



# Small-scale farmer utilisation of diatomaceous earths during storage

## Review Workshop

Report of a Workshop organised by the Plant Health Services and the Natural Resources Institute (UK) to facilitate the Crop Post Harvest Programme review, held on the 6th August 2003, at the IPM Project Compound, Shinyanga, Tanzania



# Table of Contents

	Acronyms and Abbreviations.....	ii
I.	Introduction and workshop rationale .....	1
	Workshop design.....	2
II.	Workshop programme .....	3
	Workshop hosted for the CPHP Reviewer, Professor Denash P. Giga .....	3
III.	Welcoming, introductions and workshop objectives.....	4
IV.	Project overview from the Natural Resources Institute’s perspective .....	4
	Presented by Ms Tanya Stathers, Project Leader (NRI) .....	4
V.	Project overview from the Plant Health Services’ perspective .....	7
	Presentation by Mr William Riwa, National Team Leader (PHS).....	7
VI.	Presentations: Progress against outputs.....	9
VIa.	First season storage trials (Activity 1.1) .....	9
	Presentation by Ms Stathers and Mr Riwa .....	9
VIb.	Farmers’ evaluation (Activity 1.2) .....	15
	Presentation by Mr Kitandu, IPM Technology Development Officer and Ms Stathers.....	15
VIc.	Preparation for the 2 <sup>nd</sup> storage season .....	20
	Presentation by Ms Stathers .....	20
VI d.	Zimbabwe up-date .....	20
	Presentation by Ms Stathers .....	20
VIe.	Communication strategy: The challenge of scaling up.....	21
	Presentation by Mr Morris (NRI).....	21
VII	Tasks at hand .....	24
	Window on different activities currently under discussion .....	24
VIII	Process review: Learning from experience .....	26
	Presented by Mr Morris .....	26
IX	The future outlook.....	31
	Outstanding activities and outputs: Ms Stathers.....	31
	Beyond the project .....	31
X.	Discussion, question and answer session.....	32
XI.	Closing remarks.....	33
	Appendix I. Workshop participants and contact details.....	36
	Appendix II. Recognising farmer diversity, mainlining and optimising their different inputs.....	37
	Appendix III. Storage stakeholder questionnaire - Draft 1 .....	40

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Cover photograph: Workshop participants including (right to left) the national coordinator, project leader, project reviewer, and stakeholders from intermediate organisations

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## Acronyms and Abbreviations

AKIS	Agricultural Knowledge and Information System
AEC	Actellic EC
ASD	Actellic Super Dust
ASDS	Agricultural Sector Development Strategy
ASDP	Agricultural Sector Development Programme
CBO	Community-based organisation
CPHP	Crop Post-Harvest Programme
DEs	Diatomaceous earths
DFID	Department for International Development (UK)
Dryacide®	Commercial diatomaceous earth sold by Dryacide
Dumuzi	Large grain borer, <i>Prostephanus truncatus</i>
EC	emulsifiable concentrate
Godown	Village/communal warehouse
HH	Household
IPM	Integrated Pest Management
Kihenge	Locally made storage basket (plural: vihenge)
LGB	Large grain borer, <i>Prostephanus truncatus</i>
MAFS	Ministry of Agriculture and Food Security
MME	Ministry of Minerals and Energy
NGO	Non governmental organisation
NPPC	National Plant Protection Committee
NRI	Natural Resources Institute
Output/s	The changes (e.g. knowledge, practices) to be effected by the project
PHS	Plant Health Services
Protect-It®	Commercial diatomaceous earth sold by Hedley Technologies Inc.
PRSP	Poverty Reduction Strategy Paper
SMEs	Small to medium enterprises
TPRI	Tropical Pesticides Research Institute
UZ	University of Zimbabwe
VEO	Village extension officer / bwana shamba

# I. Introduction and workshop rationale

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). 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 however issued in June 2002 and for an initial period of one year, with future activities to be determined by a programme review scheduled after this period. Given the three year timeframe, the project team would anticipate delivering the following six **outputs**:

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.
2. Several different sub-Saharan African deposits of DEs evaluated against storage insect pests and assessed for their potential use as grain protectants.
3. Evaluation of user/farmer acceptability of DEs, in terms of efficacy, cost, application method, taste, cooking and brewing characteristics.
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.
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.
6. Project procedures evaluated throughout the project cycle, using participatory processes to capture different stakeholders' perspectives.

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 will now play an active role in future activities.

The work commenced in July 2002 at the beginning of the 2002/03 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 agro-ecologies), 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. The farmers' assessments of treated stored grains corroborate these findings.

To facilitate implementation, improve dissemination and promotion (outputs 4 & 5), and ultimately uptake, the project continues to seek the active engagement 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 play a central role in farmer-managed trials (Activity 3.4) at the different trial sites. Moreover the team will work with farmers' groups, disaggregated according to existing technology use and gender, to explore differences in their respective communication networks.

The exploration of local DEs - Output 2 - has also been advanced. The Tanzanian Ministry of Minerals and Energy (MME) 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 MME has recently promised to designate an officer to interface with the project.

It was agreed that the project review required by the CPHP would take place early in August 2003 when the project team would be setting up the second storage season trials. Accordingly the reviewer appointed by the CPHP, Professor Denash Giga (formerly of the University of Zimbabwe), joined the project leader, Ms Tanya Stathers (NRI), the national team leader, Mr William Riwa (MAFS), Shinyanga team members, Mr Kitandu, Mr Kolowa and Mr (Tyson) Ngoye, and the social and institutional development advisor, Mr Mike Morris (NRI), in Shinyanga, from 4<sup>th</sup> - 8<sup>th</sup> August 2003.

This report is a record of the workshop organised by the Plant Health Services and the Natural Resources Institute (UK) to facilitate the Crop Post Harvest Programme review. The workshop was held on the 6th August 2002 at the IPM Project Compound, Shinyanga, Tanzania.

## Workshop design

Mr William Riwa (Plant Health Services), Mr Lazaro Kitandu (IPM Technology Development & Liaison Officer, Shinyanga) and Mr Mike Morris, the social and institutional development advisor, met the preceding week to discuss and plan the programme for Professor Giga's visit.

Earlier communications from the regional CPHP office with respect to the review, while agreeing to the suggestion that the reviewer accompany the team in the setting up of the second season's storage trials in Shinyanga, had not provided terms of reference for the review or indicated any specific operational requirements. In the absence of more specific directives for the visit<sup>1</sup>, the 'design' team discussed the possibility of incorporating a 'review' workshop into the programme to facilitate the breadth of enquiry that it was anticipated the reviewer might seek.

Brainstorming was used to identify the objective for the proposed workshop - to provide the fullest opportunity for the reviewer to undertake his task - and to identify and develop potential items for inclusion. The outcomes would include not only meeting the (unknown) requirements of the reviewer, but also presenting the achievements of the project in terms of both product and process, in a comprehensive manner, and using the opportunity to identify and learn from shortcomings. It thus became clear that the workshop offered a means for the project to capitalise on the review process (irrespective of its outcome), and the proposal was formally agreed with the project leader. Key items and issues identified for inclusion in the workshop were:

- Display of materials (e.g. reports, newsletters, posters, flyer, DEs, ASD)
- Project overviews from both the Tanzanian and NRI perspective
- Presentations / progress reports on the respective activity sets for all 6 outputs
- Summary of current activities to indicate 'business-in-hand' and provide (team) an opportunity for clarification, on-going planning etc.
- Demonstration of project approach to managing process (e.g. incorporating learning, identifying and addressing institutional constraints)
- Future outlook: outputs/deliverables and with respect to realisation of purpose
- Integrated and discrete Q&A sessions

In addition to the team members from partner agencies it was also thought that it would be desirable to invite a cross-section of stakeholders to take part in the workshop and provide the reviewer with further diverse perspectives on the project's progress. It was agreed that key stakeholders from organisations representing public, private and voluntary sector interests might be invited, but that Professor Giga's approval would first be sought. The following organisations were identified and subsequently - the day before - invited to send representatives to the workshop:

- Regional administration (Mrs Mashaka, Regional Agricultural Advisor)
- District administration (Mr Pius Karega, Plant Protection Officer)
- Municipal council (Mrs Levira, Municipal Plant Protection Office)
- Private Stockists (Mr Mfanga & Mr Dickson)
- Agricultural Programme (Mrs Kamaya)
- World Vision (Mr Kuhanda)

Opportunities for Professor Giga to hear directly from farmers about their experiences of the project to date were programmed for the Monday, Tuesday and Thursday at the two villages in Shinyanga Rural and Kishapu districts. The villages are at some distance from Shinyanga town.

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<sup>1</sup> A further e-mail request for the terms of reference of the review was sent to the coordinator of the Southern African CPHP by the design team, but no response was received.

## II. Workshop programme

### Workshop hosted for the CPHP Reviewer, Professor Denash P. Giga

Wednesday 6<sup>th</sup> August 9.00 - 3.30, IPM Project Compound  
 Host: IPM Project, Shinyanga; Moderator: Mr William Riwa

Period	Activity/Topic	Presenter
9.00 - 9.30	Welcoming Introduction of team Introduction/TOR of reviewer Host introduces proposed agenda, invites revisions etc	Mr Riwa (National Leader) Ms Stathers (Project Leader) Professor Giga Mr Riwa
9.30 - 9.50	Project overview from project leader's / NRI perspective	Ms Stathers
	Project overview from national leader's perspective	Mr Riwa
9.50 - 10.10	Tea	
10.10 - 11.20	Presentations: Progress against Outputs (each 10 minutes plus 5 min. time for questions, clarification) <ul style="list-style-type: none"> <li>• 1st season storage trials</li> <li>• Farmers evaluation</li> <li>• Preparation for 2<sup>nd</sup> storage season</li> <li>• Zimbabwe up-date</li> <li>• Communication strategy: scaling up</li> </ul>	Ms Stathers & Mr Riwa Ms Stathers & Mr Kitandu Ms Stathers & Mr Riwa Ms Stathers Mr Morris
11.20 - 12.30	Tasks at hand <ul style="list-style-type: none"> <li>- Finalising 2nd issue of newsletter</li> <li>- Analysis of outputs</li> <li>- PM&amp;E review</li> <li>- dev. &amp; pre-testing of intermediate stakeholder questionnaire</li> <li>- dev. of group identity types selection</li> <li>- dev. of tools to learn about different farmers' information contexts</li> <li>- dev. of extension material</li> <li>- etc.</li> </ul>	Moderator Mr Kitandu to elaborate on newsletter development.  Brief comments, calls for clarification etc. on other tasks by those present
12.30 - 2.00	Lunch	
2.00 - 2.30	Process review: learning from experience	Mr Morris
2.30 - 3.00	Future outlook: <ul style="list-style-type: none"> <li>• Outstanding activities &amp; outputs</li> <li>• Beyond project: outputs to purpose</li> </ul>	Ms Stathers Mr Riwa
3.00 - 3.30	Discussions - Q & A	Professor Giga & others present
3.30 - 3.40	Closing remarks & logistics	Mr Riwa

### **III. Welcoming, introductions and workshop objectives**

Mr Riwa, the national project leader and moderator for the workshop, greeted Professor Giga, and the participants and welcomed them to IPM project compound on behalf of the Ministry of Agriculture and Food Security and on behalf of the Zonal IPM Programme and its coordinator, Mr Katua, who was unfortunately obliged to be absent. He thanked everyone for attending the project workshop, apologising for the very short notice afforded to non-team stakeholders, and explained that the workshop had been called to facilitate Professor Giga's review of the 'Small-scale farmer utilisation of diatomaceous earths during storage' project. He then requested the project leader, Ms Stathers, to make introductions on behalf of the team.

Ms Stathers greeted the guest and participants, introduced team members and invited the other stakeholders to introduce themselves.

Mr Riwa then invited Professor Giga to address the workshop.

Professor Giga introduced himself and explained his role as a reviewer for the CPHP. His task had five main components:

- To assess project performance, levels of attainment, against the project measurables set out in the project memorandum.
- To assess the potential uptake and sustainability of the project
- To assess the development and strengthening of partnerships and the potential for on-going partnership development.
- To recommend to the CPHP whether the project should be terminated or extended.
- To establish an action plan incorporating and facilitating the reviewer's recommendations.

Mr Riwa thanked Professor Giga for his introduction and for the openness and flexibility that he had shown since his arrival in Shinyanga.

The moderator asked for any comments or additions to the agenda. Mr Morris pointed out that the 'progress against output' session did not as written include any reference to Output 2 which refers to an evaluation of local DE deposits as storage insect pests and their potential use as grain protectants. It was agreed that the project leader and/or team would also cover this issue.

Introductions having been made, the moderator invited the project leader to initiate the next session by presenting an overview of the project from the Natural Resources Institute's perspective.

### **IV. Project overview from the Natural Resources Institute's perspective**

#### **Presented by Ms Tanya Stathers, Project Leader (NRI)**

Ms Stathers referred to the project's title and the fact that most of the stakeholders present were familiar with the project and its objectives, as they had been involved in developing the project at the initial workshop in August 2001. Since then many of them had attended the stakeholder workshop, visited the trial sites, had received the project newsletter and liaised regularly with the IPM team in Shinyanga. She then apologised in advance for the likely use of abbreviations such as 'DE' for diatomaceous earths during the workshop and requested that if participants heard abbreviations they were not familiar with during the course of the workshop they ask for explanations. Ms Stathers then reminded participants that the project was funded by the UK's Department for International Development (DFID) through its Crop Post Harvest Programme (CPHP).

To ensure that all participants were familiar with the project and could follow the workshop presentations and discussions, Ms Stathers gave a brief explanation about DEs. Explaining that DEs were formed when microscopic unicellular organisms called diatoms which are found in both fresh and salt waters, died and sank down to form a sedimentary layer, that over many centuries builds up in thickness, and becomes compressed and fossilised into a soft, chalky rock called diatomite. This

layer of rock can be mined and ground to produce a dust (diatomaceous earth) which resembles talcum powder (at this point samples of both raw diatomite and diatomaceous earth were passed around the participants). Diatomaceous earths are composed mainly of amorphous hydrated silica and other minerals.

