

<sup>2</sup> The CPHP's decentralisation and move to a 'coalition' approach, are in line with or response to these developments.



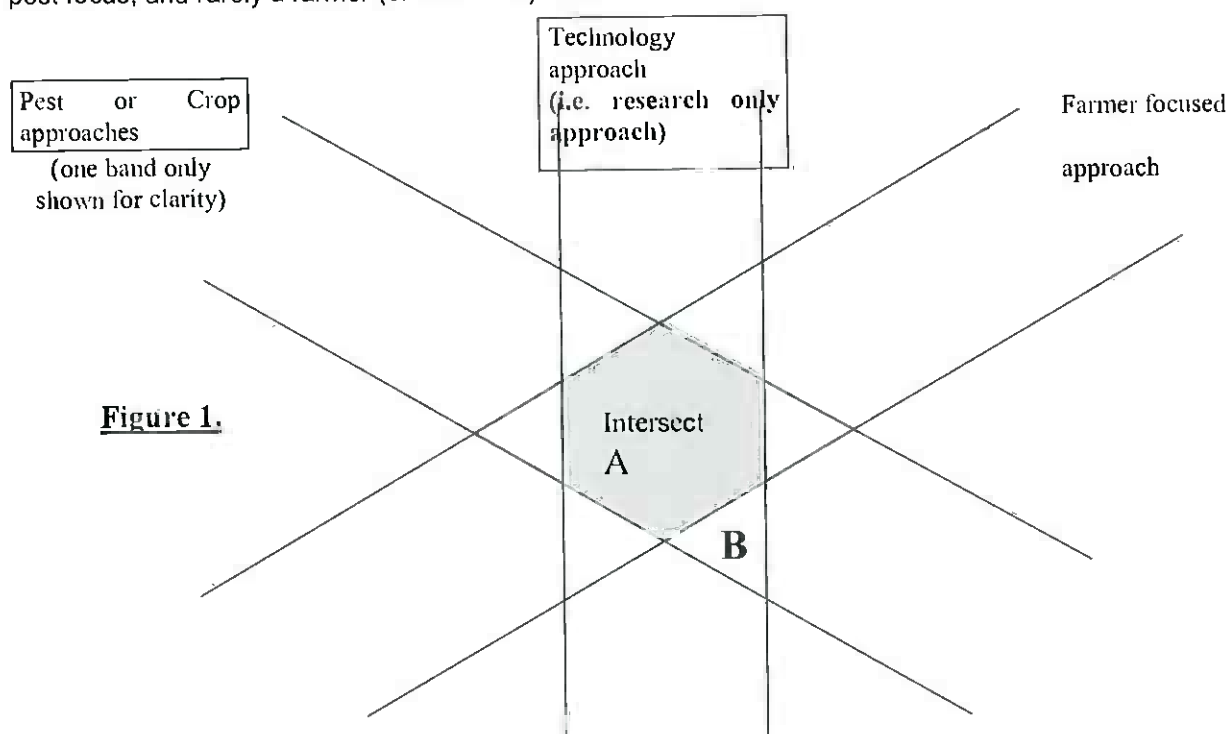
**Technology's acceptability to farmers:** The research hypothesis relates not only to scientifically testing whether DEs are effective grain protectants, but also to establishing their acceptability to small-scale producers for on-farm storage in areas where the large grain borer is endemic.

**Farmers as project stakeholders:** Project processes to date have included stakeholder identification and the rolling analysis of their multiple interests in the project. The project moreover has sought to actively engage diverse stakeholders (i.e. both intermediate and end-users - farmers) in its implementation from an early stage.

**Farmers as partners:** Groups and individual farmers from seven villages in Tanzania (5) and Zimbabwe (2) will have been engaged in the research process, from the needs assessment phase, hosting and evaluating the grain storage activities, eventually through to contributing to the promotion of the findings - new knowledge and practices - through for example, farmer field days and workshops.

**Exploring farmer diversity:** Reasons for and ways of disaggregating rural communities have been sought from the literature, from the team's own organisational experiences and that of intermediate stakeholders, and most recently in the farmer evaluation exercise, from key informants and farmers themselves at the different trial locations, where 'wealth ranking' was utilised.

The measure of this project will not only be determined by good science, but also and essentially by whether people make use of the technology. From the literature we note that analytical approaches with respect to post harvest issues have tended to adopt a technology, crop or pest focus, and rarely a farmer (or livelihood) focus.



Conceptually the different approaches may be represented by intersecting bands as in Fig. 1. The challenge with respect to farmer up-take is to focus our attention on the area where technological, crop, pest and farmers' concerns all intersect, which is represented in the diagram by area A. Areas such as B, outside the farmers band, may be of relevance to those with an interest in investigating a given technology, for example, but are not directly relevant to farmers' and their livelihoods<sup>3</sup>.

From a farmer-centred approach, and with the area of maximum overlap A in mind, the initial challenge<sup>4</sup> is to ensure that consideration be given to the diversity of farmers as represented by the breadth of the *farmer focused approach* band in Fig. 1. This would for example optimise understanding of the relevance of a given technology (and/or crop, pest) to all farmer types, which in turn would have greater merit for informing policy and promotion, targeting extension and dissemination. Working with a narrower group of farmers (e.g. progressive farmers) would not be expected to provide the same breadth of analysis (i.e. only a slice of area A along the farmer-focused axis would be in focus).

**Farmer group selection objective** The objective then in exploring different group identity types may be expressed in terms of seeking to optimise the inputs (e.g. knowledge, practices, experiences) of different farmer types in the realisation of the project outputs and purpose. And the underlying hypothesis would be that participating farmers, selected according to different identities, will inform and contribute differently to project outputs.

Table 1 was devised as a tool to explore the potential implications of farmer diversity and the selection of group identity types for the project. The entries are based on discussions held in the IPM office, Shinyanga, between Mr Riwa, Mr Kitandu and Mr Morris (see Figure 2), but it is envisaged that other team members will repeat and elaborate the exercise. Other possible identity types to be considered might include self sufficient and food insufficient households, male and female-headed households etc. It is conceivable that different identity groups might be used at different locations (i.e. Dodoma, Manyara and Shinyanga).

