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ASSISTANCE IN START-UP OF PESTICIDE FORMULATION PLANT AT MOSHI

SI/URT/93/802

TANZANIA

Technical report: Findings and recommendations*

Prepared for the Government of the United Republic of Tanzania
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

*Based on the work of I. Bendefy,
formulation technology specialist*

Backstopping Officer: B. Sugavanam
Chemical Industries Branch

United Nations Industrial Development Organization
Vienna

* This document has not been edited.

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SUMMARY AND RECOMMENDATIONS

The plant has a clear and well organized **layout** with spacious transport roads and sufficient distance zone around the boundaries. The green area within the plant is kept in good shape with continuous care. However transport roads where forklift- as well as heavy truck traffic is foreseen need to receive firm cover.

The **technical level** of machinery and equipment is up to international standards. With proper maintenance and by keeping the operating instructions it can be operated without causing any harm to either to the staff within the plant or to the environment beyond battery limits.

The erected **facilities** have been inspected at non working condition and detailed recommendations are presented under "C. Inspection of the equipment".

Availability of raw materials for **performance testing** has been controlled; findings and detailed recommendations are given under "D. Check on raw material for performance tests".

The status of the **Quality Control Laboratory** has been investigated in detail by Dr.Klaus Ziller, expert in quality control who presented his findings in a separate report. The laboratory needs substantial support in equipment, chemicals' provision and training of personnel to ensure smooth and effective assistance to the production.

The **Formulation Research and Development** activity should be located at the Moshi Plant. The respective UNIDO Project - already aproved - needs to be implemented without delay. The pilot units available at the plant should be provided with operating instructions. Future head of R&D Laboratory should be nominated and sent for training, as included in Project Identification (1) presented in Annex IV.

The range of **products** set forth in the contract has been investigated and - because some of them have been cancelled in the meantime - further products, deemed suitable for both production in the pesticide factory and for use in the country, identified. Details are presented under "F. Scope of the formulated products".

This extended list of products should also be considered as a **program for the R&D Laboratory**, as soon as its operations start. The program should also cover inclusion of locally available raw materials (e.g. caolin) into the receipts.

It has been confirmed that Copper Caffaro was granted **registration** by TPRI. TECNIMONT claims that Atrazine 500 Flowable registration is being processed by Baslini, Italia. A registration coordinator should be appointed at the Plant (the Head of Formulation Research and Development Laboratory could perform this job). With his and TECNIMONT assistance further contract products' registrations should similarly proceed. Trial production shall recieve special attention at TPRI.

It is thought very essential that the formulated products produced by the Plant reach the users in original packing in order to **avoid contamination** of the environment. Therefore it is recommended that a second packing line be established in the Wettable Powder formulation workshop. Fitting of the line to existing facilities needs no modifications. UNIDO assistance should be sought for the establishment of the said unit. Respective Project Identification (2) is presented in Annex V.

Needs and potentials for the **extension of the facilities** have been investigated in the Wettable Powder formulation workshop and detailed recommendations are presented under the same title.

During the performance tests the quantity and quality of effluents should carefully be recorded and efficacy of elimination evaluated.

Recommendations of the previous mission (Mr.Gimeno, March, 1992) still need to be observed, including implementation of a project to control final effluents by and **incinerator**. Related to this item a Project Identification (3) has been prepared and presented in Annex VI.

The **medical room** should be provided with furniture and basic first aid kit. One copy of the First Aid Manual should be placed to the medical room. A full time nurse assistance is recommended. UNIDO's individual health record forms (abt. 30 pcs "PESTICIDES WARNING CARDS") were handed over to the management for use in the future when formulation of organophosphates or carbamates will start.

The production management needs further training in Pesticides' Formulation as well as assistance of consultants and/or CTA in their everyday work. Suggested **training programme** is presented included in Project Identification (1) in Annex IV. To support the training or even to anticipate it UNIDO should provide some basic **literature** for the Plant Management.

I. BACKGROUND AND HISTORY OF THE PROJECT

The economy of Tanzania is largely based on the productivity and efficiency of its agricultural sector producing for local consumption as well as providing export revenues. Use of agrochemicals, including plant protection products, together with modern farm management practices play an increasing role in crop production and provide a steady and even increasing market for pesticides in Tanzania. Upon recommendation of a fact finding mission in 1976 the Government of Tanzania has given priority to the establishment of a pesticides manufacturing and formulation plant in the country.

A feasibility study based on market evaluation was prepared for the project as early as 1979/80 by two experts from UNIDO following the request by the Government of Tanzania. The feasibility study recommended the establishment of a pesticide complex for manufacturing copperoxychloride 3000 t/year as well as formulating the following types of pesticides:

| | |
|------------------|-------------|
| wettable powders | 3000 t/year |
| granules | 2000 t/year |
| flowables | 1500 t/year |

The type of pesticides to be formulated as wettable powders and granules was recommended to be insecticides while that of flowables to be herbicides

The estimated cost for the project at that time (1980) was TSH 127,0 million of which TSH 60,3 million should have been in foreign currency (equivalent to 7,5 million USD with 1 USD = 8,04 TSH). An investment proposal based on the study was approved by the National Development Corporation Board* for implementation. The location of the plant was originally suggested to be in Arusha area and later decided to be in Moshi.

Efforts to secure foreign financing were made through TIB and the World Bank which approved an application for the said funds. However before all formalities were completed the World Bank withdrew their offer. Efforts to find alternative sources of foreign funds succeeded in 1984 when the Italian Government offered to extend a soft loan to the Tanzanian Government for the project. Due to the delays, however, the study was already outdated. Therefore TISCO, a local consulting company was given the task of updating the feasibility study in order to obtain realistic cost estimates. The updating confirmed the feasibility and resulted in a new cost estimate amounting TSH 567,6 million including 123,5 million working capital and equivalent of 354,3 million in foreign currency.

* With the establishment of National Chemical Industries (NCI) with effect from May 1, 1980, to promote the development of the chemical industries sector in Tanzania, the Pesticides Project was transferred from NDC to NCI.

Soon after the appraisal, tenders were invited for the supply of machinery, know-how and services. TECNIMONT of Italy were selected and a contract was concluded between them and NCI at a contract price of USD 12,38 million. Negotiations with the Italian Government to increase the original grant by additional 4,9 million USD in order to match the contract value became successful in 1985. The Financing Convention was signed in March 1986 with 20% down payment for the contractor effected in August the same year. By this time, however, prices fixed in the 1984 contract already expired by 5 months and accordingly a 22% price increase was requested by TECNIMONT. As a solution, conversion of the original USD price into ECU was agreed in 1987 as an amendment to the contract.

The implementation of the project started in 1986/87 with the erection of houses to accommodate engineers coming for the construction of the plant and was followed by the erection of the workshop buildings. In early 1990 already 80% of the civil works were completed and 90% of the machinery and equipment already delivered to the site. In the meantime it was agreed that the formulation of the granules will be cancelled from the products designed for formulation originally. The rest of the complex has been erected by TECNIMONT in 1990/92.

The installation of the Moshi Pesticides Project caused great concern amongst the people of Moshi about the safety of the plant and the problems of environmental contamination related to its operation. This has been used by the local Green Party as a political tool with clear distortion of the real facts and supported by non scientific argumentation. Finally this resulted in a close down of all activities for a period of two years before start-up activities and performance tests could continue to be carried out. Meanwhile several efforts were undertaken by NCI and the Government to satisfy the local public that safety has been given utmost importance in the operation of the plant and that no significant environmental pollution is produced under normal conditions.

A high court decision of 1994 enabled NCI to resume activities in 1995. Accordingly TECNIMONT returned to the site and is presently going on with pre-commissioning and commissioning operations.