The secret to DEs acting as insecticides is their porosity. When DEs are mixed with grain, any insects that crawl into the grain come into contact with the DEs. The DEs absorb the wax and oils from the insects' cuticles, effectively removing their waterproofing and causing them to dehydrate and die. This physical mode of action is very different from that of synthetic chemical grain protectants. This mode of action means that DEs are particularly suitable for control of small insects (with a large surface area to volume ratio), and insects that feed on dry products such as those that attack stored commodities. The use of DEs in pest control is not new, observations of birds and mammals taking dust baths to rid themselves of mites and parasites is believed to have led the Chinese to start using diatomaceous earths in pest control more than 4000 years ago.

The two commercial DEs the project has been working with are Protect-It® and Dryacide® which both originate from USA. However the project is also exploring the efficacy of local deposits of DE in sub-Saharan Africa.

DEs are also widely used industrially: in filters to help clarify fruit juices, beers, wines, pharmaceuticals etc; as fillers in paints, plastics and asphalt; and in toothpaste and baby food.

The project was developed in response to farmers' demands throughout sub-Saharan Africa for alternative methods of grain protection to the use of organo-phosphate based insecticides. The project's design ensures that farmers and consumers are involved in evaluating the acceptability of DEs as alternative grain protectants in small-scale storage systems. Some commercial DEs are already registered for use as grain protectants in several countries including Australia, Brazil, Canada, Croatia, China, Germany, Indonesia, Japan, Philippines, Saudi Arabia, United Arab Emirates and the USA where they are used in large-scale storage systems. The earlier project (R 7034) in Zimbabwe was the first piece of work to assess the efficacy and acceptability of DEs in small-scale on-farm tropical storage systems (which included maize, sorghum and cowpeas). The success of the work in Zimbabwe, led to discussions between the Tanzanian Ministry of Agriculture and Food Security and the UK's Natural Resources Institute staff and the development of the current project. It is important to mention that LGB is not present in Zimbabwe and so the trials there did not assess the efficacy of DEs against LGB. The Tanzanian field trials build on information generated in the laboratory at NRI as to the DE application rates and combinations required to reduce LGB populations. The field trials are very different to laboratory trials in that mixed populations of insects are present, the climatic conditions alter significantly during the storage season, the scale is much larger, insects may be repelled by the DEs and therefore not attack DE treated grain (in comparison to the lab where they are trapped in the DE treated grain jar etc). It is for these reasons that field trials are needed to generate realistic information about DE performance in tropical small-scale storage systems and about their acceptability to end users.

## Discussion

**Mr Riwa** indicated that it was always essential that the project align itself with the law, and in particular the Plant Protection Act (1997), which was an inevitable brake on progress. To overcome this constraint it was necessary that the relevant authorities be kept well briefed on project developments, and the project had made good progress in this regard (e.g. with the Tropical Pesticides Research Institute, the Ministry of Minerals and Energy).

**Prof. Giga** pointed out that contrary to claims based on laboratory work that DEs would not work well in humid areas, fieldwork undertaken in Zimbabwe demonstrated them to be efficacious under both dry and more humid conditions. He hoped the choice of different agro-ecological sites in Tanzania would lend further insight into this debate. Expecting them to work, say in the humid conditions of DSM, would however be too much.

**Mr Kolowa** (IPM post harvest officer) asked how the Tanzanian deposits compared to those in Zimbabwe.

**Ms Stathers** explained it was important to have pure samples for testing, and that we were using a Canadian organisation to carry out the test which included pH analysis, particle size, and tapped density. More than a million species of diatoms are recognised and it is more than likely that the deposits in Zimbabwe and Tanzania differ in their diatom species composition. Some fossilised

diatom species may be more effective at killing insects than others. Thus reinforcing the need to study raw diatom deposits before making any blanket recommendations. However, no large difference in the efficacy of the different raw African DE samples had been observed during laboratory bioassay studies at NRI. Both Zimbabwean and Tanzanian samples reduced *Sitophilus zeamais* (the maize weevil) offspring production by 80 percent.

DEs are very variable and it is important to know more about where they come from and what their efficacy against the major storage pest species is like.

**Mr Riwa:** When visiting the Ministry of Minerals and Energy in Dodoma, he had been struck by the difference between samples from Singida and those from Kagera. He reinforced the need for precise information on the origins of DEs and on their particular qualities.

**Mr Mfanga** (local stockist) asked whether the trials had included DEs from these different local deposits.

**Ms Stathers** explained that small laboratory studies had been undertaken on some African deposits, and that these studies were carried out over a 7 week period to test and compare the DEs effect on the mortality and offspring production of the insect pest *Sitophilus zeamais*

Samples from Kagera have now been included in the Mlali village trials (Dodoma). People in the ministry (Minerals and Energy) in Dodoma are now getting very excited about the use of DEs, and we hope to learn much in the coming years.

**Mr Riwa** confirmed this growing interest, contrasting his first visit to the ministry, when only a small DE sample was available, with a more recent visit, when not only were sacks of DEs in evidence but a number of people there were eager to know more about the potential of DEs for grain storage protection and filters. Moreover the ministry promised to designate an individual staff member to formally interface with the project.

**Mr Mfanga** asked for more information about local DEs.

**Ms Stathers:** Material from the Singida deposits has proven to be very impure with relatively little diatomite. Kagera deposits are much purer and seem to work well as grain protectants. We were still experiencing difficulties in obtaining samples from the Dodoma deposit (Bahi). The Ministry of Minerals and Energy is not optimistic about the quality of the DE deposits in Bahi.

**Mr Riwa** indicated that as per the project memorandum we were generating information now to stimulate interest amongst other stakeholders who would have a more central role in developing these local deposits. This was a valid and good use of resources.

**Ms Stathers** confirmed that the project had met with a significant response from the private sector.

**Mr Riwa** referred to his experiences during post-harvest training exercises when he discussed DEs. He had been asked whether other powders might work as grain protectants - talcum powder for instance?

**Prof. Giga** suggested that lime too might be considered as it is widely used by small-scale farmers for grain protection. On the issue of making use of the natural deposits, he foresaw a number of challenges, including the need for the development of local / cottage industries to mine and process the deposits, and the need for quality assurance regarding the DEs' efficacy. The project's findings would hopefully facilitate the engagement of the mining sector, which of course operates for profit.

**Mr Morris** referred to a research project in West Africa with which he is working - *cassava processing for SMEs (small to medium enterprises)* - that included public sector (research) and private sector players. Moreover the project involved funds for the private sector partner to rent buildings and purchase processing equipment to trial processing developments. The project is funded by the European Union. He wondered whether key stakeholders in Tanzania should not be thinking about a similar proposal to build on the work of the project.

**Mr Kolowa** asked Professor Giga if following the DE trials in Zimbabwe that had commenced in 1997, whether DEs were now in use there?

**Prof. Giga** replied that Protect-It® was in the process of securing temporary registration. He suggested that "the flame had been lit" in Zimbabwe. There was a company, ZimPhos, which was very interested in mining raw DEs for various purposes and key staff including marketing and

technical personnel were actively discussing the way ahead. The existence of a subsidiary mining company should ease the operationalisation of any emerging plans.

**Mr Mfanga** asked what Zimbabwe farmers were using before DEs?

**Prof. Giga** sought to clarify the point that DEs were not as yet available.

**Mr Kolowa** wanted to know what work had been done on the possible price of DEs.

**Ms Stathers** referred to work that had been done with the private sector in Zimbabwe between 1999 and 2000, which predicted that commercial DEs brought in from the United States (including freight and import duty) would be available at a price similar to that of Actellic Super dust (ASD).

**Prof. Giga** suggested that interest in Zimbabwe by both ZimPhos and EcoMark would eventually lead to competition between marketing of local DEs and imported DEs.

**Mr Kolowa** mentioned that two different protectants were currently on the market here, ASD and Stocal Super Dust, of which the latter was slightly more expensive. Concerns about the effectiveness (or product integrity) of ASD meant that some farmers were happy to pay more for a reliable product. Mr Amon Mduma of World Vision joined the workshop, and after his introduction, the moderator suggested we return to the programme.

## **V. Project overview from the Plant Health Services' perspective**

### **Presentation by Mr William Riwa, National Team Leader (PHS)**

Having discovered that Professor Giga was reasonably familiar with Tanzania, Mr Riwa felt that aspects of his earlier notes were redundant.

He wished first to acknowledge the role played by the CPHP in supporting many projects over many years and wanted to put on record his thanks to the CPHP and the British government (DFID).

He spoke about the overriding importance of agriculture in the lives of the majority in Tanzania, indicating that food security was the bottom-line. All too familiar factors - the weather, limiting infrastructure, technology constraints, market trends etc. - conspired to ensure that there was never food in plenty.

A main component of the Government's strategy to address poverty was the Poverty Reduction Strategy Paper<sup>2</sup> (PRSP) process, and the Agricultural Sector Development Strategy (ASDS) was in alignment with the overarching PRSP initiative.

Of most relevance to Plant Health Services, is the prioritisation of reducing crop losses specified in the Agricultural Sector Development Programme (ADSP). Losses both pre- and post harvest are estimated to be of the order of 30-40%, while damage from the Large Grain Borer (LGB) can run far higher.

Integrated Pest Management (IPM) is the acknowledged approach to pest management in the Agricultural and Livestock Policy (1997). IPM integrates different technologies and practices to optimise their effect and benefits. In the context of PHS these include biological controls (pre- and post harvest), the use of botanicals, incorporating cultural considerations, selective and judicious use of pesticides.

DEs are therefore suited to the IPM approach. Here in Shinyanga, where we have this IPM centre of expertise, the project is afforded an excellent opportunity to benefit from the breadth of IPM experience shared by staff.

With respect to the future of this work, the Plant Protection Act (enacted in 1997 but only operational from 2001) provides the mandate and spells out both the institutions and the processes to be followed.

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<sup>2</sup> A medium term strategy for poverty reduction, complementing other government policy initiatives (i.e. Vision 2050, National Poverty Eradication Strategy, Tanzanian Assistance Strategy) and developed through broad consultation and with national and international stakeholders, in the context of the Highly Indebted Poor Countries (HIPC) Initiative

(Ms Stathers requested Mr Riwa to inform the workshop about the LGB coping strategy workshop which led to this project.)

LGB was first reported in Tanzania during the early 1980s. The initial momentum to address the LGB threat was prompted by parliamentarians. NRI was one of the first research institutions to work on LGB, which was identified in the UK. FAO and others also undertook subsequent work on LGB management. Most Tanzanians at this time were trained in the UK in large part because of NRI's early involvement. Campaigns to generate awareness were initiated and some early strategies worked. There was however a need to develop a more sustainable approach. Most farmers today know about the threat of LGB but want now to know how best to control it. Incidentally, ASD came into being in response to this need, and had to go through a very similar process to the one now being carried out with DEs.

In the late 1990s the time the Ministry of Agriculture and Food Security (MAFS) requested the CPHP's assistance to explore farmers' coping strategies in response to LGB. This was part of a region wide initiative i.e. Tanzania, Kenya, Uganda. Following the identification of farmers' coping strategies a workshop was held in Tanzania to build on these initial findings, and to explore more user and environmentally friendly protectants than ASD. The idea of using DEs emerged in response to these events, and when eventually I (Mr Riwa) met up with Tanya (Ms Stathers), the possibility of a specific proposal moved the process a step closer to the current project.

**Prof. Giga** mentioned the fit between DEs and IPM policy, and asked Mr Riwa whether he thought there would be a need for changes in policy to accommodate the development - marketing say - of DEs.

**Mr Riwa** initially thought not, but reflected on the relocation of certain policy decisions (e.g. bye-laws passed at local government level) down the structures in line with the decentralisation processes.

**Prof. Giga** offered the example of the Grain Marketing Board (GMB) in Zimbabwe. The presence of DEs at points of sale may effect grading requirements, which in turn suggest the need for changes in GMB regulations.

**Mr Riwa** indicated that in Tanzania these decisions were taken in the market place - the market decides. He also mentioned that some traders were unhappy about treated maize, fearing the persistence of pesticides and their implications for health.

**Ms Stathers** pointed out that Zimbabwe marketed into the international system, which obliged it to adopt more rigorous controls.

**Mr Riwa** referred to the role of the Food Security Department within MAFS, but suggested that quality control was largely pest management and that no grading was undertaken. Moreover Tanzania did not generally export grain, although surpluses were sometimes exported as donations.

**Mr Riwa** indicated that TPRI, the regulatory authority for pesticides, which is an institute of MAFS, checked the quality of pesticides but the onus was on the private sector to standardise its products. The Tanzania Bureau of Standards also plays a role in the quality of pesticides.

**Mr Kitandu** suggested that because existing policy endorsed the IPM approach (e.g. favoured environmentally friendly products) this bode well for DEs and implied no need for policy change.

**Mr Riwa** pointed out that grain quality not greatly affected by the presence of DEs. Moreover IPM practices of winnowing, cleaning and sorting were already in line with the quality requirements of marketable produce.

**Ms Stathers** drew attention to the focus of existing regulations in international grain trading on any 'contaminants' and the reluctance or difficulties relating to differentiating between undesirable contaminants and ones such as DEs. The issue was however currently under review.

Discussions continued in groups during the tea break, and participants had the opportunity to observe the display of project dissemination articles and documents, and inputs (e.g. raw diatomite rock, locally used protectants, DEs, Actellic Super dust, Stocal Super dust).

## VI. Presentations: Progress against outputs

The moderator drew the participants' attention to the project's outputs as displayed:

1. Optimal methods for the protection of grain against damage by LGB and other storage insects, using commercially available diatomaceous earths (DEs), based on on-farm field trials over two seasons in 3 regions.
2. Tanzanian and Zimbabwean deposits of DEs evaluated against storage insect pests and assessed for their potential use as grain protectants.
3. Evaluation of user/farmer acceptability of DE treated stored grain, in terms of efficacy, cost, application method, taste, cooking and brewing characteristics.
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.
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.
6. Project procedures evaluated throughout the project cycle, using participatory processes to capture different stakeholders' perspectives.