The conclusion that was drawn from this initial exercise was that group identities determined by existing technology use (i.e. commercial products, traditional practices only, none) scored most favourably in terms of relevance to project outputs, a position which remained unchanged when the merits and demerits of the process were taken into account. It was also concluded that gender (and possibly age) be incorporated into the selection process as a cross-cutting theme i.e. men and women (youths and the elderly) would be sought from each group. The comparison between wealth and technology user groups proved very interesting, with the clear emergence of the latter group, which spans all farmers and has most obvious overlap with the project focus, coming nonetheless as a surprise. It was noted that while technology use does not explicitly relate to wealth or poverty status, there may well be an implicit relationship with key determinants of people's livelihoods (e.g. farming strategies, resources, knowledge, access to services), which could form the basis of further study.

<sup>3</sup> The use of 'traditional' treatment materials in the research led trials, but without the incorporation of traditional practices (e.g. intermittent winnowing and reapplication), might be considered to fall into area B.

<sup>4</sup> There is need first to better understand the diversity of the rural communities with which the project is working. With this knowledge, the researchers might subsequently choose to focus efforts on a particular group (e.g. target extension where needs and potential benefits look greatest).

Figure 2. Farmer identity work as originally recorded



**Table 1. Relevance of farmer identity types to project outputs, and implication of identification and selection methodology and of implementation**

Group identity type	Relevance of group type to project outputs*	Merits & demerits of identification & selection, & of working with group type												
<p>Earlier project approaches:</p> <p>In line with existing office practice (e.g. progressive farmers)?</p> <p>Favouring volunteer / opportunistic farmers?</p>	<table border="1"> <tr><td>1.</td><td>✓</td></tr> <tr><td>2.</td><td>-</td></tr> <tr><td>3.</td><td>✓</td></tr> <tr><td>4.</td><td>✓ ✓</td></tr> <tr><td>5.</td><td>-</td></tr> <tr><td>6.</td><td>✓</td></tr> </table> <p>Relevance uncertain. Omits many farmer types</p>	1.	✓	2.	-	3.	✓	4.	✓ ✓	5.	-	6.	✓	<p>Composition unspecified</p> <p>Easy approach, but unknown bias</p> <p>Non-representative of farming community</p>
1.	✓													
2.	-													
3.	✓													
4.	✓ ✓													
5.	-													
6.	✓													
<p>Gender (could be treated as cross-cutting identity i.e. in addition to selected type. 'Age', which is also of great significance, might be treated similarly, but was not assessed on this occasion)</p>	<table border="1"> <tr><td>1.</td><td>✓</td></tr> <tr><td>2.</td><td>-</td></tr> <tr><td>3.</td><td>✓ ✓ Will pick up on gendered divisions of labour.</td></tr> <tr><td>4.</td><td>✓ ✓ ✓ Strong implications for gender aspect of extension.</td></tr> <tr><td>5.</td><td>✓ strong but indirect message for policy etc</td></tr> <tr><td>6.</td><td>✓ ✓ Would pick up on procedural differences.</td></tr> </table>	1.	✓	2.	-	3.	✓ ✓ Will pick up on gendered divisions of labour.	4.	✓ ✓ ✓ Strong implications for gender aspect of extension.	5.	✓ strong but indirect message for policy etc	6.	✓ ✓ Would pick up on procedural differences.	<p>Easy to make identification</p> <p>Cultural norms and practices might impede selection</p> <p>Require particular skills &amp; capacity</p> <p>Would not necessarily be representative (e.g. poor widows and rich women very different)</p>
1.	✓													
2.	-													
3.	✓ ✓ Will pick up on gendered divisions of labour.													
4.	✓ ✓ ✓ Strong implications for gender aspect of extension.													
5.	✓ strong but indirect message for policy etc													
6.	✓ ✓ Would pick up on procedural differences.													
<p>Wealth groups</p>	<table border="1"> <tr><td>1.</td><td>✓</td></tr> <tr><td>2.</td><td>-</td></tr> <tr><td>3.</td><td>✓ ✓ ✓ Would reflect diverse aspects of acceptability.</td></tr> <tr><td>4.</td><td>✓ ✓ ✓ Strong implications for extension</td></tr> <tr><td>5.</td><td>✓ Some farmers might also be intermediate stakeholders</td></tr> <tr><td>6.</td><td>✓ ✓ ½ Would pick up on procedural differences</td></tr> </table>	1.	✓	2.	-	3.	✓ ✓ ✓ Would reflect diverse aspects of acceptability.	4.	✓ ✓ ✓ Strong implications for extension	5.	✓ Some farmers might also be intermediate stakeholders	6.	✓ ✓ ½ Would pick up on procedural differences	<p>Wealth ranking requires skills &amp; capacity &amp; would involve training. It would demand time of village working group.</p> <p>Important that it's participatory to ensure indicators are location-specific; recent exercise points to difficulties.</p> <p>May be challenged in heterogeneous communities.</p> <p>Good representation of farmers</p>
1.	✓													
2.	-													
3.	✓ ✓ ✓ Would reflect diverse aspects of acceptability.													
4.	✓ ✓ ✓ Strong implications for extension													
5.	✓ Some farmers might also be intermediate stakeholders													
6.	✓ ✓ ½ Would pick up on procedural differences													
<p>Groups by storage technology use (i.e. users of commercial products; of traditional practices only; none)</p>	<table border="1"> <tr><td>1.</td><td>✓ ✓ see activity 2.1</td></tr> <tr><td>2.</td><td>- some may be aware of local DEs?</td></tr> <tr><td>3.</td><td>✓ ✓ ✓ Would reflect diverse aspects of acceptability, including contrasting technology perceptions.</td></tr> <tr><td>4.</td><td>✓ ✓ ✓ Technology-linked implications for extension</td></tr> <tr><td>5.</td><td>✓ Some farmers might also be intermediate stakeholders</td></tr> <tr><td>6.</td><td>✓ ✓ Would pick up on procedural differences</td></tr> </table>	1.	✓ ✓ see activity 2.1	2.	- some may be aware of local DEs?	3.	✓ ✓ ✓ Would reflect diverse aspects of acceptability, including contrasting technology perceptions.	4.	✓ ✓ ✓ Technology-linked implications for extension	5.	✓ Some farmers might also be intermediate stakeholders	6.	✓ ✓ Would pick up on procedural differences	<p>Identification relatively easy.</p> <p>Limited experience of working with non-users and traditional users. May require different approach and new skills.</p> <p>Selection key, as conceivably could degenerate to earlier or 'default' selection mode</p> <p>Good representation of farmers (may incorporate wealth, innovation, etc indicators) Technology focused.</p>
1.	✓ ✓ see activity 2.1													
2.	- some may be aware of local DEs?													
3.	✓ ✓ ✓ Would reflect diverse aspects of acceptability, including contrasting technology perceptions.													
4.	✓ ✓ ✓ Technology-linked implications for extension													
5.	✓ Some farmers might also be intermediate stakeholders													
6.	✓ ✓ Would pick up on procedural differences													
<p>*1. Optimising treatment method; 2. Evaluation of local DEs; 3. Evaluation of user acceptability; 4. Development of extension materials; 5. Promotion and scaling up; 6. Participatory evaluation of procedures</p>														

