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**DEVELOPMENT OF PROTOTYPE MOBILE SEED DRESSING APPLICATORS  
SUITABLE FOR AFRICAN COUNTRIES**

US/RAF/88/273

**Technical report: Findings and recommendations  
(6th visit)\***

Prepared for the Governments of the Republic of Zambia and the United Republic of Tanzania  
by the United Nations Industrial Development Organization

*Based on the work of J. E. Elsworth,  
Chief Technical Adviser*

Backstopping Officer: B. Sugavanam, Chemical Industries Branch

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\* This document has not been edited.

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**Report on 6th Visit. Arusha and Dar-es-Salaam, Tanzania; Lilongwe and Blantyre, Malawi; and Lusaka, Zambia.**

**May 14th to June 13th 1994.**

**Author: J. E. Elsworth, Project C.T.A.**

**1. Background**

The mainstay of the economies of the PTA countries is agriculture. Regional and national strategies accord the highest priority to attaining self sufficiency in food. The policy on pest control is to use Integrated Pest Management, of which Seed Treatment is an important component.

The project is to develop a mobile Seed Treating machine to be available to rural farmers for effective, safe and affordable treatment of their home saved seed. Initially, it is focusing upon Zambia and Tanzania.

The first visit by the C.T.A. was made in Sep/Oct. 1992 for familiarisation of the context for the machine. Broad recommendations for the design approach were made during that visit.

The second visit was in Nov./Dec. 93, to coincide with the Zambian planting season, for the treatment of trials seed. A European machine - the 'Rotostat' P500 - had been imported into Zambia as a basis for the project and to test the recommended principle with local seed varieties. Other aspects of the project were also progressed in both countries, particularly the choice of manufacturer.

The third visit was in March/April 93. A second European machine - the Hege - had been imported into Tanzania for the same reasons. This machine was demonstrated to enable seed to be treated for trials purposes. Other aspects of the project were progressed in both countries, including the attending of the first project workshop in Arusha and an inspection of the Zambian trials.

The fourth visit was in October/November 93. Trials were conducted in Zambian villages on the P500, and the prototype machines from the European Contractor, and Zambian Engineering Institute. A start was made on Market Research. Plans were made for trials in Tanzania in February/March 94.

The fifth visit was to Tanzania only, and was to conduct trials on the prototype from the Tanzanian Engineering Institute, and a second prototype from the European Contractor.

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The current visit - the sixth in the series - was to check on results and to plan the next phase in Tanzania, to plan for trials in Malawi, and to check progress, plan trials and attend the second review meeting in Zambia.

## **2. Summary.**

In Tanzania, farmers and village officials seemed generally pleased with the results of the treatment carried out in March. They advised that machines should be made available at harvest time - say starting in early July. Plans were made to have a small number of machines available for commercial use at harvest 1994. Provisional plans for further dissemination were made.

The visit to Malawi was the first in the series. Meetings were held with government officials, researchers, companies engaged in engineering, seeds, agro-chemicals, agricultural input distribution and farmers. Most contacts expressed enthusiasm for the project, and there were no voices of dissent. The SRI machine was taken from Zambia to Malawi for immediate trials.

In Zambia again farmers seemed pleased with the results of the treatment carried out in November. The second prototype was almost finished but had a little too much clearance around the rotor. Plans were made for the production of a few of a smaller (5 kg) machine for October for commercial use. The review meeting was attended. It expressed general satisfaction and enthusiasm for the project and encouraged the building of machines for commercial use as the next phase.

## **3. Recommendations.**

- 3.1 That effort be put into the creation of equipment for safe handling of chemicals.
- 3.2 That funding be considered for the rapid dissemination of the application technology being developed by the project.
- 3.3 That the SRI pedal driven machine in Zambia be imported into Malawi for trials, (done).
- 3.4 That this machine be used by Chitedze Agricultural Research Station for tests, demonstrations and actual farmer trials, using 'Fernasan' D imported from Tanzania.
- 3.5 That trials be undertaken in November by Mt. Makulu to supplement those carried out in 1992/3.
- 3.6 That the efficacy of stored product insecticides in various formulations when used in the prototype machines be investigated as a collaborative programme between TPRI and NRI in UK.

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#### **4. Acknowledgements.**

Mr Msolla had a major distraction at the time of the visit, but still managed to facilitate the visit so that effective use of the available time was made.