It was noted that the status of activities relating to Output 2, referred to at the start, had been substantially covered during the earlier discussions.

Before inviting Ms Stathers to make the first presentation, he wondered, given the challenge of the project purpose (also on display), whether the participants thought that additional outputs might be necessary.

### Vla. First season storage trials (Activity 1.1)

#### Presentation by Ms Stathers and Mr Riwa

Handouts of the graphs of the 1st season's trial progress (in both Kiswahili and English) were given to the participants.

Ms Stathers explained that during the 1st storage season, which ran from July 2002 to May 2003, the researcher-managed field trials had been carried out at 5 sites in 3 regions of Tanzania, and focused on three main commodities, maize, sorghum and beans as detailed in the table below.

<b>Trial site location</b>	<b>Region of Tanzania</b>	<b>Treated commodity</b>
Mwamakaranga village, Shinyanga district	Shinyanga	Maize grain
Mlali village, Kongwa district	Dodoma	Maize grain
Arri village, Babati district	Manyara	Maize grain
Mwataga village, Kishapu district	Shinyanga	Sorghum grain
Singe village, Babati district	Manyara	Beans

The trials ran for a storage period of 40 weeks (~10 months) to give an idea of the treatments under both short and long-term storage regimes. Researchers took samples to assess the grain damage and insect populations at 8 weekly intervals, in the company of the host farmers who then had an opportunity of visually assessing the different treatments. Waterproofed visual notice boards in the local vernacular language and in English, including photos of the host farmers setting up the trials and details about the trials were displayed at the trial sites (Ms Stathers referred the participants to copies of these visual notice boards which were on display at the workshop).

The treatments used in the first season's maize and sorghum trials were:

- Protect-It (a commercially available diatomaceous earth) mixed at an application rate of 100g per 100kg of grain
- Protect-It mixed at 250g per 100kg of grain
- Protect-It mixed at 100g per 100kg of grain AND permethrin 2%a.i. (a synthetic insecticide) mixed at 10g per 100kg grain
- Actellic Super dust (a synthetic insecticide commonly used in Tanzania) mixed at 100g per 90 kg grain

- Dryacide (a commercially available diatomaceous earth) mixed at 250g per 100kg of grain
- Traditional protectant (as typically used in each village, e.g. cowdung ash, kitchen fire ash, botanical materials etc applied at the farmer recommended rate)
- Untreated control - just grain

The treatment of the DE Protect-It combined with permethrin, is being trialled following laboratory work at NRI that found it successfully controlled LGB, and might be a more economic or more acceptable option to farmers than higher concentrations of DE.

Similar treatments were used with beans (see graph for details), but lower application rates of DEs were used as the main bean pests are known to be particularly susceptible to DE so higher concentrations were unnecessary.

Insect damage in all the maize treatments remained low from July to November, after which time it started to increase in the untreated control and traditional protectant treatments. The DE treatments kept insect damage of grain at below 10% for the entire storage period at Mwamakaranga and Mlali villages, although at Arri the lower application rate of Protect-It and the Dryacide treatment went above 10% towards the end of the storage season. Actellic Super dust also performed well at all three locations throughout the 40 week trial period, which surprised some farmers and extension workers who thought that it wouldn't work. The Actellic Super dust used in these trials was bought from Twiga chemicals in Dar and admixed with grain at the recommended application rate.

Higher insect damage was experienced in the sorghum treatments than the maize. Of the DEs only the higher application rate (0.25%w/w) of Protect-It and the Protect-It and permethrin combination kept damage to below 20% of grains during the 40 week storage period, the Actellic Super dust treatment also performed well. The lower dose of Protect-It, Dryacide, the traditional protectant and the untreated control all experienced >20% by December. The higher damage *Rhyzopertha dominica* observed in the sorghum than the maize is likely to be due to the very high populations of insects in the sorghum, which like LGB are less susceptible to DEs than other insects.

All the grain protectant treatments used on beans, kept damage below 5% throughout the storage period, however it should be noted that it was only after January that damage in the untreated control rose above 10%.

The data generated during these first storage season trials suggest that DEs are effective under the environmental conditions experienced in the trial site areas of Tanzania, and could have an important role to play in the future of small-holder grain protection in the region. However, what is not yet known is whether DE would perform this well during a year when extremely high LGB populations are experienced by farmers, and further work is needed to answer this.

All this data suggests that if grain is to be consumed within the first three months of storage it is not worth treating it with a protectant, as damage levels within this period do not reach high levels. However any grain that is to be stored for longer than 3 months should be treated with a grain protectant immediately after harvest to prevent insect populations and damage from starting to build up.

Figure 1a.