## What are the project's methods/ strategies for dissemination of project outputs?

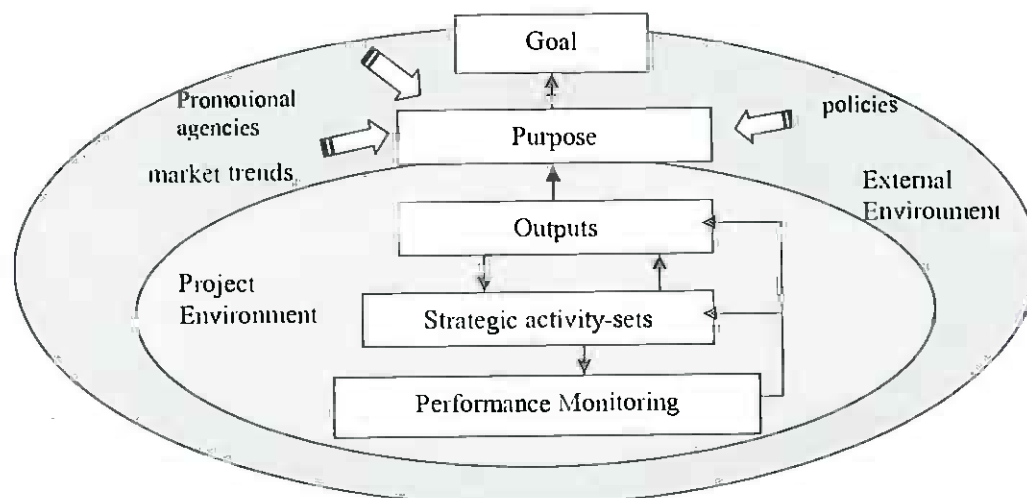
### Communication strategy: The challenge of scaling

To effect this, the project is contracted to assess the efficacy of DEs (output 1) in different agro-ecological locations, to establish their acceptability to different groups of small-holder farmers (output 3), and to disseminate and promote these findings (outputs 4 & 5 respectively). The project is also assessing the efficacy of regional DE deposits and exploring their potential to replace imported DEs (output 2).

The following relates to progress with respect to outputs 4 and 5, which address the dissemination and promotion of the project's findings.

The project activities and outputs can be conceptualised as in the diagram in Fig. 3, with their location within the 'project environment' implying that we have significant control over them. However, no matter how excellent the research activities are or how fine the eventual results (or outputs), from either the researcher or farmer-managed trials, these will all be irrelevant if farmers do not (or cannot) adopt the strategies that flow from our research findings i.e. make use of the DE technology.

Fig. 3. Objectives and monitoring: The logframe presents goal, purpose and outputs as a set of nested objectives. Logframe 'activities' are the strategic activity sets deployed to realise outputs. The project's performance in realising the activities and outputs can be monitored. The project purpose is beyond the timeframe of the project, beyond therefore its control and subject to multiple other influences.



Strategies and activity sets: Strategies describe how human and financial resources will be applied - activities - to achieve the stated output objectives

The widespread up-take by farmers of the proposed strategy or technology would approximate to the realisation of the project's purpose. This can only happen after completion of the project, as awareness of the change (i.e. new knowledge and practices) brought about by the project spreads and has impact - so the 'purpose' in the diagram is located outside the influence of the project.

Moreover, a number of other factors (i.e. policies, institutions, processes, trends, shocks) beyond the control of the project, will favourably or otherwise, influence the realisation of purpose. Some of these factors in the 'assumptions' (or 'risk') column in the logframe (e.g. a disabling or enabling environment, the capacity levels of intermediate agencies, food production levels, political stability or instability) have been identified.

From a project perspective the realisation of purpose is brought about through scaling-up, where scaling up is defined as the provision of more quality benefits to more people over a wider geographical area, more quickly, more equitably and more lastingly (IIRR, 2000 in Gündel *et al.*, 2001). Scaling-up will be effected both through the dissemination of the project's findings (Output 4) to intermediate and end-users, and by their promotion (Output 5). Both are strategic activities, but whereas dissemination relates to activities undertaken by the project, promotion relates to encouraging others to promote the project's findings.



Promotion aims to ensure that **intermediate stakeholders** will continue to use the research findings to develop additional products (e.g. DE commodities) and processes (e.g. policies), and extend information to **end-users**, after the project has finished. It ensures the persistence of the new knowledge revealed by the project.