II. ACTIVITIES

A. Introduction

Dr. I. Bendefy served in Moshi, Tanzania from 5 to 30 May, 1995 at the Pesticides Manufacturers Ltd. plant with consultation before and after the mission at Dar es Salaam at UNDP headquarters and NCI headoffice respectively.

The objectives of the mission were to provide advisory assistance and supervise the start up of the plant and make sure that the plant is properly inspected and all items of equipment are in good functional order.

It was expected to ensure on-the-job training in the plant and give them raw material purchase programme, name of suppliers and methods of ordering raw materials.

He was assisted by Dr. Klaus Ziller, expert in quality control, who was expected to scrutinize the activities in the laboratory and provide on-the-job training to the laboratory personnel.

B. Activities during the mission

When arriving to the site the plant was found just at the beginning of the start-up, pre-commissioning and commissioning operations being carried out by TECNIMONT staff. TECNIMONT decided to proceed step by step with provision of the utilities first, followed by the start of the hydrochloric acid production (planned by end of June), manufacturing of copperoxychloride, then finally going to the formulation facilities.

This organizational set-up was matching the fact that

- in the plant there was available raw material only as much as was needed to carry out the performance tests,
- the staff of workers was not sufficient to service the whole plant at the same time.

In this given situation that the production equipment was not yet functioning, accordingly on-the-job training was not possible it has been decided in consultation with the counterparts that

- an inspection and evaluation of the erected, not yet commissioned equipment will be undertaken,
- the production management will be given theoretical training in formulation of pesticides,
- short description of the processes in the plant will be prepared to provide initial information for future experts,
- a check will be made to identify potential problems at the foreseen performance tests,
- a visit will be organized at TPRI, Arusha, to discuss matters of registration and the situation of Formulation Research and Development Project.

C. Inspection of the equipment

The sampling points are foreseen to be marked with tags fixed to the valves. This would allow that later at repair of the valves they be lost or returned to wrong place. Therefore it is recommended instead to paint white sections on the pipes close to the sampling points and mark those with numbers painted on them.

The hole in the platform through which copper is hoisted into the reactor R-101, should be surrounded by rail. For closure a hinged lid of either wood or steel is preferred to the present one.

There is no provision to notice eventual overflow from the mixer D-114, which would be useful.

Normal operating procedures reads: "Continuously check visually D-114 level". However the manhole through which the level could be checked is fixed with 10 bolts - should be a hinged lid instead - and there is no light provided.

Calcium ligninsulphonate can be carried to the upper floor to be fed into the dissolving tank D-105 only manually on the stairs outside the building. It is recommended instead to shift the whole unit of D-105 to the ground floor and send the liquor prepared in it through pipeline up into the mixer D-114.

Among operating procedures should be mentioned that in case that by any reason the feeding of the cake to the spray drier by GY-102.1 pump stops, the feeding of the liquor by G-105 pump should also be stopped.

The D-105 vessel should be provided with a level indicator (watch glass). As the withdrawal of the liquor is continuous but the preparation of it is made in batches, it is recommended that after the first batch made prepare half amount of a batch only by feeding 75 lit of process water and adding 25 kg of calcium ligninsulphonate as soon as the level has sunken to half of the total volume.

There is no rim around the platform hole above the Y-102 drier unit and so there is nothing to prevent water coming from the next door room when the floor is washed from dropping down into the area of the drier.

The charging platform for D-118 mixer is too far from the hopper. It should be extended and the front rail lowered to allow the door of the hopper to rest on it when charging.

It is feared that the valve below the hopper D-118 will be blocked by powdery material. A butterfly valve would be appropriate for the same purpose instead.

The front doors of the mills P-210 and P-211 are fixed with nuts instead of wheels, what would be much more appropriate. To rectify the situation a handle made of a 12 cm piece of 1/2" steel pipe should be fixed to the nuts by electric welding to enable the operator to fix the nuts firmly when closing the door without additional tool needed, or open them.

The airlocks attached to items P-208, D-201.A, F-203, H-200.4, F-204, H-200.5, DY-202, KY-202 and H-200/C bear small imprinted A and C letters to show open or closed status. These marks are not visible from greater distance and can be misleading instead of abbreviations in English O and C. It is recommended to provide the airlocks with well visible signs showing their status.

The tank D-320 collecting cooling water should be protected against sun irradiation to save cool energy.

The differential pressure meter on the filter F-301 should be taken down to the ground level and fixed on the supporting structure at eye height to allow regular observation without mounting up to the structure. The present location is not accessible easily.

The pilot pearl mill is placed in an area where transport of raw material by forklift truck is foreseen. It is recommended to shift the apparatus in the corner, behind the control panel by shortening the respective pipelines

The apparatus bears a wrong number.

The battery of gas cylinders behind the laboratory building should be protected against sun irradiation which may result in overheating and consequent explosion.

It can be foreseen that raw material sometimes may arrive in condition of being blocked into drums or other packing. To be able to handle such cases and still keep the material clean it is recommended to prepare of strong enough steel-sheet a tray large enough to receive about 100 kg of material and surrounded by a rim preventing the material from scattering.

D. Check on raw material for performance tests.

Performance tests will be carried out only after the mission ended. During the mission it was only possible to make an assessment whether everything is available to perform the tests.

Suspension concentrates' production

From the 15 t atrazine active substance available it will be possible to produce 27 batches of Atrazine 500 SC i.e. GUGUCIDE 50 FW which will make a total of 28.809 kg of formulated product. The atrazine content of it (calculated on 98% a.i. basis) will be 50,5%. The major part of the production will be filled in 1 l^l, the minor part in 5 lit plastic containers (to be supplied by a local firm).

Labels for the containers have been printed, specimen is attached in Annex VIII.

| Sr. No. | Material | Quantity for one batch | Quantity for 27 batches | Available |
|---------|--|------------------------|-------------------------|-----------|
| 1. | Atrazine technical 98% | 550 | 14850 | 15000 kg |
| 2. | Soprofor FL (amino salt of ethoxylated polyarylphenols) | 32 | 864 | 1000 |
| 3. | Geroxon T/36 (sodium polycarboxylate) | 5,3 | 143,1 | 150 |
| 4. | Synthetic antifoam | 2,1 | 56,7 | 1000 |
| 5. | Monoethylene glycol | 53,3 | 1439,1 | 1500* |
| 6. | Attagel (attapulgit) | 32,1 | 866,7 | 908 |
| 7. | Formalin 40% (formaldehyde) | 3 | 81 | 230 |

*Monoethyleneglycol has been delivered in unmarked second hand barrels, their content being proved only by oral statement of the management.

It is recommended that any material coming into the plant without being marked should immediately be marked. Documents showing quantity and certified quality of the arriving material should be kept in the storekeeper's office.

Water solubles' production

Formulation of Gramoxone and Reglone foreseen in this section of the workshop has been cancelled, however the performance test may be carried out with process water.

Wettable powder formulation

Due to shortage in funds as well as the sensitivity of public there was no provision made for raw materials for the performance testing in this workshop. However the copperoxychloride produced will provide opportunity to carry out the performance test with that.

Copperoxychloride production

From the available 44.175 kg of copper wire it is possible to produce (stoichiometrically) 88.350 kg Copperoxychloride 50 WP, i.e. TANKOPA 50 WP. Calculating this way it is foreseen to manufacture and formulate batches of 44 x 2000 kg.

| Sr. No. | Material | Quantity for one batch | Quantity for 44 batches | Available |
|---------|--------------------------|------------------------|-------------------------|-----------|
| 1. | Copperoxychloride 57,6% | 1740* | 76560 | 76693 kg |
| 2. | Calciumcarbonate powder | 180 | 7920 | 40700 |
| 3. | Calcium ligninsulphonate | 80 | 3520 | 12000 |

*The raw copperoxychloride contains also calcium ligninsulphonate added in the process in liquid form, 16 kg/batch, above the 80 kg which is added in powder form.