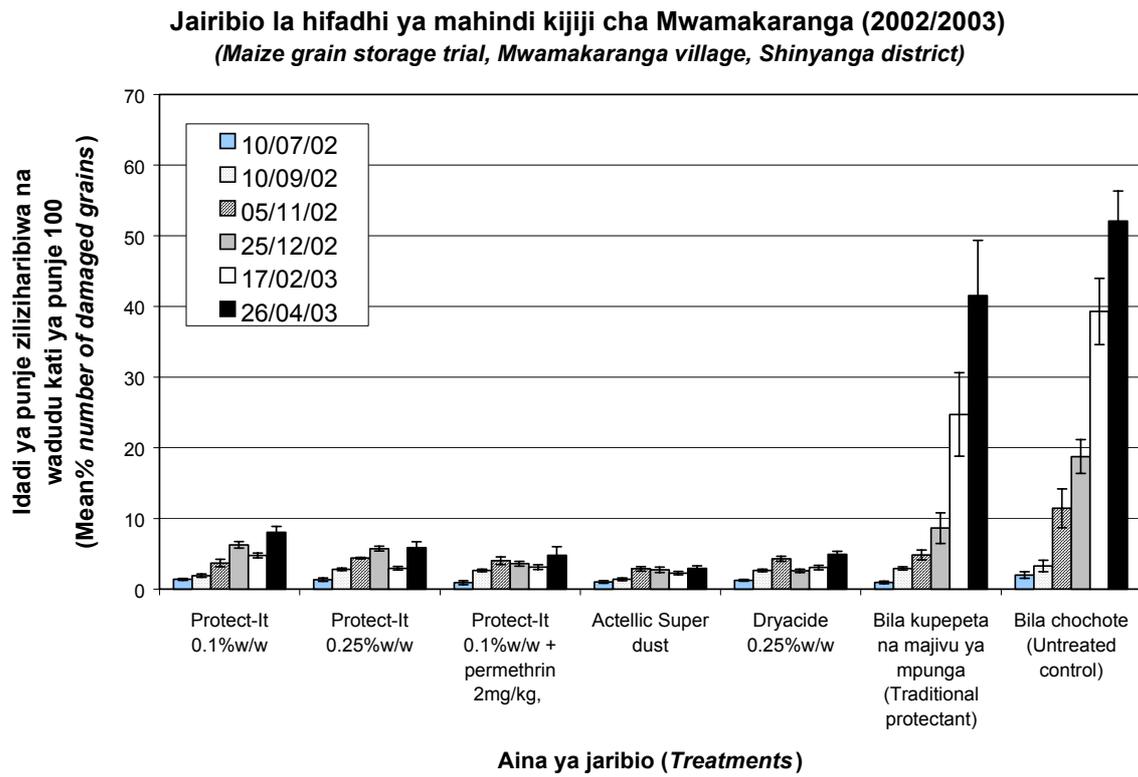


Figure 1b

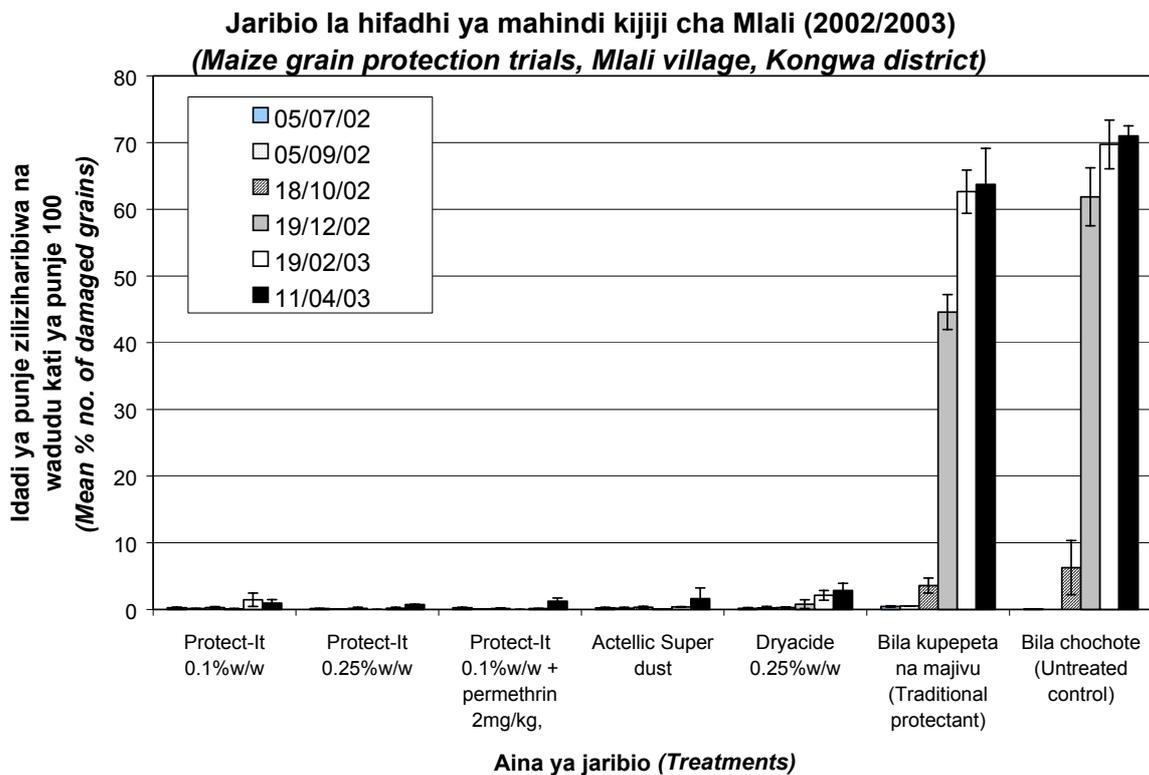


Figure 1c

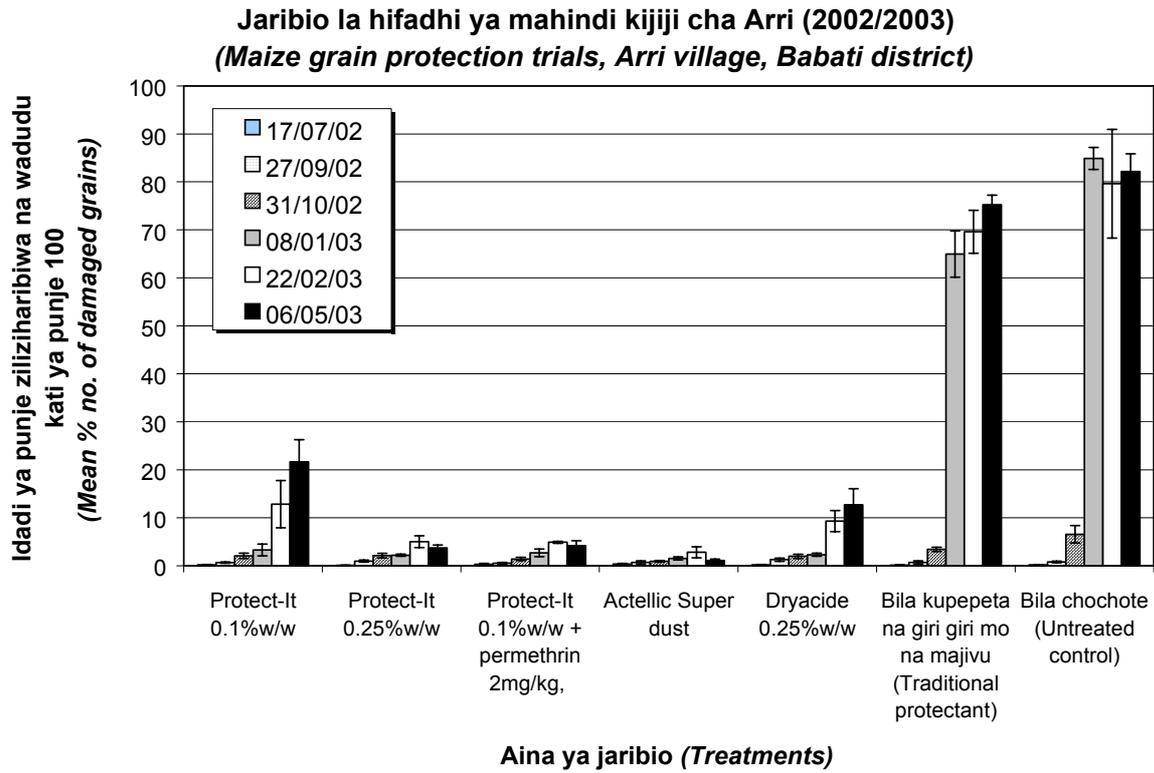


Figure 1d

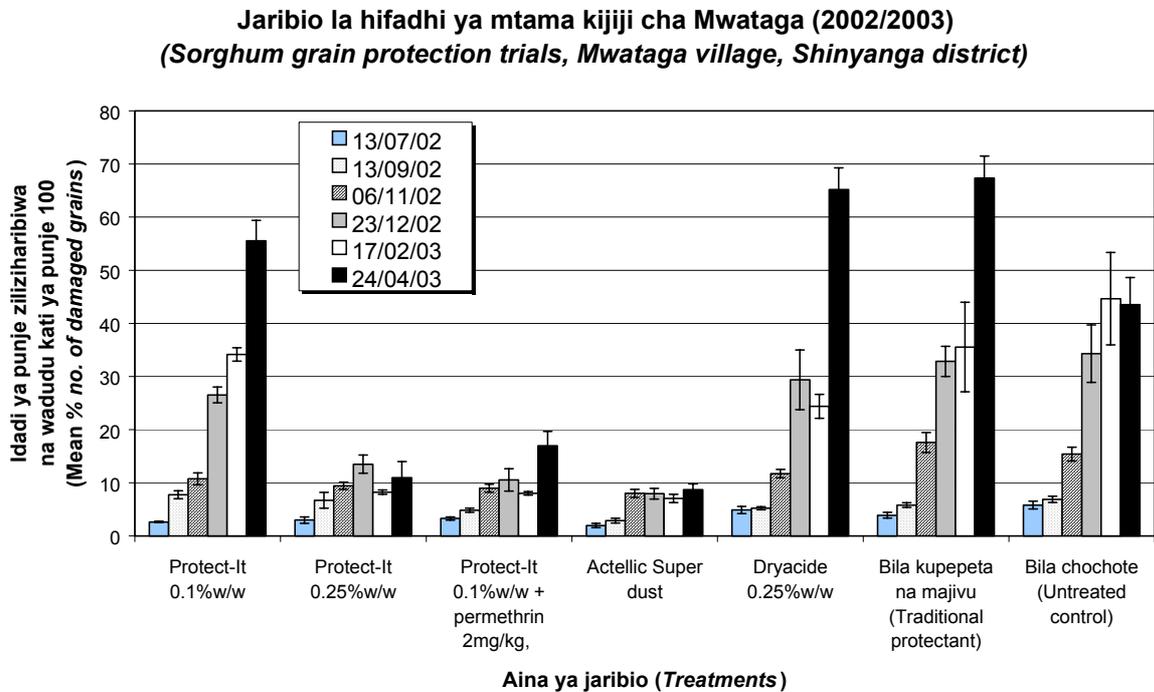
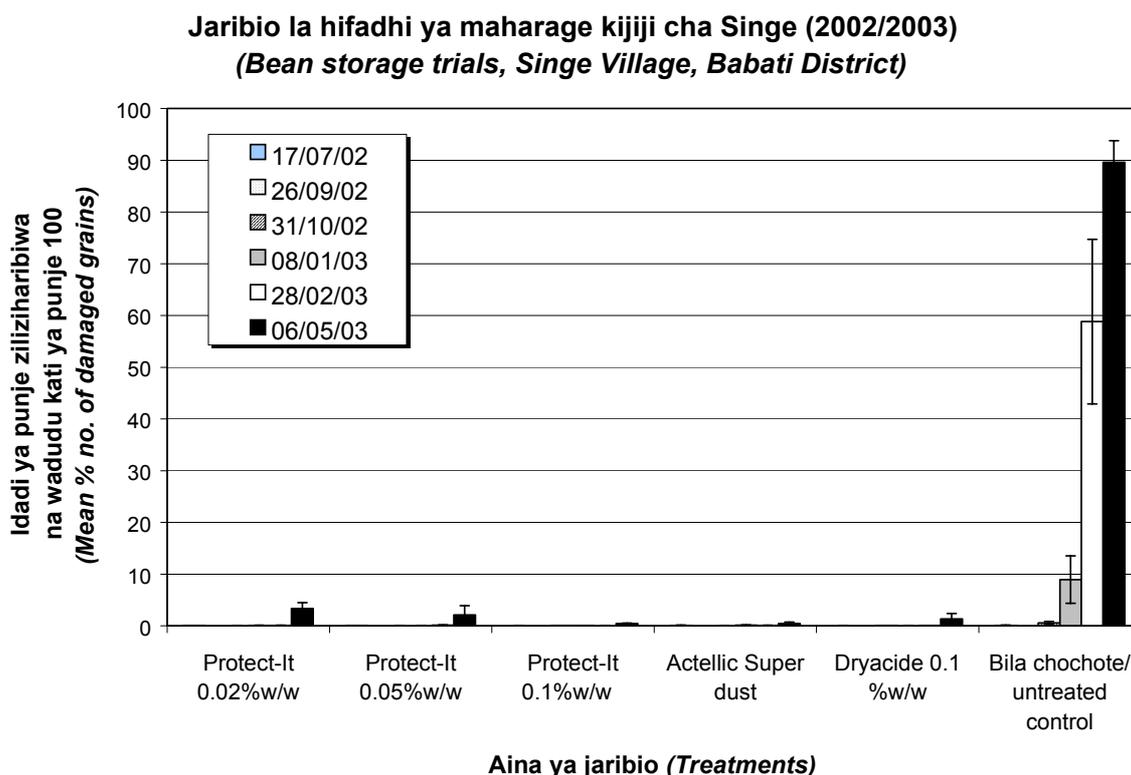


Figure 1e



**Ms Stathers:** It is important to know when damage starts. From the graphs we see that it does not go up before November. If people are going to consume their grain in the first 3 months then there is no cost benefit in treating the grain. In some areas of Zimbabwe people have different ‘bins’ inside their storage structures, which enables them to differentiate grain to be consumed in the short-term, from longer-term supplies, which might be treated.

**Mr Riwa:** The project has adopted farmers’ practices at all the 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 they 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 throughout and their questions welcomed.

In current government recommendations farmers are only advised to treat grain with ASD once insect damage becomes obvious - but should farmers treat their grains immediately after harvest or wait until they see evidence of infestation? We are advising them to divide their grain and treat only that which will be consumed after 3 months?

**Ms Stathers:** There is a contradiction in the present advice given to farmers.

**Mr Riwa:** We need to review the extension messages.

**Mr Karega** felt that they should be advised to treat all grain immediately.

**Ms Stathers** redirected him to the graphs / results, which suggest minimal damage in the first 3 months, and questioned why it would benefit farmers to treat grain that they would be consuming within that period.

**Mr Riwa** drew attention the economic aspect: there would always be a level (of infestation) which economically warranted treatment, and a level at which it did not. He remarked upon the question frequently raised by farmers: “When after treatment should they eat their grain?”, and the fact that only grain intended for long storage should be treated and that when its time to consume the grain it needs to be washed first.

**Prof. Giga** asked about the levels of dumuzi (LGB) at the different trial sites.

**Ms Stathers** indicated that she believed that the numbers of *P. truncatus* in the controls were relatively low, and that it was planned to collect weather data to use in a predictive model to check whether last year was a high risk or low risk year for LGB at all of the trial sites, using the model developed by the LGB risk assessment project.

**Prof. Giga** questioned if there had been low dumuzi pressure whether the treatment results would stand up.

**Ms Stathers** Agreed with his concerns, stressing that this was why the trials should be carried out for 2 or 3 years, and ideally 6 or 7, before firm conclusions were made. Last year may have been exceptional and it would be far safer to continue the work over more years.

**Prof. Giga** observed that the probability (analysis?) would be improved if dumuzi were artificially introduced at one site.

**Mr Morris** suggested that comparison of the various damage versus treatment graphs would be made easier (from a lay perspective) if some indication of dumuzi levels accompanied each graph.

**Mr Kitandu** observed that whilst there were relatively few dumuzi in the controls the mortality rates were high.

**Mr Riwa** indicated that he too felt the number of years should be increased.

**Prof. Giga** asked whether artificial infestation could be undertaken.

**Ms Stathers** drew attention to the ethical aspect of releasing dumuzi at trial sites which are all in villages.

**Ms Stathers** referred to the significant between years fluctuations of LGB damage, and wondered whether on-station trials might be needed if LGB inoculation (artificial infestation) was to be used.

(There was some amusement at the scientific desire for a bad (high risk) LGB year in order to ascertain which treatments were effective under high LGB pressure).

**Mr Kolowa** asked about the differences between the two sites in Babati and Shinyanga.

**Ms Stathers** referred to different agro-ecological and climatic conditions, and to initially different levels of damage at the two sites.

**Mr Mfanfga** wondered whether lower application rates (50 g. / 100 kg.) of DEs could be used and asked about the active ingredient concentration.

**Ms Stathers** indicated that 100 grams per 100 kilograms of Protect-It® had been proven to work, whereas 50 grams (/100 kg.) doesn't work against the main pests attacking maize and sorghum. Moreover farmers were already eking out their use of protectants - using much lower than recommended application rates - with predictable consequences. This was why the education / extension side of grain protection was so important. She explained that the active ingredient of DEs could not be increased as DEs do not contain active ingredients at set concentrations as synthetic insecticides do. They have a physical mode of action, and reducing the application rate, means that insects have less chance of coming into contact with the DE and therefore less chance of dying from desiccation.

**Mr Kitandu** pointed out that the treatment of beans at Singe had been effective against bruchids even at low concentrations.

**Ms Stathers** mentioned that the insect pests that attack beans are more susceptible to DEs than those that attack maize. Insect susceptibility to DEs is based on many factors including their size, cuticle thickness, speed of movement through grain, and hairiness, amongst others.

**Mr Kitandu:** There were of course different factors relating to different insects (e.g. ticks harder to treat than houseflies).

**Prof. Giga** agreed that bean bruchids were more susceptible than grain pests.

**Ms Stathers** pointed out that treatment recommendations for ASD in Tanzania were the same for both beans and grain.

## Vlb. Farmers' evaluation (Activity 1.2)

### Presentation by Mr Kitandu, IPM Technology Development Officer and Ms Stathers

Mr Kitandu handed out an information sheet about the farmers' evaluation of grain samples treated with different protectant at Mwamakaranga village containing Tables 1 and 2, and Figures 2a-e. He also indicated that the analysis was still to be completed.

In Shinyanga IPM and team staff were accompanied by TPRI staff during this work, to better inform and educate the TPRI members about DEs.

In each village groups of farmers were selected according to the wealth groups to which they were deemed to belong, and with gender representation in mind. Key informants (e.g. village executive officers, village extension officers) were used to establish the indicators for disaggregation, and in each case 3 basic wealth groups emerged: the least well off, a middle group, and the most well off, although the proportions differed (Table 1). In some cases the indicators suggested a measure of linkage between traditional protectant use and the lowest wealth group; the best off were not associated with traditional practices. Meetings were then held with each group in turn.

**Table 1: Indicators used by the key informants to distinguish between the different wealth groups in Mwamakaranga village, Shinyanga district, Shinyanga Region, Tanzania.**

Lower wealth households	Middle wealth households	Higher wealth households
They often rent their farms They usually don't own oxen They work as labourers on others fields Living standards are low. They can't manage the costs of medical treatment, school fees, new clothes, bicycles, or good houses etc They use traditional technologies for storage e.g. application of ash Their marriages are often not stable, as the wives often leave to look for better lives	They own and farm more than 3 acres They usually have 4 oxen, and a plough, if they don't they may share with another household They live in moderate houses with good thatched roofs They own at least one bicycle There are at least two wives	They farm and own more than 10 acres They are rich, they have 8 or more oxen and 2 to 4 ploughs They often adopt modern farming methods/ technologies Most of them have a modern house built of fired/ burnt bricks with a corrugated iron roof They contribute more than the other wealth groups towards the development of their village, e.g. cash or lending oxen etc There are always two or more wives in the household They have more than one bicycle for different activities They own assets like vehicles, milling machines and can purchase crops from other farmers
Approx. 20% of households in the village belong to this group	Approx. 70% of households in the village belong to this group	Approx. 10% of households in the village belong to this group.

**Mr Mduma**, of World Vision, asked about the rationale for working with these groups and the different timing of the meetings.

**Mr Kitandu** explained that communities were not homogenous and that this had potential implications for the dissemination (e.g. targeting extension) and the up-take of the DE technology. We sought therefore to better understand and compare the assessments made by different sections of the communities.

**Mr Riwa** indicated that the key informants had recommended that the less well off farmers be seen in the evenings as they were busy labouring (for others) during the day and thus unavailable.

Mention was also made of an 'embarrassment' factor, and the team had avoided publicly associating individuals with poorer groups.

**Mr Kitandu** stated that the initial objective was to establish the characteristics farmers associated with good and bad grain.

The individual groups were asked to identify and rank the criteria they used for evaluating stored grain (see Table 2). They were then invited to score samples of the grain (from each different treatment, identified only by letter i.e. blind testing) on a scale of 1 to 3 for each of the criteria they had identified, three being the best (Table 2).

**Mr Morris** asked whether they were invited to differentiate between grain used for consumption and that sent to market; and whether in referring to (the absence of) insects farmers had differentiated between different species.

**Mr Riwa** confirmed that the farmers were invited to assess the grain as if in a market situation, buying grain for home use.

**Mr Kitandu** indicated that the farmers had not referred to different types of pest.

**Mr Mduma** asked whether participating farmers had been invited to comment on taste.

**Table 2. Evaluation of maize grain samples after 40 weeks storage with different grain protectants by Group 2 (lower wealth households, 2 men and 8 women (mainly old)), Mwamakaranga village.**

Important criteria for evaluating stored maize grain	Rank of criteria (1= most imp.)	Score given to each sample for each criteria (3=none, 2=some, 1=lots)						
		Protect-it 0.1% w/w (100g/ 100kg za mahindi)	Protect-it 0.25% w/w (250g/ 100kg za mahindi)	Protect-it 0.1% & permethrin 2mg/kg	Actellic Super dust (100g/ 90kg za mahindi)	Dryacide 0.25% w/w (250g/ 100kg za mahindi)	Traditional protectant (Bila ku pepeta na majivu)	Untreated control (Bila chochote)
No insects present (Yasiwe na wadudu)	1	3	3	3	3	2	1	1
No insect bored grains (Yasiyobunguliwa na wadudu)	2	3	3	3	3	2	1	1
No rotten/ mouldy grain (Ambayo hayakuoza)	3	3	3	3	3	3	3	3
No dust/ dirt (Hayana vumbi/ uchafu)	4	3	3	3	3	3	1	1
No smell of unrecommended pesticides (e.g. cotton or livestock pesticides) (Yasiwe na harufu ya dawa mbaya)	5	3	3	3	3	3	3	3
Not prematurely harvested (Yaliyokomaa, yawe magumu)	6	3	3	3	3	3	3	3
<b>Total score</b>		<b>18/18</b>	<b>18/18</b>	<b>18/18</b>	<b>18/18</b>	<b>16/18</b>	<b>12/18</b>	<b>12/18</b>

**Mr Riwa** replied that the project had not wished to set parameters but rather to allow farmers to base their evaluation on their own criteria, understanding that choices would differ between groups and localities.