Implementation of the project's **communication strategy** is underpinned by the various approaches adopted by the project since its inception, including the following:

<ul style="list-style-type: none"> <li>• Incorporating dissemination and promotion activities as contractual project outputs.</li> </ul>	<ul style="list-style-type: none"> <li>• Establishing sets of end-users - farmer types - for whom DE technology most relevant and appropriate.</li> </ul>
<ul style="list-style-type: none"> <li>• Interdisciplinary and multi-agency approach ensures breadth of experience &amp; has extended competencies of team and partner agencies with respect to addressing promotional and institutional constraints.</li> </ul>	<ul style="list-style-type: none"> <li>• Involvement of local organisations and structures (e.g. district &amp; village extension staff, community representatives, local NGOs).</li> </ul>
<ul style="list-style-type: none"> <li>• Early and progressive involvement of stakeholders from design phase.</li> </ul>	<ul style="list-style-type: none"> <li>• Integration of dissemination into the research process through user feedback/evaluation loops</li> </ul>
<ul style="list-style-type: none"> <li>• Stakeholder analysis: including group work and questionnaire for intermediate stakeholders.</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of intermediate stakeholder profile inventory to better target and share diverse communications. Includes key workers (e.g. researchers, officials, policy advisers) throughout the region.</li> </ul>
<ul style="list-style-type: none"> <li>• Inclusive approach: active involvement of farmers and other stakeholders in the project activities.</li> </ul>	<ul style="list-style-type: none"> <li>• Focus on understanding different sets of farmers' information networks to tailor dissemination products and counter dissemination pathway discrimination.</li> </ul>
<ul style="list-style-type: none"> <li>• Pluralistic approach: state, private and voluntary sector involvement, together with rural householders.</li> </ul>	<ul style="list-style-type: none"> <li>• Encouraging media interest.</li> </ul>
<ul style="list-style-type: none"> <li>• Viewing gender as a cross-cutting issue.</li> </ul>	

Dissemination and promotional pathways and outputs to date have included the following (a comprehensive list will be found in the annual reports):

Pathways	Nature	Target group
<ul style="list-style-type: none"> <li>• Publications</li> </ul>	Crop Protection,	Researchers, practitioners, policy makers, donors
<ul style="list-style-type: none"> <li>• Leaflets</li> </ul>	All purpose project information flyer	All secondary stakeholders
<ul style="list-style-type: none"> <li>• Newsletters</li> </ul>	PhAction News, DE Project Newsletter, Ukulima wa kisasa	Range of Intermediate stakeholders and literate end-users
<ul style="list-style-type: none"> <li>• Presentations</li> </ul>	IPM Project Review Meeting;	IPM stakeholders; registration authority
<ul style="list-style-type: none"> <li>• Radio</li> </ul>	Radio Tanzania, Radio Free Africa (Mw), Radio Faraja (Shy)	Local and national audiences
<ul style="list-style-type: none"> <li>• Posters</li> </ul>	Village notice boards; international workshop	Villagers; international stakeholders
<ul style="list-style-type: none"> <li>• Workshops</li> </ul>	Training and stakeholder workshops	Stakeholders with implementation focus
<ul style="list-style-type: none"> <li>• Training</li> </ul>	Post harvest training; IPM training	Village extension staff; farmers, plant protection officers, NGO staff
<ul style="list-style-type: none"> <li>• Research collaboration</li> </ul>	Exchange visits & communications	PHS project team staff from different regions of Tanzania, counterpart in Zimbabwe
<ul style="list-style-type: none"> <li>• Reports</li> </ul>	Various: CPHP quarterly and annual monitoring, internal, BTORs, discussion papers	Project team, colleagues & stakeholders
<ul style="list-style-type: none"> <li>• Website</li> </ul>	Project website linked to NRI and MAFS; copies also distributed by e-mail	More than 200 international and regional grain-storage stakeholders sent details by e-mail along with Issue 1 of newsletter; also distributed to international Food-Africa conference participants

• Networking	Networks (e.g. Mwiwata); E-mails	Farmers networks; international stakeholders
• Print media	Mtanzania newspaper;	Local literate audience
• Television	Star Television	General Tanzanian public (with access to TV)
• Video	Farmer Education Unit production	Farmers & extension staff
• Curricula	Tertiary education course, UZ;	Undergraduate students at UZ

### Will the process used lead to sustainable uptake of project outputs?

An integral component of the project is dissemination and identification of uptake pathways aimed at optimising uptake of research outputs. A preliminary analysis to explore the relevance of farmer identity types to project outputs and implications of identification and selection methodology and of implementation has been performed. The tool developed goes towards understanding uptake of outputs (see Table 1 for conceptual model developed).

Farmer training and stakeholder awareness (as ultimate promoters of technology) is very important for dissemination, uptake and adoption. Perceptions of stakeholders in the uptake process are important and may be very different. The project is cognisant of this. Uptake is a major output of the project and is receiving adequate attention. The active interest by the private sector is noteworthy, and beyond the project, once DEs are fully registered and available, promotion of the technology will inevitably be 'stepped-up' in the marketing strategy. Advertising/promotion materials that would inevitably be produced by the private companies could be developed in conjunction with project members.

### *How could dissemination and uptake of the results be improved and optimised?*

The project has already developed dissemination materials targeted to diverse audiences. The key messages would need to be tailored for area/site specific situations. There needs to be a clear understanding of farmer information pathways, and what dissemination materials would most effectively meet their requirements and the development of appropriate dissemination materials (Activity 4.1, 4.2, 4.3). Updating of websites, new issues of newsletters, dissemination articles for different media (as identified as appropriate for different types of stakeholders (Activity 4.2, 4.3, 5.3) needs to be continued. The national and regional information workshops (Activity 4.3, 5.3) as planned must be fully supported.

Given the "break down" of traditional public sector extension services in Zimbabwe, the need to engage NGOs and other appropriate intermediary agencies is strategic. NGOs seem to be better funded and more focused in specific areas. A workshop of these intermediary stakeholders working with rural communities in Zimbabwe could enhance dissemination and uptake of technologies.

## IMPACT

*Is there any evidence of impact or early pointers to impact of the project at the beneficiary level?*

Farmers (the beneficiaries) have expressed a great interest in the DEs as alternatives to synthetic grain protectants and have demanded samples for their use. The problems faced by farmers regarding synthetic pesticides are continuously being raised with project team members. The issue of adulteration of ASD and the (apparent) loss of efficacy is serious enough to have been debated in Parliament in Tanzania. The impact of the project, however, would be more fully realised once DE products become commercially available, offering a more user and environmental friendly option for stored grain protection.