Mr Kazembe accompanied the author for the entire week and demonstrated boundless enthusiasm for the project.

Dr Kwendakwema again facilitated the visit, and the exhibits and demonstrations given at the review meeting.

#### **5. Tanzania.**

##### **5.1 Village Reaction.**

Visits were made to the two villages where farmers' seeds were treated during the previous visit. These are Imbasseni and Kikatiti villages, USA River area. Village officials and relevant farmers were consulted. Although there is no outstanding success story to quote, they appeared to be generally satisfied with the results at this stage. (The harvest was still some two months away.) In answer to questions about the bearable price of a seed treatment service, all said that TSh 50 per kg was acceptable, and some extended it to TSh 100 per kg.

There was a general view that the time to offer the service was harvest, rather than planting. This is the time that seeds are selected from the crop. Both they, and food grains could then be treated with their respective chemicals. There was a feeling that the current method of application of food storage insecticides left much to be desired, and this confirms other statements made to the author.

The price of commercial seed was given as TSh 500 per kg, and one village official commented that this seed was the best. The author agreed and commented that this project does not attempt to compete with commercial seed, but to provide a treatment service to those farmers who, for one reason or another, choose to save their own from the previous crop.

##### **5.2 Biological Trials at TPRI.**

The trial plots at TPRI were inspected. Again there is no obvious difference between any of the treatments at the current growth stage, with either the maize or the beans. There is a further trial site for beans at Babati district, and for maize at Kilimanjaro district.

### **5.3 Discussions at TEMDO.**

Data on the positioning of tractor hitch points for the tractor mounted machine, provided by Silsoe Research Institute, was passed to Mr Baytani, the engineer in charge of the project. This will enable a design to be drawn up of a Mk II tractor mounted machine, incorporating the modifications suggested during the previous visit. (Later, after details of the proposed gearbox had been received, a proposal for a revised tractor mounted design was given to Mr Msolla.)

The recommended modifications to the tractor mounted machine had been started. The lid had been hinged to give good access for charging with seed, without having to remove it completely. The recommendation for the discharge chute was changed to extending the width by 4 inches on the downstream side of the chute. Since this will make it too wide for small bags, it was suggested that the upstream side could be tapered across to keep the actual discharge point the same size as before.

In discussion with Mr Msolla, Director General, and Mr Baytani, the following plans were drawn up.

- 1) The two forthcoming agricultural shows to be attended with both types of machine (tractor mounted and pedal powered) on show. These are:
  - a. The International Agricultural Show at Dar-es-Salaam in July, and
  - b. The Tanzania Agricultural Society Organisation show at Arusha in August.
- 2) Two further machines of each type to be built. The tractor mounted to be to the above Mk II design. The pedal powered design to be taken from the successful Silsoe Research Institute machine. Drawings were requested. (SRI has sent them direct to Mr Msolla.)
- 3) Both types of machine to be demonstrated early in the harvest season, in a number of villages in a wide area, and offers from entrepreneurs invited for purchase of the six machines then available. These entrepreneurs to be given some training in the use of the machine and the handling of the chemical. The experience thus gained to be monitored closely.
- 4) A pilot production batch of, say, 10 machines of each type to be manufactured for sale for the 1995 harvest season. This depends upon some finance becoming available. (Later provisionally arranged with Dr Sugavanam.)
- 5) A chemical mixing and metering system to be designed and built in order to facilitate these operations, which have proved to be time consuming in the demonstrations so far. (Later, a suggested design was given to Mr Msolla.)

### **5.4 Discussion with Mr Felix Mathenge.**

Mr Mathenge is a seed technologist working with FAO in Dar-es-Salaam. He revealed that there are plans to encourage individual farmers in the rural areas to become producers of seed. This is a SADC project and is common to a number of countries in the region. This project could improve the quality of seeds available to rural farmers whilst still retaining an ability to use varieties favoured by particular communities. The existence of an appropriate seed treater could improve its viability and the two projects are mutually reinforcing.

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#### **5.5 Discussion with Mr Z.J. Masanje, SADC, Dar-es-Salaam.**

Mr Masanje was up-dated on the progress of the project. He suggested a deeper involvement of TFA as possible end users of the machine as well as possible selling agents and chemical distributors. He also confirmed the Rural Seed Production project, and gave the contact person for that project as Mr Mugwara, in the SADC office in Harare. (The Harare office has responsibility for agricultural projects within the community.)