**Ms Stathers** verified that farmers had frequently used 'smell' to assess the quality of stored grain.

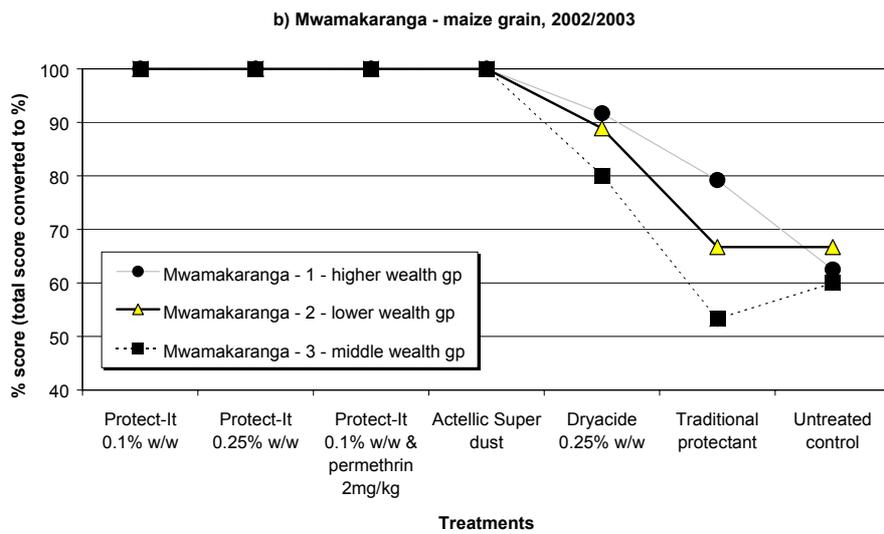
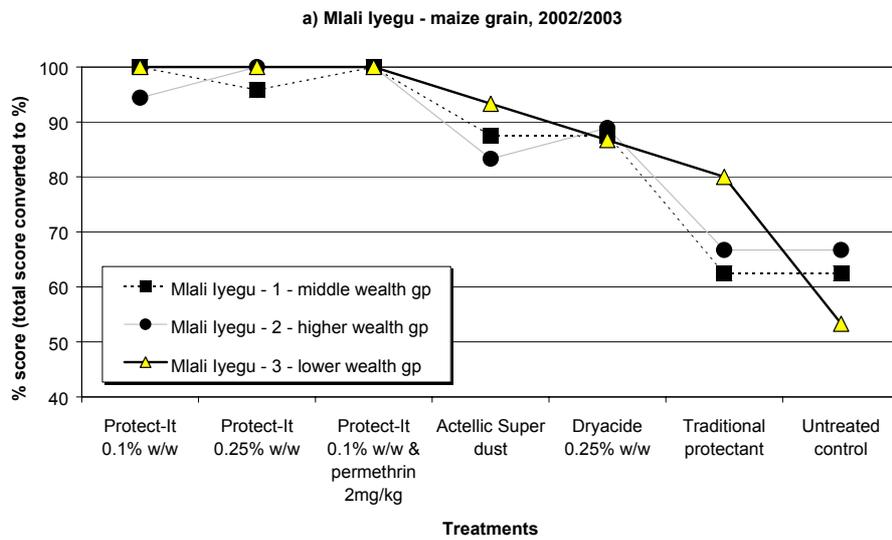
**Mr Mfanga** wondered whether the cow dung used to plaster the vihenge acted as a deterrent and asked whether we had compared vihenge and sacks as storage vessels.

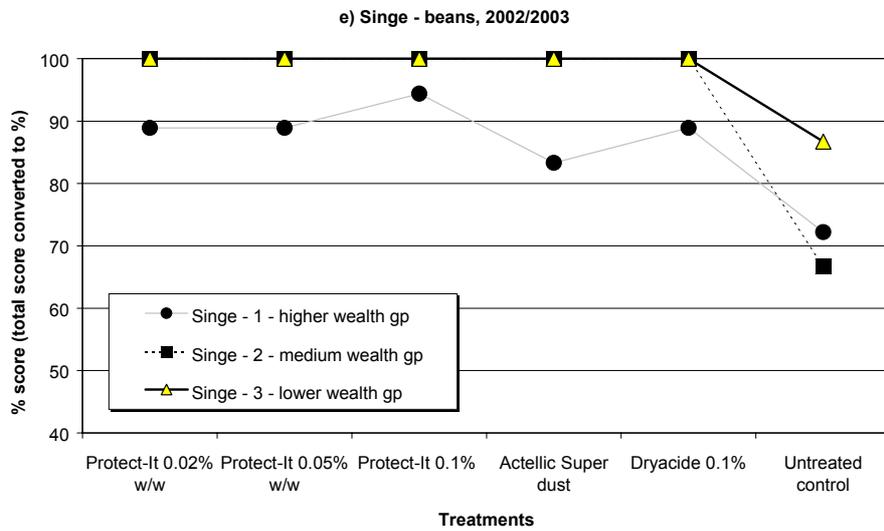
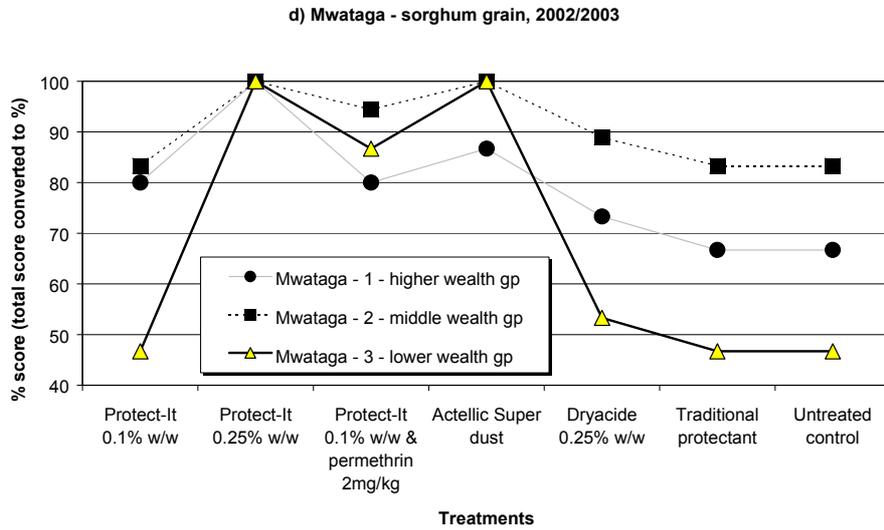
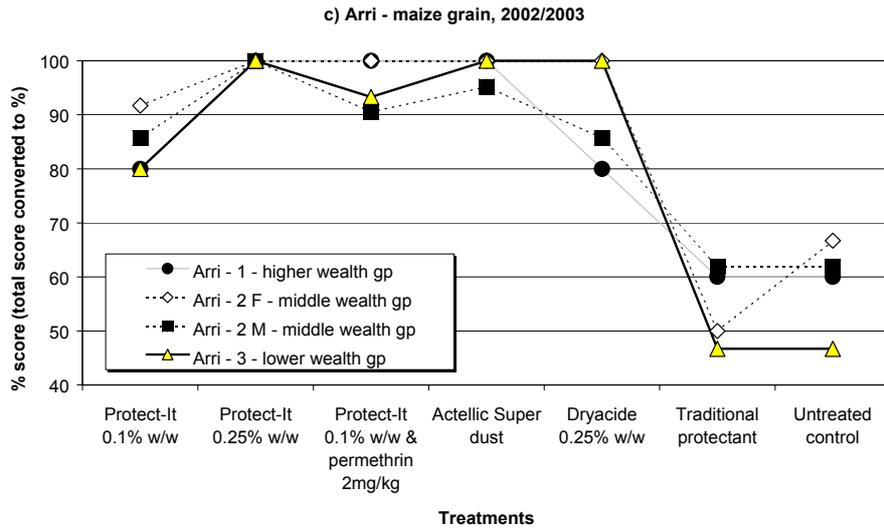
**Ms Stathers** replied that we had used the predominant on-farm storage facility at each site, and pointed to logistical and resource issues were both vihenge and sacks to be used.

**Mr Riwa** added that all the vihenge were made locally.

**Mr Kolowa** further stated that in line with farmers' earlier suggestions the vihenge had been made in accordance with the improved storage structure design (i.e. with a lidded side access point at the foot of the vihenge). The trials were thus also promoting the improved design.

Figures 2 a-e. Comparison of total scores given by the different farmer groups for each grain protectant treatment following 40 weeks storage.





**Ms Stathers** drew attention to the graphs (Figures 2a-e) comparing the total scores given to the different treatments by the different farmers' groups at the five village sites. She indicated that the farmers' assessments were very similar to those of the researchers' data, with the DE and Actellic Super dust treatments obtaining higher scores than the traditional protectants and the untreated controls. This was important as it didn't matter how successful researchers thought DEs were if farmers didn't find them acceptable.

She noted that in Mlali village (Dodoma), the poorest group rated the traditional treatment with ash more favourably than other wealth groups, suggesting this might relate to their familiarity with the use of ash, a different scale of measuring efficacy and/or perhaps a familiarity and acceptance of higher levels of insect damage during storage.

In Mwamakaranga (Shinyanga Rural District) maize from four of the treatments (Protect-It at 100g/100kg, 250g/100kg, Protect-It and Permethrin combination and Actellic Super dust 100g/90kg) received full marks from all three farmer wealth groups.

In Mwataga (Kishapu District), where sorghum was used Protect-It 0.1% w/w consistently received a lower score than Protect-It 0.25% w/w, due to the presence of insect damage and although the total scores given by the different wealth groups varied, the trends were the same.

In general there didn't appear to be much difference between the scores the treatments received from the different wealth groups, and the criteria chosen as important in terms of the quality of stored grain also didn't vary much between the different wealth groups. All groups had included criteria related to insect damage. Additional issues that were revealed during the study included:

- Several farmers commented on the poor availability of pesticides in their areas.
- There were problems with application rates with farmers frequently under-dosing (resulting in some amazement at how effective ASD had been in the trials when applied at the recommended application rate of 100g/90kg of grain).
- Confusion existed between the use of Actellic EC and ASD, with many farmers thinking they contained the same active ingredients. This was often compounded by the village extension officers (VEOs) who were undertaking paid work spraying with Actellic EC.
- Recalling and/or pronouncing the names of DEs as they are not Kiswahili is still difficult for many farmers, although they seem to have mastered the name Actellic over the years

The final version of the farmers' evaluation of diatomaceous earths as grain protectants in Tanzania report should be available by the end of September and will be circulated to stakeholders.

**Mr Mduma** asked whether price was raised as an issue.

**Ms Stathers** suggested it was and that this explained why some farmers were under-dosing.

**Mr Kolowa** asked what the objective of the study had been.

**Ms Stathers** indicated that it served as a check on the researcher's criteria, and provided an indication of how farmers viewed DEs as grain protectants.

**Mr Morris** added that the farmers' evaluations would serve to corroborate (or not) the findings derived using scientific processes. Unless the research was aligned with the farmers' assessments (and needs generally) then it was unlikely to lead to up-take by farmers.

**Prof. Giga** observed that the coming season's farmer trials would allow for broader criteria to be taken into account.

**Mr Mfanga** asked about storage conditions for DEs and expiry dates.

**Ms Stathers** recalled that the literature indicated that DEs should not be left exposed to a moist atmosphere, but added that as they were formed many millions of years ago the expiry date by one analysis was thousands of years. She felt that the current practice for ASD of printing the manufacturing details and expiry dates in English on the packet was unhelpful to many Tanzanians.

**Mr Riwa** pointed out that this aspect was more related to quality control, in which case DE may have other dimensions for checking quality.

## Vlc. Preparation for the 2<sup>nd</sup> storage season

### Presentation by Ms Stathers

For the second storage season the project will repeat the researcher-managed trials at all five trial sites (**Activity 1.1 & 1.2**) with the addition of two new treatments (Stocal Super dust and a Tanzanian DE samples from Kagera) at Mlali. In many of the trial sites farmers wanted to change the traditional protectant and practice used during the first season, due to the unimpressive results. Farmer-managed trials would also be initiated (**Activity 3.4**) at each site to generate information about the acceptability of DEs as grain protectants under farmer management and from farmers perspectives.

**Prof. Giga** asked whether farmers were going to choose which treatments they might use in the farmer-managed trials.

**Ms Stathers** responded yes that they would probably choose one with which comparisons with their normal practice would subsequently be made.

**Mr Riwa** referred to the on-going work that was being done to explore the value to the project in selecting different farmer group identity types. A tool had been developed for this purpose (see Appendix II, Recognising farmer diversity: mainlining and optimising their different inputs) and preliminary analysis has suggested that technology user groups (i.e. users of commercial products, of traditional practices only, of none) more so than wealth groups would be of most value to the project. Gender, and possibly age, would be additionally included into the sampling process.

It was also observed that certain groups (by wealth or technology-use identities) would be adverse to trialling traditional treatments.

**Mr Kitandu** informed the stakeholders that for the second season researcher trials in Mwamakaranga and Mwataga different local treatments (Mkalya and Marumba - botanicals) were being used instead of rice husk ash and kitchen fire ash respectively.

**Mr Morris** suggested that we needed to be careful to differentiate between the use of traditional protectants in the trials as compared to the deployment of traditional practices. The trials as such did not allow for re-winnowing or re-treatment of the stored grain (as traditionally practised elsewhere).

**Ms Stathers** pointed out that the use of traditional treatments was as practised by the majority in the study areas who only treat their grain once per season. Although some households did retreat when they saw insect damage, not all households did.

## Vld. Zimbabwe up-date

### Presentation by Ms Stathers

In the forerunning project (R 7034) in Zimbabwe two imported DEs, Dryacide® and Protect-It®, were tested by both researchers and farmers on maize, sorghum and cowpeas for two consecutive storage seasons (1998/99 and 1999/2000) in three agro-ecological zones covering typical semi-arid and sub-humid conditions, with promising results.