On the issue of exploiting and making use of natural (local) deposits of DEs there are a number of challenges, including commercial mining and/or the need for development of local/cottage industries to mine and process the deposits, and the need for quality assurance regarding efficacy. The projects' findings would hopefully facilitate the engagement of the mining sector and other private sector players. The project is generating information that would stimulate interest among private stakeholders who would have a more central role in developing local deposits.

*What is the assessment of the likely policy outcomes of the project?*

Existing policy endorsed the IPM approach (e.g. favoured environmentally friendly products), this bodes well for DEs and implied no policy change. Marketing of grain with such additives to grain are not anticipated to be problematic particularly in Tanzania where no marketing/grading standards exist.

Much of the grain produced by small scale farmers in Zimbabwe is however, marketed through a formal channel, namely the Grain Marketing Board which has stringent grading standards. Since Zimbabwe marketed into the international system, it was obliged to adopt more rigorous controls (in comparison to Tanzania). The presence of DEs at GMB points of sale may effect grading requirements, which in turn suggest the need for changes in GMB regulations. DE treated grain should be recognised not to be contaminated. The focus of existing regulations in international grain trading on any 'contaminant' and the reluctance or difficulties relating to differentiating between undesirable contaminants and ones such as DEs is however currently under review.

*To what extent have the project beneficiaries been involved in the project and in what ways?*

Groups and individual farmers from seven village in Tanzania (5) and Zimbabwe (2) have/will have been engaged in the research process, from the needs assessment phase, hosting and evaluating grain storage activities, eventually through to

contributing to the promotion of the findings – new knowledge and practices – through for example farmer field days and workshops.

Farmers have been involved at various levels in the trialling process. During the set up of experiments at each site, a field day was organised to explain the storage trials and to interactively discuss problems being encountered in storage of grain. The problems/issues raised during these interactive sessions highlight the huge need for awareness campaigns and farmer training in storage pest control in Tanzania. The traditional structures in which experimental treatments were set up were built by farmers and their grain used in trials. Farmers were involved in the selection of the most appropriate traditional practice to test (amongst several traditional options), they assisted in preparing grain for experiments, viz. winnowing, weighing and admixing treatments and loading of the treated grain into the experimental granaries. At all experimental sites they were also involved during the sampling processes, enabling them to visually compare how the different treatments were performing throughout the trial. Village notice boards (posters) were placed at homesteads in vernacular to expose non participating farmers of the research being hosted at the particular homestead. Groups of farmers at all sites were also involved formally to evaluate and compare the treatments at the end of the trial. The methodology used and findings of the farmers' evaluations of the different trials and the implications of these findings are presented in a comprehensive report.

In the second season the processes were repeated with farmer involvement in the set up of the trials. In addition to these researcher trials farmer-managed trials were also set up.

The extent of involvement of farmers in the trials has been reasonably good and inculcated an element of pride.

### *What partnerships have been developed in the project?*

The project by design incorporated several partners each having a clearly defined role in project, expertise including grain storage specialists, entomologists, a social scientist, IPM specialists, extension personnel, pesticide registration officer and a marketing manager of a private chemical company.

Active partners in counterpart institutions include:

Natural Resources Institute: Food Marketing and Management Group (project leader) - UK

NRI Livelihoods and Environment Sustainability Group - UK

Ministry of Agriculture and Food Security: Plant Health Services - Tanzania

Tropical Pesticide Research Institute - Tanzania

University of Zimbabwe: Dept. Soil Science and Agricultural Engineering – Zimbabwe

Institute of Agricultural Engineering; Post Harvest Technology Division – Zimbabwe

Department of Agricultural Extension and Research – Zimbabwe

EcoMark Limited – Zimbabwe

Diatom Research Consulting - Canada



The NGO stakeholders vary in their activeness, in Shinyanga the stakeholders listed in the Project memorandum and reports have been active in workshop and visiting the researcher trial sites but not much more than that. In Babati, Farm Africa has been more involved in visiting the trial sites and were involved in helping the Tanzania MAFS to identify trial village, initially, and the Farm Africa Farmer Research Group in Arri village have been closely involved in the trials.

In Tanzania the extension workers at both the district and village level at all sites have been very active partners. Also since the operationalisation of the Post Harvest Management services of the Tanzanian MAFS in September last year, all three trial regions the zonal coordinators have been involved closely. Extension workers in Buhera (Zimbabwe) have also been actively involved in farmer identification and preparatory work for the forthcoming trials.

Working relationships and the team spirit that has formed between the core team members in the counterpart institutions is commendable.

*What is the potential for further development of the partnerships in the project within a context of a sustainable system for generation, production, dissemination, adaptation and use of project outputs?*

The involvement of the private sector interested in importing and marketing commercial DEs is a positive development that will ensure dissemination and promotion of the technology beyond the project. The agrochemical companies have a central role to play in the promotion and adoption process. However, the thrust from that sector will come once the products of interest are registered and available for marketing, and marketing strategies elaborated. Of course there is a profit motive here for the companies.

Other private sector opportunities exist in mining, processing, packaging and marketing of local deposits of DEs as grain protectants and other industrial uses. The project's findings would hopefully facilitate the engagement of the mining sector.

A public-private link ('smart' partnership) is a potential option for exploring future project related work. A public-private 'research proposal for funding is something that certain groups of stakeholders might develop along the lines of the *Cassava processing for SMEs (small to medium enterprises) in West Africa* – that includes the public sector (research institutes) and private sector players. This project could facilitate such a partnership.

*Does the project have a monitoring and evaluation system in place?*



Monitoring of the project is effected in a number of ways. Quarterly and annual reports which are part of the reporting and monitoring regimen of the CPHP are the 'external' monitoring requirements. 'Internal' monitoring and evaluation are complex processes and have been evolving as the project progresses (see below for details of process). Monitoring of the trial and evaluation of the experimental treatments were performed by farmers using their own criteria. Project outputs to date have been shared with a diverse range of stakeholders in a workshop setting, which is also an evaluation process.