The consignment of calcium ligninsulphonate stored in the warehouse became hardened from moisture due to poor packing. Accordingly it cannot be used in the present status (moisture 12% instead of 6% specified).

For the use in liquid form solubility was tested and found satisfactory, however the material must be broken into parts of 40-50 mm to allow entering the vessel D-105.

For the use in powder form it is recommended to prepare a pre-mix in mixer P-209 of 50% calciumcarbonate and 50% calcium ligninsulphonate, the latter broken into parts not bigger than 15-25 mm and mill it twice on mills P-210 and P-211. The withdrawal may happen through a butterfly valve and a bagging head fixed below the junction of the screw conveyors beneath the mixer P-207. In case the material proves to be sticky in the mill, a weaker mix of 40% calcium ligninsulphonate +60% calciumcarbonate should be tried.

E. Needs and potentials for extension in the workshop for Wettable Powders

The process of the wettable powders, formulation, as described in Annex III. is a closed flow. Whatever composition is charged into the first mixer, that will go through the full system and - except the mills, bypassing - there is no further possibility to change it until the product appears as sealed bags. This is a great advantage at one hand, but might be a drawback at the other hand when one wished to use only part of the system. The facilities were investigated from this viewpoint and potential needs and means of execution are highlighted below.

The author wishes to remark that the presented considerations should not interpreted in a way as if the facilities in the workshop did not meet the requirements set forth in the contract between NCI and TECNIMONT.

Filling of minor packages.

The packing line of the workshop is suitable to produce packages of 5 kg to 25 kg size but no smaller ones. Many farmers in Tanzania cannot afford to buy 25 kg or even 5 kg of a pesticide. Notwithstanding that it is recommended in other part of the report to formulate products for demand of households and to be used in and around farmhouses for

purposes of public hygiene. This market sector needs also minor than 5 kg packages. Therefore it is recommended that a similar filling/packing unit to the existing one should be established aside the other one providing units from 0,2 to 2 kg. The space available for the purpose is sufficient (maybe the pilot mixer/mill should be displaced) and the storage silo has at its base plate a second outlet opening closed at present by a butterfly valve and a blind flange. The second packing line can be fed through this outlet.

Production without micronization.

In the case of fine crystalline active substances, such as e.g. lindane it is deemed possible to reach the required fineness of the material already by milling through the two perplex mills. In such cases micronization can be omitted but it is necessary to take out the material from the system. For this purpose the baseplate below the junction of the screw conveyors feeding the micronizers should be replaced by a butterfly valve and this extended by a bagging head. This way bulk milled products may be obtained which should then be brought to packing.

Filling and packing bulk products.

Bulk products may need to be packed in cases described above, or in case pesticides imported in big packing need to be repacked in smaller ones. For this purpose the manhole of the storage silo should be mounted with a hopper (joined to the suction-duct). Through this hopper bulk material can be fed into the storage silo and from this packed according to the standard procedure.

Introducing liquid substances

It is foreseen in the future to formulate wettable powders starting from liquid active substances as well. For this purpose the following extension is needed: on the 2nd level aside H/200.4 a pump has to be established on firm base frame with a flexible hose at the suction side ending in 1" s/s pipe, curved, to empty barrels of 200 lit, holding the liquid active substance. The barrel should stand on a platform scale, 250 kg capacity. A pipeline should connect the pressure side of the pump with three nozzles mounted on the top of the mixer P/209.

Production of low concentration products.

Low concentration products are formulated in two steps by producing a premix of the required fineness first and by diluting it to the final concentration in a second step. The production of the premix may start from solid or liquid active substance and may require micronization or may not, should be handled as a bulk intermediate product. For dilution the mixer P-208 should be provided with a charging hopper and a platform scale for weighing the components.

F. Scope of the formulated products

As soon as the performance tests will have been completed the possibility is given ready to start regular formulation. Already during the history of the project there happened changes in the original range of products foreseen. The project will be provided with facilities to conduct research and development aiming new products to be formulated. Considering the above a review has been prepared to identify potential new products.

Wettable powders

The original scope for products formulated in the workshop included wettable powders based on aldrin, dieldrin, DDT, lindane, carbaryl, and endosulfan at various concentrations. From these active substances listed the first three had been deleted in the meantime to comply with up-to-date safety requirements. However TPRI still maintains registration for DDT in mosquito control, therefore the production of DDT wettable powder should later be reconsidered with its restricted use for antimalaria program only. Justification for the rest of products on feasibility has been given in detail in the reports of Mr. Handa (November, 1979) and revised by TISCO, accordingly this aspect was not touched at present. Further products recommended as potential target for the extension of the product range and subject of the R&D programme are presented herebelow:

DIAZINON 40 WP

use: for the control of pest of fruits, chewing and sucking pests in coffee, tobacco, rice, sugarcane, vegetables, field crops as well as against cockroaches and flies around the house. May also be incorporated in seed dressing.

FENITROTHION 40 WP

use: for the control of coffee leaf miner, chewing and sucking insects in cereals, cotton, orchard fruits, rice, vegetables. Residual contact spray for farms against fly, mosquito, cockroaches as well as against locust and grasshopper.

MALATHION 40 WP

use: for the control of aphids, spider mites, scale insects and other sucking, chewing insects attacking fruits, vegetables, ornamentals, cotton, tobacco and pastures as well as stored products.

PHOSMET 50 WP

use: for the control of wide range of insects including alfalfa weevil, boll weevil, codling moth, leafrollers, grape berry moth and many others in alfalfa, citrus fruits, corn, cotton, grapes, peas, potatoes, etc.

PHOSALONE 40 WP

use: for the control of mites and insects including lepidoptera, coleoptera and piercing, sucking pests on perennial crops, field crops, vegetables, cotton.

TRICHLORPHON 50 WP, 80 SP

use: to control many different pest species in banana, cereals, chickpea, citrus fruits, coffee, corn, cotton, fruit trees, grapes, rice, cane sunflower, vegetables, tea, tobacco.

PROPOXUR 1 DP, 10 WP

use: in household and around farmhouses against ants, cockroaches, crickets, flies, mosquitoes, to dust bedsheets against fleas.

PROPOXUR 40 Wp

use: to control sucking and chewing insects in cane, fruit orchard, grapes, maize, rice, vegetables, cotton, alfalfa, etc.

Fungicides:

THIOPHANATE-METHYL 50 WP

use: as a systemic fungicide against a broad spectrum of plant diseases including blast, leafspot, powdery mildew, scab, blight etc. in vegetables, fruit, rice, wheat, tobacco, banana.

COPPEROXYCHLORIDE + ZINEB 65 Wp

use: broad spectrum protective fungicide against downy mildew in grapes and many other diseases in fruit crops, vegetables, potatoes, tomatoes, plantation crops.

Suspension concentrates (flowables)

The formulation programme included Atrazin 500 SC, Simazin 500 SC and two combined products: Atrazin + Simazin 500 SC (200+300) and Atrazin + Terbutryn 400 SC (200+200). Further products recommended:

ATRAZINE + METOLACHLOR 500 SC (200 + 300)

use: preemergent herbicide in maize and sugarcane.

ATRAZINE + AMETHRINE 500 SC (200 + 300)

use: preem. herbicide in maize, sugarcane, sisal, coffee, banana.