The current situation in Zimbabwe has caused considerable constraints to planned project activities despite team members' best endeavours. In the current project, there was no need to repeat researcher efficacy trials, work has focused on assessing local deposits, the 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 Protect-It® is registered as a grain protectant).

Raw DE samples have been obtained from sites at Chemutsi River and Beitbridge. Preliminary assessment of physical properties by Diatom Research, and laboratory studies at NRI have shown they have insecticidal potential, UZ studies were delayed by technical problems. It is hoped that if sufficient quantities can be obtained they can be included in on-station field trials (at the Institute of Agricultural Engineering (IAE)) during the 2003/ 2004 storage season.

The current food security situation and other logistical issues relating to the situation there make it presently very difficult to organise the planned farmer managed trials, but Dr Brighton Mvumi hopes to initiate some trials in the near future (Aug/ Sept 2003).

## **Discussion**

**Mr Mfanga:** Is there much interest from the private sector there?

**Ms Stathers:** Yes, one Agrochemical company, EcoMark Ltd., has been very interested in the DE trials since 1999, and is currently applying for temporary registration of Protect-It in Zimbabwe. Another private company is more interested in the potential for mining locally available DEs. There is also a lot of interest from the private sector and the registration authority (TPRI) here in Tanzania.

**Mr Riwa** reminded us that in Tanzania the commercial aspects fell outside the core functions of the government, so that there was no choice but to hand over to the private sector.

**Mr Mfanga** made the point that large chemical companies, who were essentially profit-oriented and without local commitments, might have reason to suppress DEs even if they were involved in their registration, as they might want to promote another product they distribute rather than DEs, despite showing interest. Whereas SMEs and entrepreneurs were likely to be more active in promoting them. He cited an example.

**Prof. Giga** confirmed that this was common practice with pesticide manufacturers. While they will have a long list of crop pesticides they may choose to only push the one that they have identified for promotion. The choice of what to market is theirs. Even registered products, Protect-It® say, could be recalled.

**Mr Ngoye** asked why use could not be made of imported DEs until local DEs were registered.

**Mr Riwa** explained that the registration process applied equally to both categories, imported products and products derived from local deposits.

## **Vle. Communication strategy: The challenge of scaling up**

### **Presentation by Mr Morris (NRI)**

The **project purpose** is to improve the food security of poor rural households through the development and promotion of strategies that will provide for efficient, cost-effective and safe grain storage.

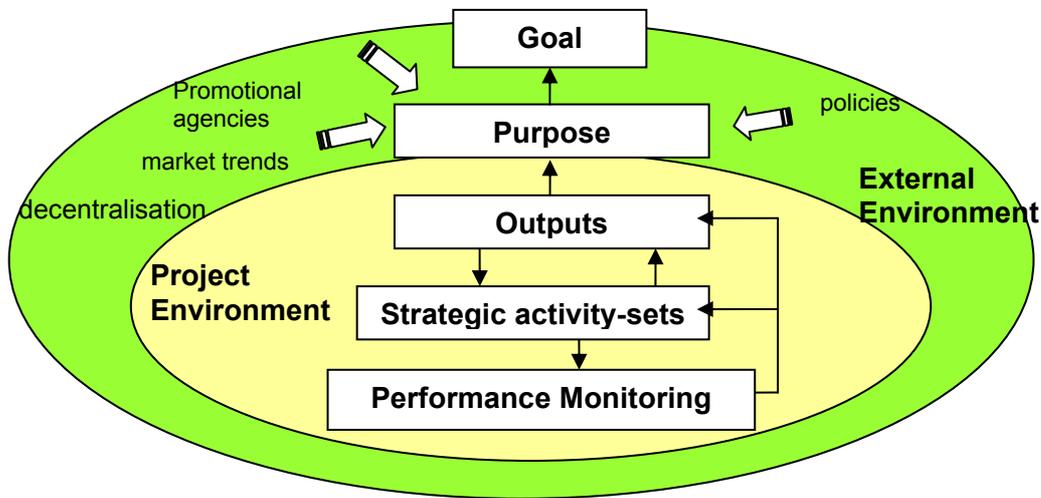
To effect this the project is contracted to assess the efficacy of DEs (output 1) in different agro-ecological locations, to establish their acceptability to different groups of small-holder farmers (output 3), and to disseminate and promote these findings (outputs 4 & 5 respectively). The project is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

The previous presentations have reported project progress with respect to the activities - or activity sets - associated with outputs 1, 2 and 3 in the project memorandum. This presentation 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 Box 1, 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.

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.

**Box 1. 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 (e.g. policies, institutions, processes, trends, shocks).

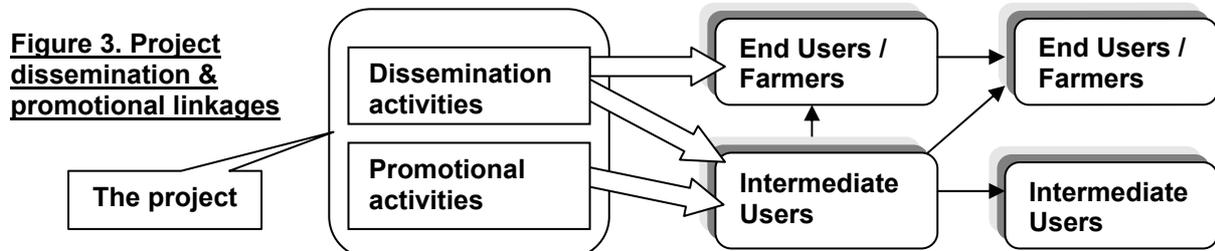


Strategies and activity sets: Strategies describe how human and financial resources will be applied - activities - to achieve the stated output objectives

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. We identify 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).

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. 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 develop and disseminate the project’s findings (see Figure 3).

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 these developments to **end-users** and further intermediaries, after the project has finished. It ensures the persistence of the new knowledge revealed by the project and is about sustainability and scaling up to ensure maximum impact.



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

- Incorporating dissemination and promotion activities as contractual project outputs.
- Interdisciplinary and multi-agency approach ensures breadth of experience & has extended competencies of team and partner agencies with respect to addressing promotional and institutional constraints.
- Early and progressive involvement of stakeholders from design phase.
- Stakeholder analysis: including group work and questionnaire for intermediate stakeholders (see Appendix III); farmer group identity work (see Appendix II).
- Inclusive approach: active involvement of farmers and other stakeholders in the project activities.
- Pluralistic approach: state, private and voluntary sector involvement, together with rural householders.
- Viewing gender as a cross-cutting issue.
- Establishing sets of end-users - farmer types - for whom DE technology is most relevant and appropriate.
- Involvement of local organisations and structures (e.g. district & village extension staff, community representatives, local NGOs).
- Integration of dissemination into the research process through user feedback/evaluation loops
- 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.
- Focus on understanding different sets of farmers' information networks to tailor dissemination products and counter dissemination pathway discrimination.
- Encouraging media interest.

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

Pathways	Nature	Target group
• Publications	Crop Protection,	Researchers, practitioners, policy makers, donors
• Leaflets	All purpose project information flyer	All secondary stakeholders
• Newsletters	PhAction News, DE Project Newsletter, Ukulima wa kisasa	Range of Intermediate stakeholders and literate end-users
• Demonstrations	Research & farmer managed trials	Farmers, extension staff & team members
• Presentations	IPM Project Review Meeting;	IPM stakeholders; registration authority
• Radio	Radio Tanzania, Radio Free Africa (Mw), Radio Faraja (Shy)	Local and national audiences
• Posters	Village notice boards; international workshop	Villagers; international stakeholders
• Workshops	Training and stakeholder workshops	Stakeholders with implementation focus
• Training	Post harvest training; IPM training	Village extension staff; farmers, plant protection officers, NGO staff
• Research collaboration	Exchange visits & communications	PHS project team staff from different regions of Tanzania, counterpart in Zimbabwe
• Reports	Various: CPHP quarterly and annual monitoring, internal, BTORs, discussion papers	Project team, colleagues & stakeholders
• Website	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. Mviwata); 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

**Prof. Giga** asked about the degree of ownership of the project amongst stakeholders.

**Mr Morris** referred to the preliminary design phase (funded by the CPHP) which afforded a number of potential stakeholders the opportunity to be involved in the design of the project. He spoke about alienating aspects of the logframe approach (e.g. the concept itself, the jargon) which 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 internal discourse papers (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 was not a 'social development' project with empowerment writ large, it strived however to be inclusive and pluralistic with respect to all post harvest 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 is covered in a later session, will also cast light on the ownership issue.

**Mr Riwa** emphasised that there were different levels of ownership amongst the project stakeholders.

**Mr Mduma** asked why the purpose was outside the project.

**Mr Morris** responded that the purpose was a 'given' by the CPHP/DFID, and while we planned and believe that the project outputs should over time achieve the project purpose, there are other factors outside the project's control (e.g. markets, policies, decentralisation), some of which are identified in the risks/assumptions column in the logframe. Moreover the CPHP recognised the need for and had commissioned other projects as complementary to the on-going realisation of this purpose.

**Mr Mduma** asked then if we should be limited to the current 6 outputs.

**Mr Morris** indicated that there would be a number of other factors and initiatives that would together contribute to the realisation of the purpose. Moreover there may be other opportunities, or other projects beyond this project, that would address other outputs.

**Mr Riwa:** These are the cards and they are very much in line with national goals.

## VII Tasks at hand

### Window on different activities currently under discussion

Mr Riwa explained that in addition to setting up the second season storage trials in Mwamakaranga and Malaga villages this week, the team would need to address a number of other issues relating to current or planned activities. This session was simply intended to reflect the nature and breadth of some of these issues, and afford an opportunity for the reviewer, stakeholders and core team members to seek further clarification.

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) - see Appendix III.
- development of tools to learn about different farmers' information contexts (Activity 4.1)
- development of extension material (Activity 4.2)

The second newsletter, to which most of the sub-teams (i.e. in Dar es Salaam, in the 3 regions, Zimbabwe and UK) will have contributed, is this time being coordinated by Mr Kitandu in the

Shinyanga IPM office. Mr Riwa invited Mr Kitandu to share his thoughts on current progress with the participants.

**Mr Kitandu** explained that the purpose of the newsletter was to spread awareness of the work currently being undertaken by the project and specifically to provide a pathway for information exchange. The current draft for the second issue comprised 4 parts:

- background information
- progress reports on the farmers' evaluation of the treated stored grains in the 3 regions
- highlights of the results
- a section for contribution from other stakeholders (e.g. progress in Zimbabwe)

He referred to interviews with the farmers at Mwamakaranga, which will feature in the 2<sup>nd</sup> issue. He spoke about the need to integrate pictures into the text. The first issue had featured the storage stakeholders' workshop that had been held at the IPM compound in November 2002, and he wondered whether this issue might not include coverage of the review workshop. Mention was made of the need to check the distribution addresses against the stakeholder inventory.

Hard copies of the first issue were widely circulated locally together with electronic copies to more than 200 grain storage stakeholders globally. The newsletter can also be viewed on the project website <http://www.nri.org/de/>

**Mr Riwa** thanked Mr Kitandu and asked the participants if they had any further questions about the newsletter. He also suggested that aspects of the review were included in the newsletter.

**Ms Stathers:** With respect to the development of group identity types for farmer selection, Ms Stathers asked the stakeholders present whether they differentiated between the groups of farmers they worked with and how they selected the farmers they worked with.

**Mr Mfanga** indicated that he found it more efficient to work with groups of farmers rather than with individuals, and that he worked with both farmers who came to his shop asking for advice and those in the villages who were interested in advice.

**Mr Riwa** suggested that there was a tendency to see farmers in terms of their common interests and not take account of the implications of their differences.

**Mrs Levira** explained how training sessions with which she was involved were generally run with men and women, youth and elderly farmers. While hitherto there had not been a chance to work with differentiated groups, she believed that on some occasions it would be the better thing to do.

**Mr Mfanga** pointed out that whether farmers should be separated into different groups would depend on the issue. If the matter related to livestock (i.e. cattle) then only men need be consulted. Other issues might relate more specifically to youth or to women.

**Mr Morris** agreed with both of Mr Mfanga's points. Working with groups was generally more efficient because of the group dynamics, and more cost-effective, but disaggregation was sometimes also necessary to take account of the different activities undertaken by different people and their different perceptions.

**Mr Kolowa** felt that it also depended on 'character'. Sukuma women for example, were shy and reluctant to talk in front of men, which could make working with mixed groups difficult. Where however mixed groups were already established then it might work well.

**Mr Morris** suggested that there were two issues with respect to gender: there was the issue of the division of labour between the sexes, but there was also the issue of power - women were often viewed and treated as subordinate to men.

**Mr Kolowa** referred to the different roles played by men and women: in some places women do not apply the pesticide or admix it, but are responsible for taking the treated grain back to the granaries.

**Ms Stathers** asked Mr Mduma how World Vision worked with farmers.

**Mr Mduma** explained that World Vision worked through community committees; the communities were invited to select their own committee members prior to any engagement.

# VIII Process review: Learning from experience

## Presented by Mr Morris

Earlier presentations articulated the project's evolution in terms of the progress of activity sets toward their respective outputs. The presentations generally however omitted mention of the complex processes (e.g. action-reflection cycles, feedback mechanisms) that are essential if performance is to lead to the realisation of objectives. If we are to learn from our experiences then we need to actively monitor and review what is taking place, adjust our plans accordingly, and identify 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.

This presentation 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. The goal approximates to an even longer term 'vision'. 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) and external, realisation of both outputs and activities takes place within the timeframe of the project, and would be monitored to optimise performance and identify potential improvements(see Box 1).

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>3</sup>.

Mr Morris indicated some areas where lessons were being learnt which might in turn suggests revisions to the existing programme of activities and/or logframe outputs:

- Output 3: new thoughts on the complexity of 'user evaluation'<sup>4</sup> and greater clarity as to what can and cannot be done before registration and commercial up-take; better understanding of registration timetables.
- 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.
- Outputs 4 & 5: the distinction currently made by the project between 'dissemination' and 'promotion' suggests that the former be removed from output 5 and inserted into output 4<sup>5</sup>.
- 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

<sup>3</sup> Because the project memorandum, and specifically the outputs, constitute the hub of the contract, changes to the logframe would require formal approval from the CPHP.