What is the type, extent and effectiveness of the monitoring system in place?

If a monitoring and evaluation system is in place does it capture changes in relationships between the partners in the projects as well as delivery of outputs, processes used?

### Process review: Learning from experience

The processes of monitoring and evaluation (e.g. action-reflection cycles, feedback mechanisms) are essential if performance is to lead to the realisation of objectives. This aspect of the project is evolving and the team is fully cognisant that to learn from experiences it needs to actively monitor and review what is taking place, adjusting plans accordingly, and identifying lessons that might be of value in future. Together with project activities and outputs, the diagram in Box 1 includes 'performance monitoring' and a set of arrows to imply that they are iterative.

The following examines two general ways - logframe revisions and participatory monitoring and evaluation - by which the fit of current plans and activities to the overall challenge might be upgraded, and introduces current project thinking on the institutional context - research opportunities and process constraints.

### Logframe review and revisions

The project logframe, or logical framework, as its name suggests sets out the rationale behind the project. It identifies the long and medium term objectives, the project goal and purpose respectively, to which the project aspires; together with the short term objectives or outputs, which constitute the 'change' (in knowledge, practice etc) that will be achieved within the timeframe of the project. The outputs may be considered as that which is effected during the project's lifetime - the 'effect' of the project - whereas the purpose may be conceived as the 'impact' of the output changes, or its effect, over time. Although the outputs are conceived as being essential to the realisation of the purpose, its attainment, as reflected in the 'assumptions' column, is beyond the control of the project. With respect to purpose the assumptions column identifies risks and events in the external environment that might unduly influence the output to purpose design logic. From the project perspective, whereas the purpose is fixed (by CPHP), the realisation of both outputs and activities may be monitored (see Fig. 3)

Project design is an imperfect process, and reviewing and revising the logframe provides an opportunity for improvement. Moreover it provides both further opportunities for project partners to develop or extend their ownership of the project and a means to incorporate lessons learnt<sup>5</sup>.

Some (unilateral) suggestions as to lessons learnt and their possible implications for logframe outputs:

- Output 3: new thoughts on the complexity of 'user evaluation'<sup>6</sup> and greater clarity as to what can and cannot be done before registration and commercial up-take; registration timetables?

<sup>5</sup> Because the project memorandum, and specifically the outputs, constitutes the hub of the contract, changes to the logframe would require formal approval from the CPHP.

<sup>6</sup> The following change to Output 3 was mooted in an internal discussion paper (Methodology for engaging farmers - some thoughts; Mike Morris, July 2003): to develop a comprehensive understanding of the factors

- Output 4: timing for first draft extension materials for farmers currently premature and unrealistic; grain storage management workshop might be brought forward to end of 2004.
- Output 6: participating stakeholders should be expected to 'monitor and' evaluate project procedures (see Table 1 for definitions) i.e. the term 'monitoring' should be included, with the implication that the extended concept and use of PM&E will need elaboration (as is underway).

## Participatory monitoring and evaluation (PM&E)

PM&E is an approach that seeks to involve those stakeholders who actively contribute to or are directly affected by the project. There are some difficulties about the definition of PM&E stemming from the discourse that surrounds the use of these terms, the different experiences associated with their use, and from problems associated with the concepts of 'monitoring', 'evaluation' and 'participation'. Table 3 sets out some definitions of these terms. PM&E is an internally driven process, initiated and led by these project insiders (e.g. core team staff, collaborating groups, local people, other stakeholders).

**Table 2. Definitions of 'PM&E' as reported in Learning from Change: Issues and experiences in participatory monitoring and evaluation**

Concept	Definition/Features
Monitoring	Knowing where we are Observing change Regular on-going assessment Routine reflection Feedbacking
Evaluation	Reflection process to look back and foresee Assessment of achievements/impact over a longer period Learning from experience Valuing Performance review
Participation (in M&E)	Shared learning Democratic process Joint decision-making Co-ownership Mutual respect Empowerment

Although PM&E is not referred to using that specific term in the project logframe, three of the six project outputs involve *participatory evaluation*:

**Output 6:** Project procedures evaluated throughout the project cycle, using participatory processes to capture different stakeholders' perspectives.

**Output 3:** User acceptability of diatomaceous earths in terms of efficacy, cost, application method, taste, cooking and brewing characteristics of DE treated stored grain evaluated.

**Output 1:** Methods for the protection of grain against damage by *P. truncatus* and other storage pests using commercially available DEs optimised. **Activity 1.2** relates to farmer evaluation of the different grain protection treatments at the end of each season.

Moreover other project activities (e.g. Grain Storage Stakeholder Workshop, Shinyanga, November '02) have served as mechanism through which stakeholders can reflect and feedback on project activities to project staff.

Four basic stages are typically involved in establishing a PM&E process:

used by different groups to assess grain storage protectants and to assess the DE technology against a subset of these factors using a farmer-participatory approach.

- Planning the framework for the PM&E process, and determining objectives and indicators
- Gathering data
- Analysing and using data by taking action
- Documenting, reporting and sharing information

As above plans for the PM&E components are outlined in the project memorandum, which drew on the involvement of a number of different stakeholders during an initial planning phase. PM&E typically involves significant front-end transaction costs associated with engaging stakeholders, as well as longer-term resource requirements relating to capacity building. In this case additional funds were provided by the CPHP (A1027) expressly for the collaborative development of the PM with Tanzanian colleagues. Expanding objectives and identifying specific indicators<sup>7</sup> were left however to be developed as and when the respective output activities are initiated, and are the subject of on-going discussions.

**Output 1:** Indicators for Activity 1.2 have been identified by farmers' groups differentiated according to wealth in the 5 village sites, and also at one of these sites, according to gender. The data have been collected and initial analysis undertaken.

**Output 3** awaits the conclusion of the debate on group identity selection (see section 'recognising farmer diversity'), however gender will be treated as a cross-cutting issue.