METOBROMURON 500 SC

use: selective preemergent herbicide against annual grasses and broadleaf weeds in beans, potatoes, soybeans, sunflowers, tobacco, tomatoes.

DIURON 500 SC

use: against emerging and young broadleaf and grass weeds for selective use in alfalfa, cotton, citrus fruits, fruit orchards, sugarcane, wheat and vineyards as well as total weed control.

Water soluble herbicides

GLYPHOSATE 480 WSC

use: nonselective, postemergence herbicide, controls many annual and perennial grasses and broadleaf weeds plus many tree and woody brush species in cropland and noncrop sites. Glyphosate has no soil activity, thus can be applied preplant to over 140 crops. A foliar-applied, translocated herbicide, it may be applied in spring, summer, or fall to undesirable vegetation by boom equipment, hand-held and high volume equipment and if appropriate, by aerial application.

G. Registration of pesticides at TPRI

The Tropical Pesticides Research Institute (TPRI) was established by Act of Parliament No. 18 of 8th December, 1979 as a parastatal organization under the Ministry of Agriculture, Livestock Development and Cooperatives. Among others activities of the Institute include:

a) carrying out research and to evaluate and disseminate the findings of pesticides application in relation to tropical pests in various fields; and,

b) control the importation, manufacturing, formulation, storing, distribution, selling, transportation and using pesticides in the country.

Based on the above activities, the Institute ensures that all pesticides in the country, should they used either in crop protection, human or animal ectoparasites control, antimalaria programme or in the household, are registered and are effective against the pests or plant diseases they are meant to control and are safe to humans, livestock and the environment.

In order that a pesticide be registered, the following materials must be submitted to the Registrar of Pesticides before any application for registration can be considered:

1. Duly filled in PRC-1 forms in triplicate. These are available at USD 50 or TAS equivalent a set.
2. Three copies of registration dossier containing all technical information and data on the product. This includes summaries of toxicological, environmental and efficacy data obtained in different countries.
3. A label specimen which is in accordance with the labelling requirements of the country.
4. A sample for analysis and field test.

There are four categories of pesticide registration, namely the Experimental, Provisional, Full and Restricted Registration.

Experimental Registration

A product submitted for registration is first given an experimental registration status. The product undergoes laboratory and field testing in the country. Products in this category of registration are for experimental purposes only. They cannot be imported, sold or used in Tanzania.

Provisional Registration

Products which have successfully gone through the experimental stage are upgraded and given a Provisional Registration status. Products in this category can be imported, manufactured, formulated, sold and used in Tanzania.

Full Registration

Products in the provisional Registration category, which have been in use successfully for at least three years are upgraded to the Full registration status. Products in this category can be imported, manufactured, formulated, sold and used in Tanzania.

Restricted Registration

Products which have successfully gone through the Experimental Registration may be given a Restricted Registration status. Pesticides in this category are usually very toxic; and are restricted to specific uses. Restricted pesticides can be imported, manufactured, formulated, sold and used in Tanzania.

Registration of the performance-test production

During a visit in Arusha at the Tropical Pesticides Research Institute TPRI officials were informed about the progress at the Pesticide Manufacturing and Formulation Plant, Moshi, including pre-commissioning and commissioning operations going on and performance-test production foreseen for the next months. It has been explained that the output of the performance tests is expected to be about 50 tons of Copperoxychloride 50 WP as well as 27 tons of Atrazine 500 SC. It was highlighted that in case of the regular registration procedure performed, by the time all requirements are met and the registration granted, the product would have passed considerable portion of its shelf life. Considering that the targeted products are already well known in the country and the active ingredients had been purchased together with manufacturing licence from producers already known as suppliers of reliable quality pesticides it was requested that for the above items a special registration procedure be granted. It was agreed that in case the chemical and physical characteristics of the products resulting from the performance test shall be found matching the prescribed values a restricted registration may be granted. Officials of TPRI while appreciating the concern for the registration procedure on the traditional route promised their utmost flexible and helpful attitude in the matter however pointing out that even if the restricted registration will be granted the standard registration procedure should be applied for and run parallelly. Considering the above it is necessary to initiate registration procedures for each item included into the contract (and not cancelled) to put the Formulation Plant in the legal position of starting the production thereof at any time.

Standard Registration Procedure

However TPRI promised assistance in making sales of performance-test products period of the Plant possible the standard registration procedure should be started, as stated above.

First of all a person responsible for coordination and execution of all matters related to the registration, including data collection, preparation of the dossier, maintaining contacts with suppliers of raw materials, filling in forms and submission of registration at TPRI.

For all the products figuring in the contract TECNIMONT is obliged to initiate registration procedures through his partner companies supplying the formulation know-how or alternatively make for NCI available the respective registration dossiers containing all the information required by TPRI.

For development products registration should be initiated in collaboration with the to be supplier. Samples produced within the plant should be handed over for testing as soon as possible.

H. Pesticide formulation Research and Development

Going back to the early history of the project already Mr. Handa stated in his report in November, 1973:

"The suitability of local carriers, adjuvants as well as packaging materials to be used in the pesticides formulations and the final composition of these products need to be thoroughly checked on a laboratory pilot scale and in the field before any large scale production is organized. For this purpose the existing facilities available at TPRI, Arusha may be utilized."

At the time of this suggestion the Pesticides Formulation Plant has not yet existed but its establishment had been envisaged by the expert in Arusha area, certainly next door to TPRI which situation offered a close daily cooperation between the two establishments. In following up the above suggestion as an Annex 14 to the Report on Mission to Tanzania (SI/URT/86/075/11-01/32.1.g/ by Dr.K.Szabó a detailed Project Document has been prepared with the following main features:

| | |
|--------------------------|----------------------------------|
| Project Title: | Assistance to the TPRI at Arusha |
| Estimated starting date: | 01/1992 |
| Duration: | 1 year and 5 months |
| UNDP contribution: | USD 697,000 |
| Government inputs: | 1,000,000 Tshs. in kind. |

At the time of the present survey the situation has changed and is at present as follows:

- TPRI still has laboratory space earmarked for the project
- TPRI has no laboratory equipment either laboratory scale or pilot scale to conduct formulation R&D activity
- TPRI has no trained personnel and no expertise in this field either at graduated or assistant level.

- The Pesticide manufacturing and formulation plant has been shifted to Moshi, 100 kms off Arusha which, due to the poor infrastructure, makes daily cooperation not possible. This however is thought indispensable because in the development work practical experience of the formulation workshop management needs to be used in daily consultations.
larly.
- The Pesticides formulation plant has got a quality control laboratory and therein there is still space available to conduct formulation R&D studies.
- By using fracture of the funds a pilot mixing and jet-milling unit had been installed in the premises of the Wettable Powder Formulation Plant and a pilot-scale pearl-mill in the premises of the Flowable pesticide plant.

Considering the above findings it seems advisable that the R&D activities for the Pesticides Formulation Plant should be established at the Moshi plant. Accordingly the scope of the project document should be revised and stress should be placed on the extension of the facilities by laboratory scale equipment and on an extensive training programme. As a training base aside pesticide formulating companies it is recommended to place the trainees to companies producing emulsifiers for pesticides.

Summarizing the above the approved project should be urgently implemented with view to the actual situation to initiate and promote pesticides R&D in close connection with registration activities at both TPRI and the Moshi pesticide Plant.

It needs mentioning that the operation instructions for the mentioned pilot instruments could not be found. in case it will not be possible to trace them back the suppliers of them should be contacted by TECNIMONT to provide replacement for the instructions.