#### **5.6 Discussion with Mr Raymond Mbonika of AgrEvo.**

AgrEvo is the amalgam of Hoechst and Schering, and now claims to be the second largest agro-chemical company in the world after Ciba-Geigy. It distributes 'Decis' which contains deltamethrin, a pyrethroid insecticide. (This group of insecticides is effective against the larger grain borer - a serious pest of food grains in Tanzania.) However, the 'Decis' formulation sold in Tanzania is not suitable for use on food grains. The one required is called KO3, and AgrEvo would be willing to import samples for experimental work if necessary. No indication of the cost was available.

#### **5.7 Discussion with Ministry of Agriculture.**

Mr Mtolera, assistant to the National Seed Co-ordinator was seen, and by chance Mr Swai, manager of the Arusha Seed Farm, was also present. Thus not only was a project up-date enabled, but the question of the purchase of a tractor mounted seed treater from TEMDO was also progressed. Mr Mtolera confirmed the ministry's view of synergy between the current project and the rural seed production one.



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## **6. Malawi**

The Malawi authorities are enthusiastic about the project, and see seed treatment and food grain protectants as having equal priority.

### **6.1 Malawian Agriculture.**

Maize is the dominant crop, although a range of other crops are grown including ground nuts, cowpeas, beans, pigeon peas, sunflower, sesame, sorghum and tobacco. Certified hybrid maize seed is available from the two seed companies, National Seed Company and Lever Bros. It costs about MK 4 per kg from the government distributor. (Admarc) This is a subsidised price, and only available (theoretically) for small farmers. The non subsidised price is MK 4.4 per kg. Less than 8% of the maize grown is certified, the remainder being farmer saved. Admarc buy in maize food grains for storage at MK 35 for a 90 kg bag.

Thus the ratio of maize seed to crop price is about 10:1 compared with 5:1 in Tanzania. This makes the treatment process more cost effective in Malawi compared with Tanzania.

Yields in Malawi were given as 8 to 10 bags of 90 kg each per acre, say 2 tonnes per hec., compared to the data for Tanzania of 1.5 tonnes per hec. It is perhaps worth noting that estate maize growers produce about twice this yield per hec.

The 1993/4 season has seen a deficiency of rain, and the crop is poor. Maize will have to be imported by the Malawi government to prevent starvation. The villagers visited in the Lilongwe area estimated 75% losses this year due to drought.

### **6.2 Opportunity to test machines quickly.**

The harvest season in Malawi is from approximately end of May to end of July. (The planting season is approximately from end Sep to end Oct.) Thus it was just beginning and so the opportunity to introduce the machine and demonstrate it to some rural farmers was during the following two months. The Zambian based SRI machine was therefore imported for immediate demonstrations and farmer trials.

This operation will require a chemical product. The seed companies do not use a proprietary product, but make their own "cocktails" - an inappropriate procedure for village use. It is therefore recommended that a supply of 'Fernasan' D be imported from Tanzania.

### **6.3 Discussion with Chief Seed Technologist at Chitedze Agricultural Research Station.**

Dr Luhanga was supportive of the above plan. He would require to carry out some tests on the machine before it was used on farm. These would be assessments on the treatment quality and physical damage, and germination tests. These would be carried out on a range of seeds.

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#### **6.4 Discussion with Chief Agricultural Research Officer.**

Dr Munthali is in charge of all of Malawi's agricultural research and was familiar with the project. He was particularly supportive of the idea of using farmer's clubs to support dissemination. (See below)

#### **6.5 Opportunities to sell machines.**

Many Malawian farmers are organised into farmers clubs with about 30 farmers per club. It has been suggested by the Programme Manager of Agricultural Development Divisions (ADDs) that some of these may be interested in the purchase and operation of pedal powered seed treaters. There are about 15,000 of these clubs so that if 10% of them were to purchase machines over a 10 year period, this would represent a market of 150 machines per year.

There are probably opportunities to sell the tractor powered machine to estate growers and seed growers. (See below - Lever Bros.)