**Output 6**, which refers to an annual evaluation by the different groups of stakeholders and the taking of any necessary action, is also under development. The diversity of stakeholders and their differing degrees of involvement however, means that feedback (two-way) and responsive actions tend to be negotiated independently at the different locations, and in line with the activities timetable. A stakeholder monitoring table and framework have been drafted to ensure compliance with the logframe activities and outputs, while a monitoring mechanisms<sup>8</sup> has been elaborated within the team, albeit as yet confined to sub-groups, to further address process issues. Specifically the mechanism is intended to enable constraints within and between partner organisations to be raised, and their accommodation to be facilitated through negotiation. Documenting and reporting of the process It is intended that inter-location visits for all team members will be effected at some point, to benefit from optimal sharing.

Benefits to date from the above processes have included:

- Improvements to planning and implementation, through
- Provision of timely, reliable, and 'experiential' information (both within project team and from stakeholder partners).
- Consolidation of understanding of the project's objectives amongst staff and project stakeholders.
- Reinforced partnerships and extended sense of local ownership over project.
- Enhanced local learning, management capacity and skills (e.g. Mr Mugara's computer skills)
- Organisational strengthening and institutional learning (e.g. through working as partners in multi-agency interdisciplinary team, developing communication strategies, exposure to the socio-economic and institutional analyses, exposure to research processes and new technology).
- Advance alert for local farmers and extension staff of the possibility of DEs as an alternative storage protectant option.
- Revealing the importance of diverse institutions (e.g. differing organisational capacities, policy and political shifts and implications for ministry staffing, registration processes, commercialisation aspects etc.) in facilitating and/or constraining implementation and realisation of project objectives.

## ASSUMPTIONS

<sup>7</sup> PM&E guidelines for the selection of indicators (with social development rather than technology projects in mind) suggest they might be 'SMART' (specific, measurable, action-orientated, relevant, time-bound) or 'SPICED' (subjective, participatory, interpreted, communicable, empowering, disaggregated).

<sup>8</sup> The November '02 Tengeru model: facilitative rather than top-down approach; participatory agenda setting; adequate time; all issues valid; negotiated grouping and weighting of issues; active discussion, diagramming etc, but emphasis on compromise solutions if all relevant parties present; closure by consent.

*What is your assessment of constraints to the project?*

**Tanzania**

An initial constraint had been the delay between submission of the proposal in November 2001 and the absence of any communication from CPHP between then and June 2002 causing great planning difficulties and uncertainties with regard to the storage season activities due to commence in May 2002 for set up in July/August 2002 in Tanzania.

The restructuring of MAFS led to the transfer (and promotion) of Mr Mathias (a central player in the development of the project since August 2001) from the Plant Health Services to Post Harvest Management in September 2002, and his removal from the active project team. In the longer run this latter switch had effectively established a broader interface between MAFS and the project, but initially imposed significant constraints on the earlier implementation of the trial of the trials and an unexpectedly increased need for training of new project team members who had less experience with field work, research trials and grain protection. It was thought now however that the team is strong enough to resistant and inadvertent "destabilisation".

At the start of the project there appeared to be a number of barriers to the registration process of DEs in Tanzania and TPRI, the registration authority seemed somewhat remote with limited interest in the project. TPRI personnel are now more actively involved in the project activities – Dr Kaoeneka of TPRI was involved both in farmer assessment of grain quality, and most recently (August 2003) in setting up the first farmer-managed trials in Babati - and the registration process and requirements are much clearer. An early favourable outcome has also been further advanced by the appointment of a more dynamic director at TPRI.

The initial challenges faced in obtaining samples of raw DEs have been overcome after visits to the Ministry of Mining and Energy. There has been a recent change in interest by the Ministry since the project had awakened their interest in DEs not only for grain protection but also for other uses such as filtration. The ministry has promised a dedicated officer to interface with the project.

A constraint on operations in year two might be the fact that in Tanzania, three agro-ecological zones/farming systems are being covered in replicated trials, with the addition of farmer replicated trials (5 sites in total) which may create bottlenecks in the analysis of samples (insect counts, damage assessments).

Project members anticipate some challenges in switching from research-focused approach associated with the researcher-managed trials to a farmer-centric approach required for the farmer-managed trials and for the exploration of disaggregated farmers' information networks. These will take the form of ensuring the time to train, and develop the respective methodologies with the sub-teams in the different regions – a process which is already under way. Social and institutional challenges in realising the farmer decision-making (user acceptability) output are much more complicated than testing of the DEs themselves and would suggest maintaining a larger, diverse sampling framework (e.g. more villages in more diverse



areas). But there will have to be a compromise around resources –time, skills, and capacity etc. A number of changes will be necessary to deliver this output; there will have to be a measure of re-orientation of existing local staff practices (e.g. training inputs), promoting farmer awareness of this phase of the project will be required, ensuring gender capabilities (e.g. the Shinyanga team is presently all male). These and associated constraints suggest that the team at least re-considers whether to continue to split their resources (for this output) between the 3 locations (it has already been recognised that setting up ‘farmers’ trials at the 5 villages too much) for the farmer trial.

The social scientist in the team would arguably, need more time from NRI and/or a local counterpart may be necessary.

### **Zimbabwe:**

There have been enormous constraints being faced by the project in Zimbabwe. These included the absence of systems for transferring funds from UK to Zimbabwe, related to the banking and exchange rate problems, difficulty with working with rural communities where many were struggling to survive and logistical issues. Hyper-inflation and dramatically fluctuating exchange rates have made project financial management very difficult. The critical fuel shortage and food security situation in Binga has meant a curtailment of activities in that area. However, preparatory progress has been made in setting up of trials in Buhera and the Institute of Agricultural Engineering, near Harare, which are scheduled for end August/September 2003. The current situation in Zimbabwe has caused considerable constraints to planned project activities despite the team member's best efforts. In the current project there was no need to repeat researcher efficacy trials and work has/will focus on assessing local deposits, the temporary registration of the DE, Protect-It as a grain protectant and further farmer-managed acceptability trials, but the success of this is dependent on successful completion of the temporary registration process, as no Protect-It treated grain can be consumed until the product is registered as a grain protectant. It was anticipated by the registrant (EcoMark) that approval would be granted within four months (application submitted in March 2003). Representations are on-going to facilitate speedy approval of the registration application. There is no evidence that the application will be rejected, given that the product is registered and extensively used in several countries worldwide.

