Farmers' livelihoods

What role for grain protection?

Farmers throughout sub-Saharan Africa suffer serious losses to their stored produce due to insect damage. For many families, these losses threaten household food security, for others they may force early sales at lower prices.

Understanding grain storage issues is particularly difficult because of their private nature. In the case of field crops or livestock it is possible to get a feel for what is happening from direct observation. The same is not true for storage practices. While they are initially characterised by discreet activities, mostly undertaken in public (e.g. threshing, winnowing, treating), they typically culminate in secluded storage and/or sale arrangements. Perhaps because post-harvest activities are directly linked to household food security and survival, and/or to profit and well-being, their undertaking tends to be a much more private affair, with quantities and qualities of grain stored neither readily disclosed by farmers, nor obvious to others.

Although the situation remains unclear, it is known that some farmers protect their grain by mixing in ash or plant materials, or funds allowing, purchase synthetic pesticides. Others store their grain untreated. However the effectiveness of both ash and plant materials is highly variable, and as much as a third of a sack of ash may need to be mixed with a sack of grain. Use of synthetic pesticides also has its problems: many farmers are not following the recommendations for their use; and unscrupulous traders are selling fake or expired products. Non-treatment is not an option for longer term storage as the grain becomes heavily damaged. Not surprisingly, farmers are demanding better options for improved grain protection.

With this demand in mind, researchers decided to explore whether diatomaceous earths (DEs – see box) could meet the demands of these small-scale farmers. Trials initiated in Zimbabwe in 1998 confirmed laboratory studies that the DEs, Protect-It and Dryacide, were effective grain protectants for small-scale on-farm storage. Further work to evaluate these inert dusts was initiated in Tanzania where the devastating larger grain borer (LGB, *Prostephanus truncatus,* dumuzi) is already widespread. Research trials were set up in Shinyanga, Dodoma and Manyara regions to test and compare the efficacy of a number of different grain protectants (including African DEs) in these different agro-ecological zones. These comparative trials have been run for two consecutive 10-month storage seasons during 2002–2004, and a third season is underway. The treated commodities include maize, sorghum and beans.

Loading DE treated grain into a granary

Esther compares her ash treatment (left) with DE treatment (right)

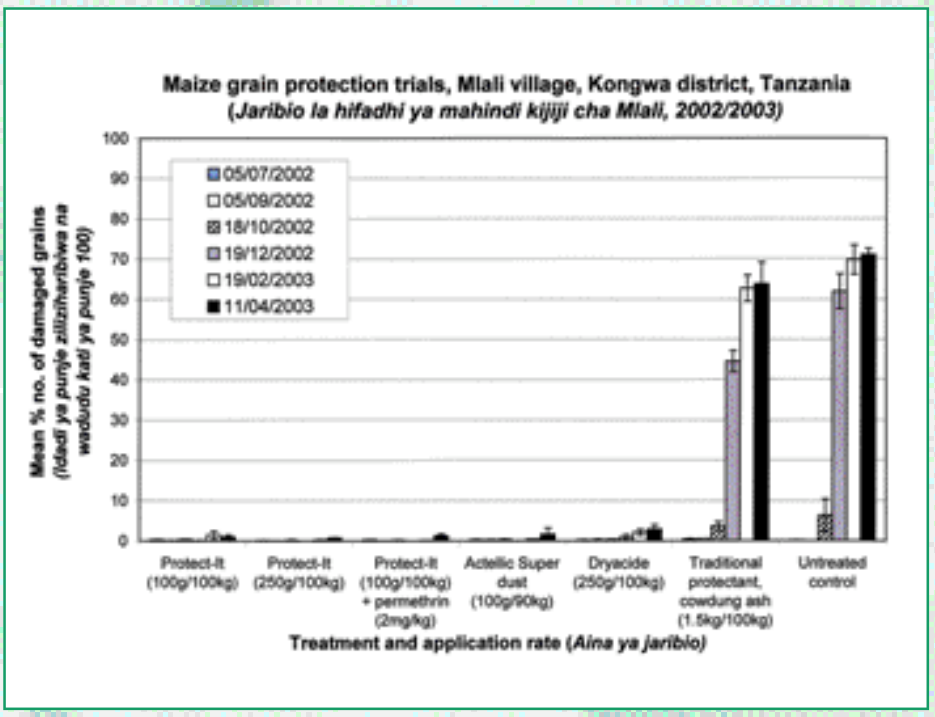
Catherine's plight: Where does the harvest go?