J. Seed dressing project at TPRI

Dr Bema Uronu, entomologist, UNIDO consultant gave information of his activity on a Seed Dressing Project at TPRI. In frame of the project seed dressing machines are tested of which TEMDO type has been developed locally keeping in mind local possibilities. The machines can be driven by tractor or by manpower using pedals. The first phase of the project proved that the seeds were not damaged by the mechanical treatment, germination strength remained satisfactory. Combination of thiram and malathion was used as chemicals. The treated seeds provided good harvest. Beside germination and yield early crop development and pest damage were recorded. Actually demonstration work is going on at regional centers to get farmers acquainted with the new technology which is aimed to be provided from local production. In a next phase responses at higher and lower altitude site experiments will be investigated.

Dr Bema was informed that as soon as the Formulation Research and Development Laboratory will be operational it will be able to provide seed dressing compositions tailored for local needs and as soon as the demand in seed dressing chemicals would reach commercial size (i.e. several tons) the plant could be capable to formulate it.

PERSONS AND INSTITUTIONS CONTACTED

UNDP: Mr.A. Krassiakov
Mr.V.J.Akim - UNIDO National Coordinator
Mr.F.Gastblom - programme officer
Mr.K.Ziller - UNIDO consultant
Mr.B.Uronu - UNIDO consultant (at TPRI)

MINISTRY OF INDUSTRIES AND TRADE:
Mr.Nyachia - Director of Project Investments
& Implementation
Mr.A.A.Nyiti - Director of Heavy Industries

NCI - Dar es Salaam:
Mr.M.P.Ole Paresoi - Managing Director
Mr.H.N.Kitilya - Director of Development & Finance
Mrs.E.Undiri - Chemical Engineer
Development Manager

NCI - Moshi:
Mr.G.S.Msangi - Project Manager
Mr.F.C.Kombe - Production Manager
Mr.Ntanga - Head, Analytical Laboratory
Mr.I.S.R.Muya - Assistant Production Manager
Mr.C.Baluah - Assistant Production Manager

TPRI: Mr.J.B.Chogo - Chief Scientific Officer
Head, Technical Services Department
Mr.H.A.Lyatuu - Registrar of Pesticides
Mr.E.E.Lekei - Scientific Officer
Pesticides Registration & Control

TECNIMONT:
Mr.A.Proietti - Site Manager
Dr.P.G.Lovisetto - Programme Manager
Mr.P.Rematelli - Chemist

REPORTS AND INFORMATION USED DURING THE MISSION

- 1) Production of Selected Pesticides in Tanzania, Dr.S.Mosinski, September, 1979..
- 2) Pesticides Formulation and Marketing in Tanzania, G.K.Handa, November, 1979.
- 3) Formulation of Selected Pesticides in Tanzania - a Feasibility Study, G.K.Handa, March, 1980.
- 4) Assistance to Pesticides Industry in Tanzania - Terminal Report, G.K.Handa, November, 1982.
- 5) Pesticides Project Appraisal - TISCO, 1984.
- 6) Pesticides Project, Contract for Machinery Supply, December,1984
- 7) Pesticides Project, Amendment 1,2,3 and 4 for Contract for Machinery Supply, 1986.
- 8) Assistance in the Establishment of a Pesticide Production and Formulation Plant in Tanzania, Dr.K.Szabo, January, 1987.
- 8a) Addendum. Revised financial analysis of the project, Dr.K.Szabo, November, 1987.
- 9) Effect of copper oxychloride facility on Moshi Complex, Findings, Dr.F.Sager, May, 1988.
- 10) Assistance to Finalize Project Implementation, Dr.B.Sugavanam , May, 1988.
- 11) Pesticides Project Appraisal, TISCO, 1989/90.
- 12) Assistance for Pesticides Technology, M.Gimeno, March, 1992.

DESCRIPTION OF THE PRODUCTION PROCESSES

Production of Hydrochloric Acid

Hydrochloric acid is produced in a De Nora type membrane electrolyser. Sodium chloride brine is the raw material feed to the electrolysis. This brine, nearly saturated, after thorough purification is introduced into the anode compartment of the electrolytic cell (anolyte). A membrane separates the anolyte from the catholyte compartment. Demineralized water is added to the catholyte chamber where sodium hydroxide is formed by the combination of hydroxyl ions and sodium ions which migrate through the membrane to the cathode. Chlorine gas (cell gas) is formed at the anode. Hydrogen gas and sodium hydroxide are formed at the cathode.

Part of the chlorine produced and chlorine effluents are sent to the hypochlorite production unit where chlorine is contacted with circulating caustic soda, diluted, in a packed tower. The produced hypochlorite is partially sent to the copper oxychloride production plant while the remaining quantity can be loaded into road tankers. Chlorine is used to produce hydrochloric acid solution by synthesis of hydrogen and chlorine in a combustion chamber. The hydrochloric acid gas then is absorbed in water circulating in a scrubber. The result of the production is 31-33% HCl solution.

Production of Copperoxychloride

In the production of tetracupric oxychloride metallic copper is reacted with hydrochloric acid and oxygen (from the air), in presence of chloride ions in an aqueous solution. The cuprous chloride formed is then precipitated by adding sodium hydroxide solution. Addition of sodium hypochlorite and calcium hydroxide completes the reaction. The resulting precipitate tetracupric oxychloride is filtered in a rotary vacuum filter. The cake of filtration is washed to eliminate soluble CaCl_2 and then dried in a spray drier. The powder obtained this way is brought to the requested concentration with carrier- and auxiliary material in a Nauta-type mixer, then brought pneumatically into a storage silo from which it is packed by a semi-automatic bagging instrument. The capacity of the process has been designed to produce 3000 t/year in continuous process.

Formulation of Wettable Powders

Batches of the wettable powders are prepared first in mixer P-209. Previously weighed solid components are charged manually through a hopper into mixer P-209 and mixed for a preset time. Once accomplished the premix is discharged through a screw conveyor into the mill P-210 which can be cooled by chilled air. The milled product is fed into the mixer P-206 which operates continuously with level regulation. The mill P-210 can be bypassed.

The mixer P-206 feeds the mill P-211 through a screw conveyor. The milled product is collected in mixer P-207 operating as a stirred storage tank, fitted with level control. The mill P-211 is cooled as well by chilled air and operates continuously.

Three micronizers - working parallelly - are fed through screw conveyors from the mixer P-207. The micronized product is collected in bag-filters and fed into mixer P-208 through screw conveyors. The mixer operates intermittently, controlled by level detectors. As soon as the max. level is obtained the micronized product is discharged into the storage silo, fitted with deaerating screw conveyor sending the product to the semiautomatic bagging station for packaging into 5 to 25 kg bags. The bags are sealed by sewing.

The capacity of the mixers is abt. 1500 kg, the daily production is foreseen as 12000 kg/day in three shifts. The mixers are Draize-type ones, the mills Perplex-types.

Formulation of Suspension Concentrates (flowables)

The basic dispersion for the suspension concentrates is prepared in the jacketed dispersion tank DY-302. The capacity of the tank allows to prepare batches of 1000 to 1100 kg, three batches a day. The dispersion tank DY-302 is fed with water through a flowmeter. It is equipped with a variable-speed agitator which can be lifted by a hydraulic unit. Height and speed can be regulated according to the process requirements.

Auxiliary materials: bactericide, dispersing agents and antifoam agents previously weighed in the stated quantity are fed into a preset volume of water in a separate stirred tank. After some minutes of stirring the solution can be transferred by gravity into the dispersion tank DY-302.

After having added the auxiliary materials the active substances shall be added through a screw conveyor, fed from a hopper in which the active substances, weighed previously, are charged manually. To avoid foam formation during dispersion the tank is kept under pressure lower than atmospheric by a vacuum pump. During the active substances' loading the stirrer is started at the minimum speed and in the lower position. Thereafter it shall gradually be lifted upto the upper position and automatically switch to higher rotational speed at the end of the loading operations.