<sup>4</sup> The following change to Output 3 was suggested in an internal discussion paper (Methodology for engaging farmers - some thoughts; Mike Morris, July 2003): **to develop** a comprehensive understanding of the factors 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.

<sup>5</sup> This point has been added, but was made by Dr Kaoneka of TPRI during a briefing in Babati for the farmer-managed trials in Manyara region.

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), which is unlike the externally driven quarterly and annual reports.

**Table 3. 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 (as reported under the 'farmer evaluation' presentation).

Moreover other project activities (e.g. Grain Storage Stakeholder Workshop, Shinyanga, November 2002) 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:

- 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>6</sup> were left however to be developed as and when the respective output activities are initiated, and are the subject of on-going discussions.

<sup>6</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).

**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 accompanying paper '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, mean 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 mechanism<sup>7</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. 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 Mngara'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.

**Q** How can we demonstrate - measure - increased cost-effectiveness, either in management terms or in terms of meeting project objective?

**Q** Do we have examples of feedback as yet that relate to the poverty focus at purpose level, or to how best the findings might contribute to policy?

## **Institutional context<sup>8</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

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<sup>7</sup> The November 2002 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.

<sup>8</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.

strategies (see for example: Grain Storage Stakeholder Workshop report, November 2002; DE project website <http://www.nri.org/de/>).

An intermediate stakeholder profile questionnaire is under development (Appendix III.) 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 (see Appendix II).

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

- Continued financial support from the CPHP for the project and 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 initiate exploration of the factors that determine the acceptability of grain protectants to small-scale producers for on-farm storage.

With all the experience obtained in the first year, and the 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, and 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>9</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 on **empowerment**. In addition the livelihoods and poverty format adopted in the CPHP project memorandum invites consideration of 'farmers' not in monolithic terms but rather 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

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<sup>9</sup> The CPHP's decentralisation and move to a 'coalition' approach are in line with or response to these developments.

partner agencies, and specifically with respect to negotiating new operational arrangements to accommodate the new farmer focus associated with much of the work.

## Discussion

**Prof. Giga** asked about constraints that the project had faced.

**Ms Stathers** volunteered that an initial constraint had been the delay between submission of the proposal in November 2001 and the absence of any communication from the 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.

**Mr Morris** mentioned the restructuring of MAFS which led to the transfer of Mr Mathias (a central player in the development of the project since Aug 2001) from Plant Health Services to Post Harvest Management in Sept 2002, and his removal from the active project team.

**Ms Stathers** suggested that in the longer run this latter switch had effectively established a broader interface between MAFS and the project, but had led to serious short term difficulties in management 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.

**Mr Riwa** added that now a year later the team was probably strong enough to resist any inadvertent destabilisation: "we'd probably shut them out".

**Mr Morris** referred to developments - the releasing of constraints - with respect to the TPRI and the registration process. Discussions with the TPRI in 2002 seemed to suggest a number of barriers existed. TPRI staff had seemed somewhat remote with only limited interest in the project. Now they work with us on project activities and the registration process is much clearer.

**Mr Riwa** added that the law had been very silent on registration procedures for botanicals, but this was now changing with the creation of the National Plant Protection Committee (NPPC). DEs moreover, were now coming hand in hand with botanicals.

**Mr Kitandu** raised the issue of feedback mechanisms. While we were making use of various disseminating pathways to reach stakeholders, we were not necessarily getting feedback from them. Should we hold six-monthly meetings or host a wider national workshop?

**Mr Morris** agreed this was a challenge, but suggested that many activities had provided feedback (e.g. the storage stakeholders workshop, the recent farmers' evaluation), while that the intermediate stakeholder profile questionnaire (Appendix III) and the tools under development for understanding farmers' communication contexts (both cited in section VII, Tasks at hand) would also do so. He thought that the idea of six-monthly meetings for all team members should be followed up.

**Mr Riwa** requested stakeholders to suggest other ways of moving forward.

**Mr Morris** returned to the theme of the project facing new demands on the teams' capacity and capabilities. With one year of researcher-managed trials under its belt the project was entering a new phase. The former emphasis on good science would now require complementing with equal emphasis on the social and institutional aspects relating to the mainline role for farmers in the project and to greater engagement with the private sector. These posed institutional complexities, which hitherto will not have been encountered.

**Ms Stathers** referred to the initial challenges faced in obtaining even small samples of raw DEs, and how this issue had improved due to Mr Riwa visiting the Ministry of Minerals and Energy in person.

**Mr Riwa** supported this view and stressed the recent change in interest by the Ministry and their collection of sack loads of raw DEs from Kagera since the project had awakened their interest in the potential of DEs in Tanzania not only for grain protection but also for filtration etc.

**Ms Stathers** referred to the enormous constraints being faced by the project in Zimbabwe. These included the absence of systems for transferring project funds from UK to Zimbabwe, related to the banking and exchange rate problems, difficulty of working with rural communities where many were struggling to survive, and logistical issues.

## IX The future outlook

### Outstanding activities and outputs: Ms Stathers

These include the following items:

- management of the 2003/ 2004 storage season trials, analysis of the samples and data (Activity 1.1) and farmer evaluation of these trials building on the 1st season's evaluation (Activity 1.2)
- analysis of crystalline silica content of local DE samples, to facilitate inclusion of local DEs in new trials (Activity 2.4)
- 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)

**Prof. Giga** asked about the quarterly and annual reports, which are parts of the reporting and monitoring regimen of the CPHP (N.B. these are 'external' monitoring requirements and hence were not covered in section VIII). Dr Brighton Mvumi had mentioned to Prof. Giga that there had been a problem with feedback from the CPHP, and Prof. Giga wondered whether we were now receiving any useful feedback from them.

**Ms Stathers** confirmed that although the reports were always submitted with an accompanying message saying we looked forward to their feedback, no feedback had been received, and that she had taken to requesting acknowledgement of receipt when submitting documents to ensure they had reached the programme

**Prof. Giga** volunteered that it might be a case of 'no feedback was good feedback'?

**Ms Stathers** referred to the difficulties at the project/CPHP interface. Initially the project had been submitted as a three years 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 if it should continue. The date for the review then slipped from February to August 2003, with the nominal termination date now being September 30<sup>th</sup> 2003. We have planned beyond that - up until March 2005 - but await the outcome of this review. These factors do make it difficult to both plan and make commitments to stakeholders when there is so much uncertainty.

### Beyond the project

Mr Riwa spoke briefly about the bigger picture beyond the project and pointed out that we had already touched on this area. He invited further comments.

**Prof. Giga** indicated that Tafadzwa, the CPHP's Southern African regional programme manager, had suggested that there would be no activities beyond the end of 2004 as the programme would be winding up in the first three months of 2005. This suggested that (if the review were favourable) this project too would probably be confined to report writing in 2005.

He referred to the 'smart partnership', or the public/private link, as being a potential option for exploring future project-related work.

**Mr Morris** agreed (as mentioned earlier) that a public/private proposal was something that certain groups of stakeholders might think about, but he wondered too if there was not a gap in the present project with respect to a preliminary economic analysis.

**Mr Riwa** reminded the participants that business related developments were outside of the government's core functions, but were definitely the role of the private sector.

(N.B. the project in West Africa referred to earlier by Mr Morris - *cassava processing for SMEs (small to medium enterprises)* - that includes public sector (research institutes) and private sector players, is a 'research' project.)

**Prof. Giga** thought that private sector involvement related on the one hand to marketing and promotion (i.e. for imported DEs), and on the other to mining, processing and quality assurance (i.e. for local DEs).

**Ms Stathers** said that as yet there had been much talk but little risk taking by the private sector in Tanzania but that the trials were still at an early stage.

**Prof. Giga** asked what would happen to the project in Zimbabwe if there was a delay in registration.

**Ms Stathers** indicated that while the farmer managed trials could proceed starting at the same time as the normal storage season the consumption of the grain could not occur until temporary registration had been approved. But that Prof. Giga had an important suggestion on this issue.

**Prof. Giga** mentioned that EcoMark was interested in registering Protect-It® in Zambia (where LGB is present), where the processing of the application would take relatively little time. To facilitate this however, they required the use of project data and wanted to know if this was possible. They were already set up for distribution in Zambia, and the organoleptic and consumption tests could be done there.

**Ms Stathers** knew of no reason why they shouldn't use the data, which while belonging to DFID was now in the public domain, however remarked that she was surprised that given the absence of LGB in Zimbabwe the data generated there would be relevant, and suggested they also incorporate the data generated in Tanzania where LGB is present (although only one seasons worth of data has been generated so far).

**Mr Kolowa** remarked upon the many investors that the Tanzanian government has invited into the country since liberalisation and wondered why EcoMark should not also come.

**Prof. Giga** indicated that EcoMark, which is linked to the Welcome group and Agro Evo, had a focus on Tsetse eradication and public health in Zambia.

## **X. Discussion, question and answer session**

In introducing the final working session, Mr Riwa wondered if there were many questions left. The earlier sessions he felt had covered most aspects of the project.

**Mrs Levira** asked about silica and silica ingestion.

**Ms Stathers** stated that studies in the United States by the environmental protection agency (EPA) had revealed that there were no problems associated with modest silica ingestion as it formed a part of most peoples every day diet and was excreted from the body. DEs are also used as an ingredient in baby foods. Moreover DEs were used for 'dusting' poultry and treating cattle for internal parasites. DEs are also used by ostrich farmers to treat their flocks for external parasites.

**Someone** commented on the sustainability of the existing but finite local deposits. Their quality and the economics (i.e. imported vs. local prices) would play a role.

**Mr Mfanga** asked about the plan in Tanzania for registration.

**Ms Stathers** responded that it would be fabulous if the TPRI were able to use our results (rather than them repeating the field trials) as that might speed things up, but last year's results were possibly in a 'good' dumuzi year (i.e. few of them). We are not the registrants and can only play a facilitative role.

**Prof. Giga** also confirmed that a temporary registration in Zimbabwe was necessary to comply with the law before the final aspects of the work could be done.

**Prof. Giga** finally asked Ms Stathers about the project milestones.

**Ms Stathers** commented that they were as per the recent annual report and listed them.

## **XI. Closing remarks**

Mr Riwa thanked the participants for their contributions and their continued interest in the DE project. He urged the DE project team to make use of their experience and lessons from the first seasons trials to improve the 2<sup>nd</sup> season. He finally once again, thanked the project reviewer, Prof. Giga, for sharing his time and his thoughts with the DE team. He then declared the workshop closed (at 5pm).

## Appendix I. Workshop participants and contact details

Name	Post / Expertise	Organisation	Address
Mr Lazaro KITANDU	IPM Technology Development & Liaison Officer	Zonal IPM Project / Plant Protection Services	P.O. Box 476, Shinyanga Tel +255 28 2762731 Fax +255 28 2762731 <ipmlz@africaonline.co.tz>
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Mr G.S. MFANGA	Stockist	Mfanga Agrovet Agent	P.O. Box 564, Shinyanga
Mr A.A.S NGOYE (Tyson)	Agricultural District Extension Officer	Municipal Council	P.O. Box 28, Shinyanga
Mrs DIXON	Stockist	Dia Mimea Agrovet	P.O. Box 28, Shinyanga
Mrs N.W. LEVIRA	Municipal Plant Protection Officer	Municipal Council	P.O. Box 28, Shinyanga
Mr Amon MDUMA		World Vision, Shy	P.O. Box 78 Shinyanga
Prof. Denash GIGA	Reviewer	Independent	P.O. Box 629, Bulawayo, Zimbabwe
Mr William RIWA	IPM National Coordinator and DE national project leader	MAFS	P.O. Box 9071, DSM <wilriwa@kilimo.go.tz>
Ms Tanya STATHERS	Project Leader & post harvest entomologist	Natural Resources Institute (NRI)	Central Avenue, Chatham Maritime, Kent ME4 4TB UK. Tel: +44 1634 883734 Fax: +44 1634 883567 < <a href="mailto:t.e.stathers@gre.ac.uk">t.e.stathers@gre.ac.uk</a> >
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## Appendix II. 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.

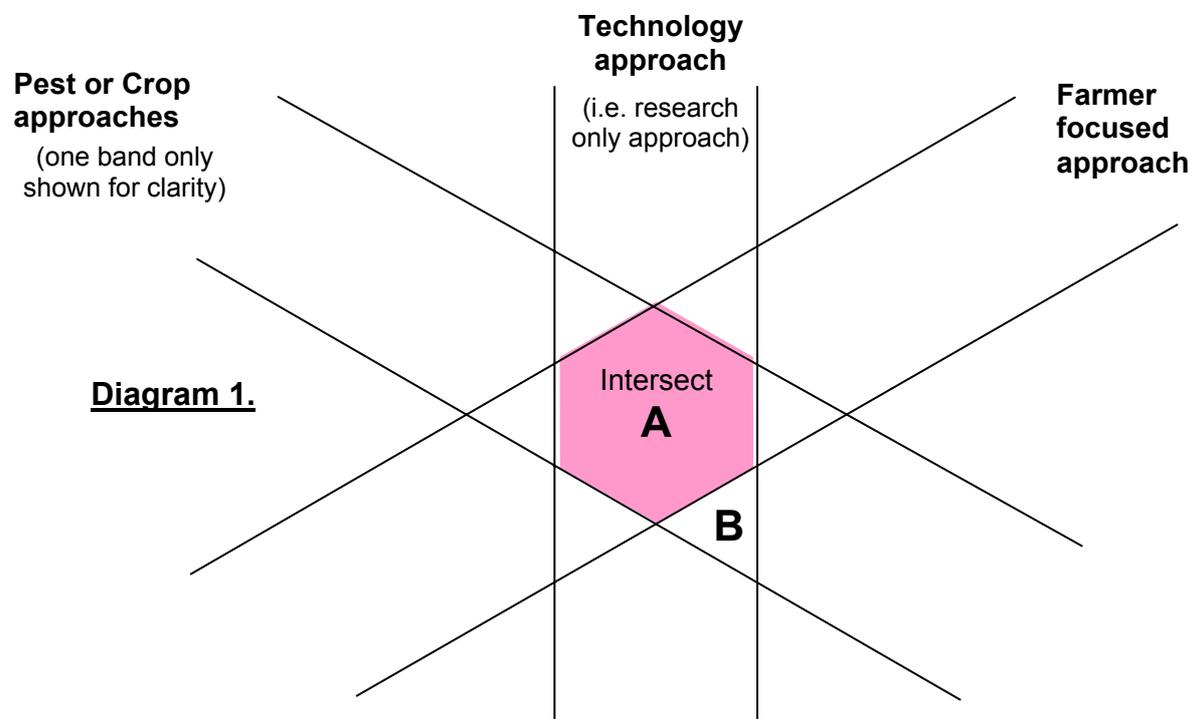
**Technology's acceptability to farmers:** The research hypothesis relates not only to scientifically testing whether DEs are effective grain protectants, but also to establishing their acceptability to small-scale producers for on-farm storage in areas where the large grain borer is endemic.