Catherine untied the neck of her last sack of maize, and picking up her bowl, started to scoop up the grain she needed to make the children's ugali for the rest of the week. As she bent to do this, she smelt the familiar smell of the insects. She looked at the light empty grain kernels full of holes and the fine dust left by the insects as they had bored their way through her food. She had lain awake at night listening to the almost mechanical crunching the insects made as they endlessly ate away at her grain. She had watched her firm sack of grain become looser and looser, shrinking as it gradually turned to dust. But she hadn't just stood by and let them steal her food. When she first heard them she bought a small packet of chemicals from a travelling salesman who had visited her village on a bicycle, she had taken her two sacks outside, winnowed the grain and then added the chemical bit by bit. But within a month she began to hear the noise of the insects chewing her grain, even louder this time. Again she took her remaining grain outside and winnowed it, this time she added some ash as her mother used to do. Now as she looked down at the bowl of dust and empty grains she felt a tear trickle down her cheek. She would have to go and seek labouring work in order to get maize grain for the next two months until they could start to harvest the green maize cobs from the fields. Could they again rely on her brother and the neighbours to help this year? They had had to borrow seed last year and had promised to repay it with two buckets of grain, but how could she do that now?

What are diatomaceous earths?

Diatomaceous earths (DEs) are soft whitish powders formed from the fossils of tiny planktons which lived in oceans, rivers and lakes. After processing - mining, grinding and drying - these powders can be mixed with grain to kill insect pests. When DEs come into contact with insects they absorb the wax from the cuticle of the insect which then loses water, dehydrates and dies. DEs have extremely low toxicity to mammals and are therefore very safe to mix with food. In industry they are used as filters to help clarify fruit juices, beers, wine, pharmaceuticals, and as fillers in paints, plastics, coating agents in fertilisers amongst many other things. In addition to the imported commercial DE products, there is the potential for exploiting local deposits both in Tanzania and the region.

This research shows that grain treated with DEs and stored for a 10-month period was least affected by insect damage (see graph). Grain treated with traditional treatments or left untreated over the same period was severely damaged. The synthetic pesticides, bought from a registered stockist and applied as recommended were also effective. These findings were corroborated by farmers who used their own criteria to assess the quality of the differently treated stored grain. Selected farmers ran trials in their own homes, which also confirmed the effectiveness of DEs.



In addition to their efficacy there is also a need to determine for whom DEs will be most acceptable. To this end, the researchers have been exploring the diverse circumstances and post-harvest needs of different households. The research has shown that the quantities of grain to be stored and sold, and treatment practices, differed enormously between households in the same location. Confirmation of the diversity of the rural client-base highlights the importance for service providers to tailor recommendations to the needs of different households as opposed to using a 'one-size-fits-all' approach.

Those farmers who have been involved in using DEs would like to be able to purchase and use these effective grain protectants. The Ministry of Agriculture and Food Security is keen to see these safe grain protectants available in Tanzania. The challenge for the private sector is to develop this business opportunity through importation, distribution and marketing of the DE products and/or exploitation of the local DE deposits for commercial purposes.

As with any product that is to be used in contact with food stuffs, DEs will need to be officially registered with the Tropical Pesticides Research Institute (TPRI) before they are made available to the general public. TPRI have been actively involved in the research programme and are also keen that farmers are given the choice to protect their stored food using an effective, safe and non-organophosphate-based grain protectant.

The sooner this happens, the sooner farmers like Catherine (see box) will not have to fear the destruction of their grain by insect pests.

Farmers assessing grain samples following storage using different protectants

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