After a given period of time the dispersed product shall be ready and the agitator shall go back to the original position while maintaining

the product under a low stirring. The dispersed product is then transferred into storage tanks D-303 or D-304 through basket filter. Then the milling operation is performed by the microball mill PM-301 which has its own feeding pump. The connecting piping loop is so arranged that it allows both a single working step and product re-cycling and reprocessing. The cycle provides the feeding of the mill through the feeding pump G-303, the milled product is collected in a small tank DP-301 through a basket filter. The product is finally sent to the tanks D-307 and/or D-308 through the pump G-304 once the desired fineness is reached.

The mill is fitted with a separate control system to avoid operation under abnormal conditions (too high pressure or temperature) and it is cooled with chilled water. Thickening agent solution is prepared in the tank D-305 by dissolving 2% of powdery product in water. The product dissolution occurs very slowly and normally requires some hours to obtain a sufficient dispersion. It is therefore advisable to prepare the day before the amount required for the next working day by adding a preset amount of bactericide agent, if required. The thickening agent shall be metered to the tanks D-307 and D-308 through a screw pump G-305. After addition of the thickening agent, the product shall be stirred for a preset time and then can be fed to the stirred tank D-309 through the pump G-306 once checked by the laboratory that the product specifications are met.

All the stirred tanks of this plant but DY-302 have a max. level alarm monitoring any excess filling to the operator. From the stirred storage tank D-309 the product is sent to the semiautomatic packaging unit to fill the product in 5 to 25 kg containers.

Water Soluble Concentrates Production

There is one single stirred tank D-310 of 2800 lit capacity, which is suitable to formulate water soluble concentrates. Active substance is discharged from drums of known weight through pump G-308 in the amount specified. Dilution is performed by adding water through flow-meter. Minor components may be filled through the manhole. Packing is same as in case of suspension concentrates, but by use of a separate filling line.

PROJECT IDENTIFICATION (1)

Project title

Strengthening the formulation activities at the Pesticides Manufacturing and Formulation Plant, Moshi.

Purpose of the Project:

Technical assistance to the Tanzanian Government to secure that pesticides production at its Pesticides Manufacturing and Formulation Plant can start operations efficiently and economically.

Scope of the project:

The project is to provide backstopping to the new Pesticides Formulation Plant by:

- visits of consultants in various fields,
- seeking for training possibilities for the personnel,
- supporting the Factory with minor equipment and spareparts which are not available in the country,
- supporting the Laboratory with minor equipment and chemicals which are not available in the country,
- providing advise in searching raw material from economic however reliable sources,
- provision of up to date literature and information.

Justification for the project:

The economy of Tanzania is largely based on the productivity and efficiency of its agricultural sector producing for local consumption as well as providing export revenues. Use of agrochemicals, including plant protection products, together with modern farm management practices play an increasing role in crop production and provide a steady and even increasing market for pesticides in Tanzania. The Government has given priority to the establishment of a pesticides manufacturing and formulation plant in the country which has been established in 1992 and is expected to start commercial scale operations in late 1995.

Findings of an expert mission stated that the training provided during the period of implementation of the project has not been efficient enough although fellows of good qualifications were selected for the posts of senior and junior management. The production management including the Head of Quality Control Laboratory as well as the Head of Formulation Research and Development Laboratory - who still needs to be nominated - should be enabled not only to reproduce the products set forth in the Contract of the Project many years ago and of which some became outdated, but to select and develop new formulations which are suitable for both production in the pesticide factory and for use in the country.

The Plant Management has to initiate and maintain numerous contacts with foreign firms, suppliers of active substances, emulsifiers and other chemicals both at the phase of development - in order to collect as much technical information from those firms as possible - as well as at the phase of ordering their products.

The fellows should be sent to formulation plants of reputable chemical companies where similar products to their present and targeted ones are formulated possibly by similar technology and where english language training is possible. To give examples for companies deemed to be able providing efficient training the following are listed:

Ciba Ltd., Switzerland,
Nippon Soda Co., Japan,
Excel Industries Ltd., India,
Hoechst Schering AgrEvo GmbH, Germany.

Fellow(s) from the Laboratory could also have very useful training at companies producing emulsifiers and other auxiliary materials, e.g. Hoechst (see above), or Omnicem S.A., Belgium. These companies develop standard receipts for the use of their emulsifiers incorporated in formulations of commodity pesticide active substances.

Locally available training possibilities should be also exploited, e.g. the course presented in attachment, organized by TPRI.

Background of the Project:

On recognizing dangerous decline in agricultural productivity and output the Government of Tanzania assigned highest priority to the rehabilitation and development of this economic sector. It has been realized that one of the basic deficiencies resulting in the low level of effectiveness of farming is the lack and poor quality of the physical inputs, among them plant protection materials available at farmers. Guided by this realization the Government initiated a programme to rectify the situation. As one result of the programme the Pesticides Manufacturing and Formulation Plant has been established at Moshi which will generate new government revenues in form of taxes, new employment at the plant and associated industries as well as supply the agriculture with high and controlled quality plant protection materials according to the local needs and conditions which will result in an improvement in safety and output of the national agricultural production.

GENERAL INFORMATION

Application

Prospective candidates can apply directly for the courses. An institution or a firm may apply for a customized group training programme.

Applications should reach TPRI preferably three months before beginning of the course, and be addressed to:

The Coordinator
Pest Management Training
Tropical Pesticides Research Institute
P.O. Box 3024
ARUSHA, Tanzania.

Fees

Fees payable for the course are to meet either tuition alone or tuition and full board costs. Tuition fees meet costs of teaching materials, tutors and allowances, secretarial services, local transport, field and medical expenses, and in-between teas and snacks. Payment for full board entitles the participant to boarding and lodging at TPRI Hostel for the course period.

Successful candidates will be required to remit full payment one month before commencement of the course, at latest. Therefore, a candidate who cancels his/her attendance will have his/her fees refund deducted by 20%.

EXECUTING INSTITUTION

The Pest Management Programme is executed at the Tropical Pesticides Research Institute (TPRI). The Institute, located some twelve kilometers north-west of Arusha Municipality, has modern laboratories, field stations, large areas of experimental plots, a fully furnished hostel and conference halls. The Institute has more than forty five scientists and a large of technicians in different pest management disciplines.

TPRI activities include research on broad aspects of pest management; and also technical services in pesticides quality control, plant quarantine, herbarium and conservation of plant germplasm; as well as disseminating the accrued information.

To:

.....

.....

If unclaimed RETURN TO:
The Coordinator
Pest Management Training
TPRI Box 3024,
Arusha, TANZANIA

TROPICAL PESTICIDES RESEARCH INSTITUTE



PEST MANAGEMENT TRAINING

PM2: Pesticides Legislation Handling
and Use

COURSE ANNOUNCEMENT

Address: Tropical Pesticides Research Institute
P.O. Box 3024, Arusha, Tanzania

Telephones: General line (057) 8813/14/15
Director's direct line (057) 8042

Telefax: (057) 8217

Telegraphic address: TROPEST

Telex: 42002 TPRI TZ

Official working hours:
Mondays - Fridays 0730 to 1530 hrs.

A course on Pesticide Legislation Handling and Use is intended to equip those involved in pesticide business with information on relevant legislation as well as basic information on use, safe handling and environmental hazards of pesticides.