Two team members (Mr Chigariro and Mr Mudiwa) are no longer available for project activities due to their movement to other jobs.

### **Management**

There appears to have been some difficulties at the project/CPHP interface. Initially the project had been submitted as a three year project proposal. The CPHP eventually issued an initial contract for 1 year only saying that the project would be reviewed after a year to see it should continue. The date for the review then slipped from February to August 2003, with nominal termination date now being September 30<sup>th</sup>. The project has planned beyond that date – up until March 2005 –but await outcome of this review. These factors do make it difficult to plan and make commitments to stakeholders when there is much uncertainty.



There have been difficulties in forwarding funds to Zimbabwe to Dr Mvumi, due to bureaucracies in the University of Zimbabwe's accounts department, and difficulties in opening a foreign currency account for the project. A local currency account for the project is not recommended due to fluctuating exchange rates (note: 3-4 fold higher rates than official bank rates are realised on the 'parallel market'). It is recommended that funds for Dr Mvumi's project activities should be transferred into CPHP's impress account to facilitate access.

Project members have requested feed back on quarterly and annual reports.

## CONCLUDING REMARKS or GENERAL ASSESSMENT?

The project has made satisfactory progress in the past year and a significant amount of **scientific information** has been gathered on the efficacy of DEs in the African environment.

Much effort is being put to scaling up, effected through **dissemination** of the project's findings (**Output 4**) to intermediate and end-users, and by their **promotion** (**Output 5**). Both are strategic activities that need to be consolidated in the forthcoming year. Implementation of the project's communication strategy is underpinned by various approaches adopted by the project since inception.

The project is facing new demands on the team's capacity and capabilities. With one year of researcher-managed trials under its belt the project is entering a new phase. The former emphasis on good science would now require complimenting with equal emphasis on **social and institutional** aspects relating to the mainline role of farmers in the project and to greater engagement of the private sector.

**This project has made much progress and funding for the completion of the project is *unreservedly recommended*.**

## RECOMMENDATIONS

1. The regional workshop scheduled for early 2005 should be **rescheduled** to the end of 2004 and not in March 2005 as indicated in the PMR.
2. There are opportunities in developing public-private-partnerships (P-P-P) beyond the project span in the exploitation of local DE deposits. These **opportunities need to be explored** and the project takes a facilitating role in future P-P-P research proposals.
3. While approval is awaited for the registration of the DE Protect-It in Zimbabwe, its **registration could be initiated in Zambia** as well, where the Larger Grain Borer already exists, using existing and data generated by the project. In the event that registration in Zimbabwe is delayed beyond the expected date, concurrent and complementary organoleptic assessments and user acceptability studies could be performed there. This initiative could be supported by EcoMark. The company has operations and

- marketing infrastructure in Zambia and 'fast-track' registration mechanisms exist.
4. There is need for preliminary **economic analyses** of the technology to be performed.
  5. There is now need to bring into the project a **local social development specialist** given that the focus is moving from pure science to social and institutional analyses.
  6. Given the current/future constraints which relate to the switch in emphasis from a technology focused approach (e.g. output 1 – researcher-managed trials) to a more farmer–centric approach, **training the sub-teams** in the first place and then together **developing the methodology** is required.
  7. Consideration of some measure of **rationalisation** or compromise for the farmer trials to optimise the quality and potential impact of the work may be necessary. Sampling and analysis of the large number of samples from both researcher- and farmer-managed trials may result in processing **bottlenecks**. The frequency of sampling in the trials could be reduced without affecting the quality of the data.
  8. Given that Larger Grain Borer populations were low at all sites in the first season's trials (note the sporadic nature of LGB from year to year), **observational trials** of selected treatments should be set up on-station (e.g. IPM compound in Shinyanga) with *artificial* LGB infestations, in the event that LGB pressure is low again this year. The situation however, should be monitored, and such trials set up only if necessary 4-5 months into the trial as the exponential phase of insect population increase and damage tends to occur at this stage.
  9. **Given the positive achievements of the project to date and the potential to contribute to the overall objectives of the regional strategy IT IS RECOMMENDED THAT THE PROJECT BE EXTENDED FOR A FURTHER PERIOD.**

Completed by

Denash P. GIGA

Date: 15<sup>th</sup> August 2003

## **TERMS OF REFERENCE - PROJECT R8179 REVIEW**

### **Preamble**

The Crop Post-Harvest Programme (CPHP) funds 6 and & projects in East and Southern Africa Regions that contribute to its aim of ‘improving the productivity and productive potential of post harvest crop systems in developing countries, through the reduction of losses and the development of storage, processing and marketing innovations.’ The Inert Dust Phase 2 Project R8179 is being implemented in East (Tanzania) and Southern Africa (Zimbabwe) regions. The CPHP periodically conducts reviews of projects and advises on progress, relevancy of the outputs and makes recommendations/suggestions on increasing effectiveness and efficiency of the project.

### **General Objective of the Review**

This review is required in order to provide recommendations to the CPHP management and Project R8179 on developing an approach and set of activities for implementation within the framework of an innovation systems approach if the project is extended for another 12 months. The reviewer is expected to assess the level of attainment of the project outputs and potential for attaining the purpose.

### **Specific Terms of reference**

The consultant is expected to provide professional inputs and advice with respect to the following:

- Assess the performance of the project against what was set out in the project Memorandum, with specific emphasis on the level of attainment of the agreed deliverables
- Assess potential uptake and sustainability of project outputs beyond the life of the project
- Assess partnerships developed/potential to develop partnerships by the project within the context of a sustainable innovation system through which the poor people can at all times be integral components of local systems that generate, promote and sustain relevant post-harvest innovations.
- Make recommendations on whether the project should be terminated or extended based on assessment of the projects potential to contribute to the overall objectives of the Regional Strategy.
- Suggest an action plan to ensure incorporation of the recommendations.