#### **6.6 Seed Companies**

##### **6.6.1 National Seed Company of Malawi.**

The company is now 55% owned by Cargill Seeds, 22.5% by CDC and 22.5% by Admarc (acronym for agricultural development and marketing - a parastatal agricultural trading company). Seed sales have slumped from 7,500 tonnes last year to 3,500 tonnes this year as a result of the reduction of subsidy which is (theoretically) only available for the small farmers, and the cessation of credit facilities. Less than 8% of the maize seed planted in Malawi is now certified. The seed varieties in the rural areas is very mixed, including some hybrid parentage.

Other seeds besides maize are also handled, e.g. sorghum, beans, etc., but sales are insignificant.

A well organised seed company, with good control over the treatment process. The product used is 0.5 kg of technical (80%) thiram, 13 ml of 'Actellic' 50%, and 55 g Sodium Molybdenate per tonne of seed. The total application rate, including water is only 5 l/tonne. Two Gustafson treaters are used in parallel.

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### **6.6.2 Lever Bros. Seed Division.**

Lever Bros. are the only commercial oil expressing company in Malawi, and became involved in the production of hybrid sunflower seeds to ensure a supply of good quality grains for crushing. Having set up a plant for sunflower seed, they then diversified into maize to improve its utility.

575 tonnes of maize was produced for the last planting season, but only about half was sold because of the cessation of the government credit scheme. This year credit will be available from the Smallholder Credit Administration - the privatised version of the former Rural Finance Bank.

80 tonnes of sunflower seed will be available for this year's planting and it is expected that most of it will be sold. Lever Bros. guarantee to buy back the sunflower crop for MK 1.3 per kg.

The product used for both crops is 0.8 kg of technical (80%) thiram, and 17.3 ml of 'Actellic' 50% per tonne of seed. The total application rate, including water, is 8 l/tonne. A Dow Meteor machine is used. The seed is quite dusty at the time of packing, and some cheap form of "sticker" is required.

Lever Bros. are interested in decentralising their seed production. Since the seed itself is produced on farm, they plan to carry out all the processing, including packing, on farm. They are very interested in purchasing a number of tractor mounted seed treaters to assist with this development. However, the slurry being used is not stable and a system of continuous agitation is desirable. This could be incorporated into the design of the machines.

## **6.7 Potential Manufacturers**

### **6.7.1 B&C Engineering.**

A large and well organised engineering company, handling machines from maize grinders to small ships. All the requirements for seed treater production are present, except casting, which would be bought in and machined in house.

### **6.7.2 Malawi Iron and Steel Co. (MISCO)**

This company includes an iron founding facility, with the capability of producing the castings envisaged for the seed treaters. However, the foundry was not actually seen.

### **6.7.3 ENCOR**

The primary product of this company is cooking pots and bowls made by deep pressing. However, a precision engineering division and a fabrication facility also exist which would be capable of making the seed treaters from bought in castings. They are orientated towards batch production.

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## 6.8 Chemical Companies

### 6.8.1 Shell Chemicals.

The only seed treatment sold is technical Thiram - 80% pure. They do have a malathion wettable powder, but it is not marketed for food grains storage.

Shell's agrochemical business has been sold to Cyanamid of USA, and the Malawian company will shortly become Cyanamid (Malawi). It is then possible that a liquid malathion may become available. It was not known if Cyanamid have any other seed treatments which might be of interest.

### 6.8.2 Chemical and Marketing Co.

This company was formally Zeneca (Malawi) (previously ICI) and still acts as an agent for that agrochemical company. Powder 'Actellic' is sold in 40 g sachets for admixture with a 90 kg bag of shelled maize. 'Actellic' Super has just been launched in the northern area where the larger grain borer has been identified following the importation of maize grains from Tanzania. 'Actellic' liquid is also sold in 250 ml and 1 l packs. Among other uses, it is recommended for the spraying of grains stores, the outsides of bagged maize, and for spraying onto maize grains as they pass on a conveyor into store.

## 6.9 Distribution - ATC.

The Agricultural Trading Company are a subsidiary of Auction Holdings - themselves 51% owned by Admarc. The other 49% is in private ownership. They distribute a number of small machines, tools, and chemicals to farmers. They are an apparently promising distributor for the seed treaters and chemicals. They expressed considerable interest in the idea of demonstrations and tests during the current harvest, and would like to participate in them to give first hand experience of the machine.