**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 our 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 Diagram 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>10</sup>.

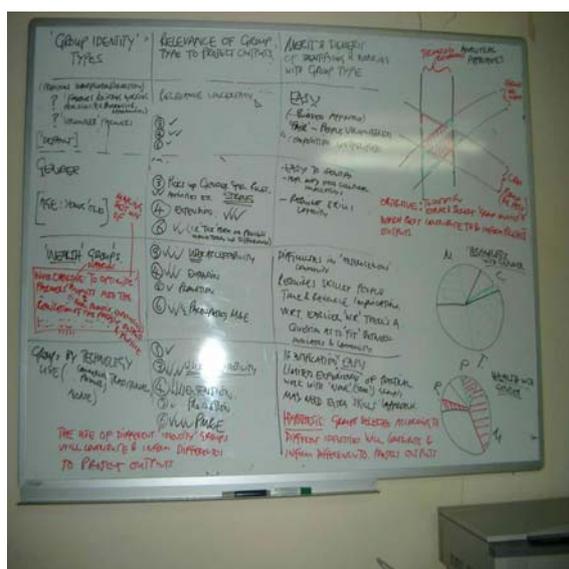
From a farmer-centred approach, and with the area of maximum overlap A in mind, the initial challenge<sup>11</sup> is to ensure that we give consideration to the diversity of farmers as represented by the breadth of the *farmer focused approach* band in Diagram 1. This would for example optimise our 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:** Our 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 4 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 4), 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.

Figure 4. Farmer identity work as originally recorded



<sup>10</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>11</sup> We need first to better understand the diversity of the rural communities with which we are working. With this knowledge, we might subsequently choose to focus our efforts on a particular group (e.g. target extension where needs and potential benefits look greatest).

**Table 4. 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
Earlier project approaches: In line with existing office practice (e.g. progressive farmers) ? Favouring volunteer / opportunistic farmers ?	1. ✓ 2. - 3. ✓ 4. ✓ ✓ 5. - 6. ✓	Relevance uncertain. Omits many farmer types Composition unspecified Easy approach, but unknown bias Non-representative of farming community
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)	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.	Easy to make identification Cultural norms and practices might impede selection Require particular skills & capacity Would not necessarily be representative (e.g. poor widows and rich women very different)
Wealth groups	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	Wealth ranking requires skills & capacity & would involve training. It would demand time of village working group. Important that it's participatory to ensure indicators are location-specific; recent exercise points to difficulties. May be challenged in heterogeneous communities. Good representation of farmers
Groups by storage technology use (i.e. users of commercial products; of traditional practices only; none)	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	Identification relatively easy. Limited experience of working with non-users and traditional users. May require different approach and new skills. Selection key, as conceivably could degenerate to earlier or 'default' selection mode Good representation of farmers (may incorporate wealth, innovation, etc indicators) Technology focused.
Other group identities?		
*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		

# Appendix III. Storage stakeholder questionnaire - Draft 1

## Small-scale farmer utilisation of diatomaceous earths during storage

A project which aims to improve the food security of poor rural households through the development and promotion of an efficient, cost-effective and safe grain storage protectant.

## Grain Storage Stakeholder Profile Questionnaire

### A. Information about the enumerator

1. Name of Enumerator		3. Date completed	
2. Her/his organisation		4. Location/region	
5. Do you or your organisation have regular contact with the respondent or her/his organisation ? ( <i>Specify</i> )	<i>No/Yes: If yes give details</i>		

### B. Questionnaire rationale and objective

To maximise the project's contribution to the improvement of food security amongst poor rural households the knowledge and potential benefits suggested by the project's findings need to be widely promoted. Several dissemination products (e.g. information flyer, newsletter, website) are currently being shared with and/or available to known storage stakeholders, however if we (the project partners) are to optimise the impact of the project's findings then we need to build on and improve linkages with these existing stakeholders and solicit the support of other stakeholders. The project has throughout its evolution actively engaged with a spread of stakeholders, both to ensure that the research is relevant to poor rural households in differing circumstances - potential end users - and that the diversity of intermediary stakeholders (e.g. policy makers, service providers, input suppliers) who process research findings and/or facilitate its uptake by end-users, are alerted to and inform our research process.

Specifically the questionnaire seeks to identify the different roles, interests and capabilities of intermediate stakeholders in storage and/or post harvest issues - a stakeholder analysis. The questionnaire - and this may need explaining / facilitating by the enumerator - seeks to differentiate between the individual stakeholder (agent or actor) and what s/he brings to her/his post, and the organisational stakeholder (structure, agency) and posts as set out in any organisational plan or organogram. The information collected will help us better tailor dissemination products and contribute to the development of the project promotional strategy.

### C. Individual Storage Stakeholder details

1. Name of Respondent:		3. Tel (w)		4. Mobile	
2. Position / Job Description:		5. Fax		6. E-mail	
7. Post to which individual reports:		8. Post-holder / line manager (optional):			
9. Individual's main role/s or function? ( <i>Shortish answer - here to give context to 10, the storage focus</i> )	<i>Check list?</i>	<i>Column to provide space for answers</i>			
10. Individual's main role or interest with respect to storage / post harvest issues?	<i>Check list?</i>	<i>Could be developed through colleagues brainstorming, or when Q pre-tested. Or is a check list too prescriptive? See section E - should we reproduce something similar?</i>			
11. What are the main constraints to carrying out these storage related aims / interests?	<i>Check list?</i>				

12. How could an understanding of DEs contribute to your work?	<i>Check list?</i>	
13. How and with whom would you share this knowledge?	<i>Check list?</i>	

#### D. Organisational Storage Stakeholder details

1. Name of Organisation (i.e. the organisational storage stakeholder):		2. Address	
3. Parent body or affiliation if applicable (e.g. ministry, directorate):		4. Nature of linkage with parent body	<i>Check list? Maybe this should be covered in the communication section?</i>
5. Date Organisation was formed / constituted:		6. Any key Organisational changes in recent history?	<i>E.g. decentralisation, merger, privatisation</i>
7. Does the Organisation have clear objective/s (as set out in a logo or mission statement), and what is it?	<i>Yes/No/Don't know</i>	<i>Write out objective in long hand (indicate 'status', and secure copy of organisational literature)</i>	
8. Characterise the Organisation's objectives	<i>Check list? Poverty reduction, increasing production, maximising profit, human development..</i>	<i>Other, or qualification</i>	
9. How many people does the Organisation employ?		10. How many of these are employed on storage or post harvest issues?	
11. How is the organisation funded?			

#### E. Organisation's main role/s or function with respect to storage / post harvest issues?

Tick relevant boxes	✓	Elaborate (e.g. for/with/to whom, what, how, example)	Tick relevant boxes	✓	Elaborate (e.g. for/with/to whom, what, how, example)
1. Funding agency			11. Producer (of what? For whom)		
2. Policy adviser (to whom?)			12. Consumer (of what?)		
3. Policy maker			13. Implementing/development agency		
4. Lobbying agency (who? for whom?)			14. Networking (with or for whom?)		
5. Research (in? for whom?)			15. Representation (of whom?)		
6. Education (of whom, for what?)			16. Marketing (of what? for/to whom?)		
7. Training (who? for whom/what?)			17. Communication		
8. Planning (what?)			18. Enforcement		
9. Service provider (of what? to whom?)			19.		

10. Input supplier (of?)		20. Other (specify)	
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Note: Brackets above are only prompts, elaborate as useful; note any unofficial/informal but key functions with respect to storage (e.g. a school may be formally (on curriculum), informally, or not at all involved in storage education).

### F. Sector with which Organisation is associated (✓)

<b>State sector</b>	1. Line Ministry		<b>Voluntary sector</b>	17. Development NGO - Local	
<i>Tick box;</i>	2. Education / Training		<i>Tick box;</i>	18. Development NGO - International	
<i>Add any comments below:</i>	3. Research		<i>Add any comments below (e.g. gender, social identity):</i>	18. Faith-based organisation	
	4. Politician		<i>Typology needs developing</i>	19. Trade Union	
	5. Parastatal			20. Community-based organisation	
	6. Project			21. Cooperative	
	7. Media (specify print, radio, TV etc.)			22. Professional association	
	8. Other (specify)			23. Networking organisation	
<b>Private sector</b>	9. Manufacturer		<b>Regional (countries) and International players</b>	24. User group	
<i>Tick box;</i>	10. Retailer			25.	
<i>Add any comments below:</i>	11. Wholesaler			26.	
	12. Processor			27. Other (specify)	
	13. Vendor			28. IARCS	
<i>Typology needs reviewing</i>	14. Producer			29.	
	15. Media (specify print, radio, TV etc.)			30.	
	16. Other (specify)		31.		

### G. Operational level / areas of Organisation (✓) and Individual (✗)

Mark relevant boxes:	✓ ✗	Indicate focus & size of coverage, project / program	Tick relevant boxes	✓ ✗	Indicate focus & size of coverage, project / program
1. Village			6. National		
2. Ward			7. Regional (SADC)		
3. District			8. International		
4. Region			9.		
5. Zone			10. Other (specify)		

Notes: The individual may focus, say, on activities in a single district, whereas the organisation may operate across all districts in a region; numbers of wards, districts, regions etc might be cited.

### H. Knowledge networks and communication context

<b>Organisation</b>		<b>Individual/Respondent</b>	
Section E identifies the Organisation's main role/s or function with respect to storage / post harvest issues. For each role in turn answer the following questions:		Section C10 identifies the Respondent's main role/s or function with respect to storage / post harvest issues. For each role in turn answer the following questions:	
First role ( <i>write in</i> ):		First role ( <i>write in</i> ):	

1. Who are the organisation's <b>main</b> sources of information? ( <i>Give sources according to categories &amp; No. in section F</i> )		11. Who are the individual's <b>main</b> sources of information? ( <i>Give sources according to categories &amp; No. in section F</i> )	
2. What type of information is received?	<i>Check list? E.g. awareness raising and understanding, operational skills (e.g. practice), technical knowledge (e.g. treatments), marketing information, policy, promotional</i>	12. What type of information is secured?	
3. Question about quality of information flow and content - any ideas?	<i>(e.g. telephone call, electronic communications, regular meetings, workshops, printed material, field days)</i>	13. Question about quality of information flow and content - any ideas?	
4. What are the constraints to the organisation receiving quality information?	<i>Check list? E.g. infrequent contact, poor electronic communications, skills shortage, staff shortage, limiting physical resources</i>	14. What are the constraints to the individual receiving quality information?	<i>Check list? E.g. infrequent contact, poor electronic communications, skills shortage, staff shortage, limiting physical resources</i>
5. With whom does the organisation share / extend its information - the <b>main</b> recipients? ( <i>Give sources according to categories &amp; No. in section F</i> )		15. With whom does the individual share / extend her/his information - the <b>main</b> recipients? ( <i>Give sources according to categories &amp; No. in section F</i> )	
6. What type of information is shared?	<i>Check list? E.g. awareness raising and understanding, operational skills (e.g. practice), technical knowledge (e.g. treatments), marketing information, policy, promotional</i>	16. What type of information is shared?	<i>Check list? E.g. awareness raising and understanding, operational skills (e.g. practice), technical knowledge (e.g. treatments), marketing information, policy, promotional</i>
7. Question about quality of information flow, pathways and content - any ideas?	<i>(e.g. telephone call, electronic communications, regular meetings, workshops, printed material, field days)</i>	17. Question about quality of information flow, pathways and content - any ideas?	<i>(e.g. telephone call, electronic communications, regular meetings, workshops, printed material, field days)</i>
8. What are the constraints to being able to share quality information?	<i>Check list? E.g. infrequent contact, poor electronic communications, skills shortage, staff shortage, limiting physical resources, poor attendance, dishonesty etc.</i>	18. What are the constraints to being able to share quality information?	<i>Check list? E.g. infrequent contact, poor electronic communications, skills shortage, staff shortage, limiting physical resources, poor attendance, dishonesty etc.</i>
Format repeated for each main role			

<b>I. Operational perception / identification of farmers and the rural community</b>			
<b>Organisation</b>		<b>Individual/Respondent</b>	
1. Does the organisation have direct contact with farmers or groups from rural communities? ( <i>cross</i> )	<i>No / Yes - specify nature of contact</i>	11. Does the individual have direct contact with farmers or groups from rural communities in the course	<i>No / Yes - specify nature of contact</i>

<i>reference with H above)</i>		of her/his work?	
2. Does it in the context of its work actively differentiate between farmers or farmers groups according to any social identity or other characteristic?	<i>Check list? E.g. by livelihood, farming system, gender, age group, wealth status, group membership, denomination, progressive farmers, ethnicity etc.</i>	12. Does the individual in the context of her/his work actively differentiate between farmers or farmers groups according to any social identity or other characteristic?	<i>Check list? E.g. by livelihood, farming system, gender, wealth status, group membership, self selection, progressive farmers etc.</i>
3. What is the rationale for this differentiation (e.g. <i>established practice, target group, self selection etc</i> )?		13. What is the rationale for this differentiation (e.g. <i>established practice, target group, self selection etc</i> )?	
4. What are the benefits of working to/with/through these particular groups?		14. What are the benefits of working to/with/through these particular groups?	