INTRODUCTION

Synthetic pesticides have increasingly been used for plant protection against pests such as insects and fungi. Pesticides use against vectors of animal and human diseases has also been increasing. The continued use of pesticides has been prompted by need to raise agricultural as well as livestock production, while in public health there has always been high demand for vector control.

Pesticides are expensive and must, therefore, be applied carefully and at recommended dosage rates to target pests in order to achieve maximum efficiency and minimum wastage. Furthermore, pesticides are poisonous and if not handled properly can cause serious health and environmental problems. Today another serious problem in most developing countries is the continued accumulation of unwanted pesticides which can not be disposed of safely.

To ensure safe use and handling of pesticides, appropriate laws and regulations have been enacted. The Tropical Pesticides Research Institute (TPRI) was set up with a mandate to enforce these laws and also to conduct research and disseminate information on all pesticide related activities.

In order to use pesticides effectively and efficiently it is necessary for everyone involved in pesticide business to have first hand information on all relevant legislations as well as basic information on use, safe handling and environmental hazards of pesticides.

The present courses have therefore been designed to fill this gap of information. This will be achieved through lectures, demonstrations and field visits.

We believe that participants will have a proper outlook on pesticide use and handling after completing the course.

You are all welcome

COURSE STRUCTURE

Course

The course is designed for personnel involved in pesticides application, manufacturing, distribution and sale.

Entry qualifications

Minimum qualifications is a certificate in a relevant field of science with at least one year exposure to use of pesticides. However, candidates with lower qualifications but with long exposure in this field may be considered.

Course content

Lectures

- Trends in pest management
- Types and properties of pesticides
- Pesticide formulations
- Elementary pesticide toxicology and first aid
- Classifications and ecology of common pests
- Pesticides application technology
- Safe handling and use of pesticides
- Disposal of unwanted pesticides
- Tanzania pesticides law and procedure for conducting pesticide business
- The International Code of Conduct on Distribution and Use of Pesticides

Practical training

- Demonstration of key pests
- Demonstration of properties of pesticides formulations and pesticide application
- Visit to pesticide retail shops, formulating firms and pests control firms.

Evaluation Written examination

Award Certificate of attendance

Duration and time

Two weeks per course. Courses will be held annually during: the 27th March - 7th April, 10th July - 22nd July, 9th October - 21st October 1995.

PROJECT IDENTIFICATION (2)

Project title

Strengthening the human and environmental safety at the Pesticides Manufacturing and Formulation Plant, Moshi.

Purpose of the Project:

Technical assistance to the Tanzanian Government to secure that pesticides produced at its Pesticides Manufacturing and Formulation Plant can be distributed for small scale users as safe tools without endangering humans and the environment.

Wettable Powders will be packed in packages sized 5 kg to 25 kg in the Plant according to possibilities provided by the present facilities. However most of the farmers in Tanzania cannot afford to buy these quantities because their property of land is smaller than to be treated with these quantities. It is feared that this fact will result in repacking of the pesticides at distributors manually into improper smaller packings which may cause contamination in the environment and danger of intoxication of the persons involved.

The Project is aimed at production of appropriately sized small packages ranging from 0,2 kg to 2 kg. allowing distribution of harmful material on a clean way. Today the need for preventive approaches to pollution caused by products of chemical industry has been recognized and clear production as well as distribution is now seen as one of the main tools for industry to achieve environmental improvements while remaining competitive and profitable.

Scope of the Project

- Provision of a packing line specified to produce units ranging from 0,2 to 2 kg installed.
- Provision of expert assistance at the installation and the start up of the facility, 2 m/m.

Justification for the Project

The Government of Tanzania in its aim to reconstruct and develop the agricultural sector on a priority basis, has secured a soft loan from the Italian Government to establish a pesticide manufacturing and formulation plant at Moshi. The plant has been erected and installation/start up activities are going on. The operations are under close observation by the local population being the first example of its kind in the country. However safety of the environment and severe control of effluents has been made integral part of each process it seems to be necessary to think over the route and fate of the products coming out of the factory after they leave battery limits. However much clean production had been provided for a clean distribution of the products should also be concern for the industry. The suggested Project will allow to produce the pesticides in packing units appropriate to treat the average plot sizes owned by individual farmers.

Background of the Project:

On recognizing dangerous decline in agricultural productivity and output the Government of Tanzania assigned highest priority to the rehabilitation and development of this economic sector. It has been realized that one of the basic deficiencies resulting in the low level of effectiveness of farming is the lack and poor quality of the physical inputs, among them plant protection materials available at farmers. Guided by this realization the Government initiated a programme to rectify the situation. As one result of the programme the Pesticides Manufacturing and Formulation Plant has been established at Moshi which will generate new government revenues in form of taxes, new employment at the plant and associated industries as well as supply the agriculture with high and controlled quality plant protection materials according to the local needs and conditions which will result in an improvement in safety and output of the national agricultural production.

PROJECT IDENTIFICATION (3)

Project title:

Strengthening the environment safety at the Pesticides Manufacturing and Formulation Plant, Moshi.

Purpose of the Project:

Technical assistance to the Tanzanian Government to secure that operations at its Pesticides Manufacturing and Formulation Plant be maintained at a high level of safety for the environment.

Effluents escaping from the Plant might endanger closely inhabitants and cause contaminations in the nature. To prevent such adverse effects as a last step within the effluent treatment in the Plant an incinerator should be installed to eliminate effluents likely to escape.

Scope of the Project:

- Provision of a drum press,
- Provision of incinerator working with fuel oil, capable to provide 1300°C incineration temperature (endosulphan to be decomposed)
- Provision of expert assistance at the installation and the start up of the facility, 2 m/m, split mission.

Justification for the Project:

The Government of Tanzania in its aim to reconstruct and develop the agricultural sector on a priority basis, has secured a soft loan from the Italian Government to establish a pesticide manufacturing and formulation plant at Moshi. The plant has been erected and installation/start up activities are going on. The operations are under close observation by the local population being the first example of its kind in the country. However safety of the environment and severe control of effluents has been made integral part of each process it seems to be necessary to extend provisions made by a final treatment of which is expected to control

- concentrated effluent residues of the waste water ponds, collecting liquid effluents from each point of the plant,
- combustible solid waste material, including emptied packing of the incoming raw material, paper and plastic bags, etc.,
- metal containers, emptied, not reusable or not needed in the plant, after being pressed to dimensions suitable to enter the incinerator.

The treatment of the final wastes by incineration will make it possible that the generated ash be sent to communal waste depo without causing any risk.

Background of the Project:

On recognizing dangerous decline in agricultural productivity and output the Government of Tanzania assigned highest priority to the rehabilitation and development of this economic sector. It has been realized that one of the basic deficiencies resulting in the low level of effectiveness of farming is the lack and poor quality of the physical inputs, among them plant protection materials available at farmers. Guided by this realization the Government initiated a programme to rectify the situation. As one result of the programme the Pesticides Manufacturing and Formulation Plant has been established at Moshi which will generate new government revenues in form of taxes, new employment at the plant and associated industries as well as supply the agriculture with high and controlled quality plant protection materials according to the local needs and conditions which will result in an improvement in safety and output of the national agricultural production.