## 6.10 Rural Farmers

A visit was made to Mphampanya village, about 15 km from Lilongwe, in conjunction with Mr Ng'ambi - Field Assistant in Lilongwe E Rural Development Zone. There are 17 farmers in the village - all farming individually. They were formed into a farmers club with another village, but now intended to form their own club. The average land holding is 0.5 hec. Principal crops are maize, ground nuts, beans (interplanted with the maize - also a common practice in Tanzania) and soya. Most of seed is from retained crop. Sometimes it is bought from the local store in which case it is normally hybrid. Sometimes the progeny from this seed is planted, even though they admitted that it did not grow well. In a good year they have crop to sell, but in a bad year, such as the current one, they do not have sufficient crop to last the year.

Storage chemicals are only used on hybrid crop since it is more vulnerable. Doubts were expressed about their effectiveness. Poor application may be a contributory factor.

The farmers were receptive to the idea of treating their seed before planting and felt that 50 - 70 tamba per kg would be acceptable. They asked if the machine could be made available to them this year.

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## **7. Zambia.**

### **7.1 TDAU**

The prototype pedal driven machine was almost complete. The mixing chamber had been re-designed and now consisted of a cast aluminium rotor housing and a plough disc rotor. The latter had been brought to TDAU as a spare to their machine by the SRI team, and had been machined down to suit the 480 dia of the new prototype, c.f. the SRI machine of 500 mm dia. Unfortunately, the gap between rotor and housing was too large, and the fit of the rotor boss on its shaft was loose. These factors effected the performance of the machine. When handling sorghum, some of the seeds fell through the gap and the rotor jammed when it stopped.

The following course of action was proposed by TDAU.

1. Build 4 machines to the same design concept but with a diameter of 400 - 420 mm (equivalent to 5 - 6 kg of maize.)
2. Sell two of these within Zambia, and one to Malawi. Keep one for local trials, further development, and assistance with technology transfer to a manufacturer.
3. One of the Zambia machines to be sold to Riverside Farm Institute. The other possibly to a sister institute.

### **7.2 Mt. Makulu.**

The lack of a proper report on the 1992/3 trial was again discussed. Mr Malenga finally delivered it to PTA on Monday 6th June - one day before the review meeting.

The possibility of further trials in the 1994/5 season was discussed. Normally, biological trials should cover a number of growing seasons to cater for climate variations. It was not known if any of the money to be paid under the terms of the agreement with UNIDO has been paid.

In the absence of the director, the deputy director, Dr Mwale, was invited to the review meeting.

Two short meetings were held with Mr Chalabesa, the contact person for Mt. Makulu, who is currently seconded to the Environmental Council. The disappointing contribution of the institute was explained to him, and he undertook to see that trials were conducted and reported properly during the 1994/5 growing season. He is scheduled to return to Mt Makulu before the planting season, so this should not present the problems this year that it did last.

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### **7.3 BMS Engineering Ltd.**

A visit was paid to this company, who are part of the Opollo Group of companies. Mr Dave Stonelake, Works Manager, was seen.

The traditional business of BMS was bus bodies, but this is now declining, and they are manufacturing maize mills. Problems with distribution through dealers have been experienced and the company will be setting up it's own distribution system. They will be importing a small tractor from S. Africa for distribution in Zambia. The seed treater could be a further compliment to both their manufacturing and distribution businesses.

### **7.4 Village visits.**

The villages of Chakola, and Mulawo, where villagers' seed was treated last November, were visited. The general view of the farmers was that the treatment had been beneficial, and they said they would be prepared to pay ZK 100 per kg to have their seed treated if a service was available. This was despite the very poor harvest resulting from the premature ending of the rains. ZK 100 is the amount considered to be economic from the entrepreneur's point of view.

The point was made that those farmers who planted early had a reasonably good harvest. Early planting is often not possible with certified seed because of it's late arrival in the local depot - and these farmers are only 100 km from the seed plant in Lusaka. The treatment should be at harvest time so that the seed is protected from weevils during storage.

One farmer, Mr London Mwiinga, who treated his retained local variety, planted part of his field with treated seed and part with the same seed, untreated. The treated seed germinated better and stayed ahead of the untreated for the whole growing season. This enabled it to yield, albeit poorly, whereas the untreated seed yielded nothing.

### **7.5 Review Meeting.**

This was held at PTA on June 7th and 8th. All four African institutes were represented at senior level. SADC was also represented, but unfortunately, GTZ were not. The author presented a paper giving a summary of the current project status and plan. The meeting endorsed the ambitious plans of the engineering institutes and agreed a plan which goes beyond the project document in terms of dissemination. It also recommended a trials programme for grain protectant products to fill the several gaps in our knowledge on this subject. Details of the meeting are contained in the minutes, to be issued by PTA.

Appendix A P. 1

**Institutions / Personnel visited.**

**Tanzania - Arusha.**

1. T.E.M.D.O.      Mr G.Msolla,      Director General      **Contact person for the  
Project in Tanzania.**  
Mr W. Beytani,      Project Engineer for the project.
2. T.P.R.I.      Dr F.Mosha,      Director.  
Dr B. Uronu,      Principal Scientific Officer.
3. National Seed Foundation Farm  
Mr Assenga      Assistant Manager
4. Ministry of Agriculture.  
Mr Mwale      District Agricultural Mechanisation Officer.  
Mrs M ?      District Livestock Officer.
5. Imbasseni Village  
Mr Sekei      Asst Secretary for Village.  
Mr Gladstone      Chairman of one section of village.  
Mrs Major-Matoto      Farmer.
6. Kikatiti Village      Mr M.Isangya      Ward Executive Officer.  
Mr Pallangyo      Farmer.  
Mr Saraki      Farmer.  
Mr Mollel      Farmer.
7. FAO      Mr Felix Mathenge      Seed Technologist

**Dar-es-Salaam**

8. Ministry of Agriculture  
Mr Mtolera      Asst to National Seed Co-ordinator. (Mr E.J. Lujuo)  
Mr Swai,      General Manager of Arusha Seed Farm.
9. SADC      Mr Z.J. Masanja      Senior Industrial Economist.
10. AgrEvo (Formerly Hoechst - now with Schering.)  
Mr R. Mbonika      Country Agricultural Manager
11. UNIDO      Mrs Mlay      Secretary to Mr Krsiakov  
Mr Akim      Assistant to Mr Krsiakov

**Appendix A P. 2**

**Malawi - Lilongwe**

**12. Chitedze Agricultural Research Station**

Mr E. Kunkwenzu Senior Farm Machinery Research Officer.  
Mr H. Kazembe-Phiri,  
Farm Machinery Research Officer.  
Contact person for the project in Malawi.  
Dr J. Luhanga Head of Seed Services Dept.

**13. Ministry of Agriculture**

Dr J. Munthali Chief Agricultural Research Officer.  
Mr Ng'ambi Field Assistant - Land husbandry.

**14. Ministry of Commerce, Tourism and Industry.**

Mr C.C. Kachiza Principal Industrial Development Officer.  
Mr K.L. Chpeta Industrial Development Officer

**15. Farmers Mphampanya Village, Lilongwe E. Rural Development Programme Zone.**

**16. National Seed Company.**

Mr K. Whisler General Manager  
Mr Lungu Production Manager

**17. Lever Bros. Dr H.M. Chimoyo Agribusiness Programme Manager.**

**18. B&C Engineering.**

Mr Chinamale Project Engineer.

**19. Malawi Iron & Steel Company.**

Mr N.Z. Phiri Engineer.

**20. Encor.**

Mr G. Human Manager - Precision Engineering Services.

**21. Shell Chemicals. Mr T. Katalama Product Development Advisor.  
(Will be Cyanamid Malawi very shortly.)**

**22. Chemicals and Marketing Company.**

Mr H. Tembo. Agrochem representative, (South.)

**23. ATC**

Mr R. Kahumbu Branch Manager (Blantyre)  
Mr S. Mkwate Branch Manager (Lilongwe)





UNIDO COMMENTS

The sixth report in the series has clearly initiated the action of introducing the machine to the village level. The SADCC project to assist rural farmers to become producers of seed make the mobile seed treater an important contributor to dress the seed at the village level. The pedal operated and the tractor operated machines once optimized for performance would be an ideal additional strength to the participating countries.

The proposal to include stored grain treatment would enlarge the scope of the project.

The earlier reports have already been discussed in the tripartite review meeting.