ADDRESSES OF SUPPLIERS OF AUXILIARY MATERIALS

1. AAKO B.V.
Postbox 205, 3830 AE Leusden, The Netherlands
Phone: (33) 948494 Telefax: (33) 948044
Telex: 79480 aako nl
2. AKZO NOBEL SURFACE CHEMISTRY AB
S-444 85 Stenungsund, Sweden
Phone: (46) 303 85000 Telefax: (46) 303 84371
3. ALLIED COLLOIDS, INC.
P.O.Box 820 2301 Wilroy rd., Suffolk VA 23439-0820, USA
Phone: 804-538-3700 Telefax: 804-538-0204
Telex: 00901455
4. BASF AG
P.O.Box 120
67114 Limburgerhof Germany
Phone: 49-6236-680 Telefax: 49-6236-682144
Telex: 464-99-0 basf d
5. DREXEL CHEMICAL CO.
P.O.Box 9306, Memphis TN 38109-0306, USA
Phone: (901) 774-4370 Telefax: 901-774-4666
Telex: 053-3218
6. HAMPSHIRE CHEMICAL CORP.
55 Hayden Ave, Lexington MA 02173, USA
Phone: 617-861-9700 Telefax: 617-863-8043
Telex: 200076 GRLX UR
7. HERBITECNICA DEFENSIVOS AGRICOLAS LTDA.
Rua Professor Joao Candido, 70
Londrina Parana 860 10-000 Brazil
Phone: 55-43-329-0027 Telefax: 55-43-329-0101
Telex: 432195
8. HOECHST SCHERING AGREVO GMBH
P.O.Box 27 06 54, D-13476 Berlin Germany
Phone: 49-30-4390-8-0 Telefax: 49-30-4390-8222
9. INTERNATIONAL SPECIALTY PRODUCTS
1361 Alps Road, Wayne, NJ 07470, USA
Phone: (201) 628-3951
10. LOBECO PRODUCTS, INC.
SC Hwy. 38, Lobeco SC 29931, USA
Phone: 803-846-8171 Telefax: 803-846-4777
11. LOVELAND INDUSTRIES, INC.
P.O.Box 1289, Greeley CO 80632-1289, USA
Phone: 303-356-8920 Telefax: 303-356-8926

12. OMNICHEM S.A., TENSIOFIX DIVISION
Industrial Research Park,
B-1348 Louvain-La-Neuve, Belgium
Phone: 32-10-450031 Telefax: 32-10-450693
Telex: 59249

13. PLANT HEALTH TECHNOLOGIES
CROP PROTECTION PRODUCTS
P.O.Box 15057, Boise ID 83715, USA
Phone: 208-345-1021 Telefax: 208-345-1032

14. PROFICOL EL CARMEN S.A.
Calle 85 No.9-65-A.A.92126,
Santafe De Bogota, D.C., Colombia
Phone: (57-1) 2579100 Telefax: (57-1) 2187168
Telex: 44895 CARMCO

15. RHONE- POULENC SURFACTANTS & SPECIALTIES
CN 7500, Prospect Plains Rd.
Cranbury NJ 08512-7500, USA
Phone: 609-860-4000 Telefax: 609-860-0459

16. STEPAN CO.
Northfield, IL 60093, USA
Phone: 708- 446-7500

17. WESTVACO CORP. POLYCHEMICALS DEPT.
P.O.Box 70848
Charleston Hts. SC 29415-0848, USA
Phone: 803-740-2300 Telefax: 803-554-1097

18. WITCO CORP.
One American Lane,
Greenwich, CT 06831-2559, USA
Phone: 203-552-3360 Telefax: 203-552-2890

**READ INSTRUCTIONS
CAREFULLY BEFORE USE**

USAGE

- For - CBD (Coffee berry disease) and Coffee leaf rust.
- Carrot blight (Cercospora).
- Mangoes (Anthracnose).
- Tomatoes (Early blight and bacterial spot)

DOSAGE

- For CBD Apply 7.5 kg of TANKOPA in 800 Litres of water per hectre at 21 days interval (280 gm/20 litres of water).
- For leaf rust in coffee apply 3.5kg 5 kg of TANKOPA in 800 litres of water per hectre at 21 days interval.
- For Carrots apply 1kg per acre at 7 to 14 days interval.
- For Mangoes apply TANKOPA monthly after fruit set until harvest at 1 kg in 500 litres of water.
- For tomatoes apply 1 kg in 100 litres of water per acre at 7-10 days interval.

WARNING

- Keep away from children and animals
- Do not take internally
- Avoid contact with skin, eyes or clothing. If contaminated wash thoroughly with plenty of water
- Do not contaminate water supplies, rivers, dams etc.
- Do not re use empty containers
- Use only as directed.
- Store in cool place away from food and animal feeds

FIRST AID

EYES Flush with plenty of water.

SKIN Remove contaminated clothing and wash skin with plenty of water.

INGESTION Get Medical attention immediately.

Date of Manufacture

Expiry date

Batch No

Tankopa is Manufactured by

Pesticides Manufacturers Ltd
P.O. Box 9748,
MOSHI - TANZANIA

APPROVED BY TORI - ARUSHA

Registration No



POISON

SUMU

**SOMA MAELEZO KWA UANGALIFU
KABLA YA KUTUMIA**

MATUMIZI YA DAWA

- Kwa ajili ya CBD na kutu kwenye majani ya Kahawa.
- Karoti (Carrot blight).
- Miembe (Anthracnose)
- Nyarira (Early blight and bacterial spot).

VIPIMO VYA DAWA

- Kwa CBD Changanya Kilo 7.5 za TANKOPA kwenye lita 800 za maji kwa nekta. Nafasi kati ya mpigo hadi mwingine ni siku 21 (gram 280 kwenye lita 20 za maji).
- Kwa kutu kwenye majani ya kahawa changanya kilo 3.5 hadi 5.5 za TANKOPA kwenye lita 800 za maji kwa hekta. Nafasi kati ya Mpigo hadi mwingine ni siku 21.
- Kwa Karoti, tumia kilo 1 kwa eka. Nafasi kati ya mpigo hadi mwingine ni siku 7 hadi 14
- Kwenye membe tumia TANKOPA kila mwezi mara baada ya matunda kutokeza hadi kuvuna. Changanya kilo moja ya dawa na lita 500 za maji.
- Kwa nyanya changanya kilo 1 kwenye lita 500 za maji kweleka. Nafasi kati ya mpigo hadi mwingine ni siku 7 hadi 10

TAHADHARI

- Weka dawa mahali watoto hawawezi kufikia
- Usinywe
- Usimwage dawa kwenye mito au mabwawa.
- Usijimwage dawa. Endapo dawa imekuingia machoni kwa bahati mbaya safisha macho kwa maji mengi.
- Mifuko ya dawa isitumike kwa kazi nyingine baada ya kwisha dawa. Tumia hii dawa kama ilivyopendekezwa.
- Hifadhi dawa mbali na vyakula vya binadamu na wanyama.

HUDUMA YA KWANZA

MACHONI Usha kwa maji mengi

KWENYE NGOZI Ondoa nguzi na safisha ngozi kwa maji mengi.

IKIMEZWA Pata huduma ya daktari haraka iwezakanavyo

Tarehe kuyitengenezwa

Tarehe ya mwisho ya matumizi

Tarhihi kutengenezwa na

Kwanza Cha Madawa

S.L.P. 8745

Moshi, Tanzania

Imedhuniwa na TORI ARUSHA

Namba ya Uandikishaji

UNIDO COMMENTS

This report should be read in conjunction with the report on quality control. The report concentrates mainly on the report while everything visually might look alright only full check up and operation would give problems associated with the plant.

The copper based fungicide should be further processed to speed up commercialization. The recommendation to carefully monitor effluent limitation should be complied with.

The plant should further consider additional facilities to bring the plant attractive for joint ventures. While it is difficult to assess where the funds will come from, UNIDO will have to try i. s best to assist a country which took an important step to safe formulation of pesticides but events that happened clearly beyond its control makes the typical situation as to how African countries are drawn into unnecessary conflicts wasting their meagre resources.

If the plant had gone according to original plans it should be making profit and contributing to the food security and economy of the countries.