

Annex 1

Pesticide Evaluation Report and Safe-Use Action Plan

Post-Harvest Insecticide Application On Crop Seeds

Background

World Vision has been working with both the small scale private sector and INIA (National Institute for Agricultural Research) to develop their capacity to identify, select, multiply, produce and market improved seed of the major basic crops. As part of this exercise trials are being conducted on appropriate seed storage technologies which will allow the producers to store their seed in a suitable conditions from harvest until time of sale. It is often necessary to store this multiplied seed for up to five months and among the trials and demonstrations being undertaken there may be some involving the use of the pesticide “Actellic”. Authorization is thus being requested for the application of “Actellic” insecticide to seed prior to it being bagged and stored.

Analysis

The following analysis follows the recommended outline, as per 22 CFR 216.3 (b) (1) (i) (a-1):

a) USEPA’s registration status of the requested pesticide:

Actellic (generic name perimiphos-methyl) is a USEPA-registered pesticide that is classified for “general use”. It is an organophosphate with a USEPA Toxicity Class of III (Caution). It controls a wide range of pests affecting grains and other stored products. It is a rapid acting chemical with a 7-day toxicity cycle and is effective in warm and humid climates. Actellic acts through fumigation and ingestion and has a low mammalian toxicity. Authorization is requested to use this product in powder form.

b) Basis for selection of the requested pesticide:

Actellic is highly recommended for use on stored grains (and is approved for this purpose in the Supplementary Environmental Assessment completed for USAID/M’s PVO Support I Project). Attached is a copy of a table from the SEA that identifies perimiphos-methyl as approved for use with stored grains. It is registered by the Mozambican Ministry of Agriculture’s Department of Plant Protection for use on stored grains and is the least toxic of other available products. Previous experience by other PVO’s (CARE/Nampula) has confirmed that it is the most effective product for this purpose.

c) Extent to which the proposed pesticide is part of an IPM:

This application will cover the proposed pesticide use in two activities :

- 1) the use of “Actellic” in a series of WV controlled storage trials/demonstrations designed to evaluate it’s effectivity and the cost/benefit of it’s appropriate usage for small scale farmers.
- 2) the use of “Actellic” by WV and INIA staff to treat seed produced for sale/distribution to private producers.

d) Proposed methods of application, including availability of appropriate application and safety equipment:

The application of this product will take place prior to the storage of the seed which may be either loose or bagged. The bagging and cleaning will take place on the trials stations. The Actellic powder will be applied

directly (dusted) onto the seed using large bags (an application rate of 20 - 50 grams of powder per 100 kg of seed). The seed will be then be sealed and stored in large bags or silos.

The seed will be stored in storage sheds located throughout WV's target districts. A variety of storage methods will be used but the sheds will be well ventilated and prior to placing the seed in each storage shed, it will be disinfected with a common cleaning product.

The following equipment will be used by WV and INIA staff during this application:

- Protective mask
- Rubber gloves and boots
- A set of overalls

The precautionary recommendations included on the packaging of this product will be strictly followed, including the use of a mask over mouth and nose, immediate removal of clothing used during application and burning of used containers. Prior to application and as per recommendations on the Actellic container, the product will be stored in its original container in WV warehouses which will not be used for the storage of food items. The warehouses will be locked and well-ventilated. Any person entering the warehouses will be informed of its existence and be aware of the toxicity of the product.

e) Any acute and long-term toxicological hazards, either human or environmental, associated with the proposed use and measures available to minimize such hazards:

Acute toxicity (LD50 in mg/kg) of Actellic is »2,000 oral and » 4,592 dermal. Symptoms of poisoning: eye effects are no corneal opacity, irritation is reversible in seven days. The skin can also show moderate irritation at 72 hours. Soap, water and hand towels will be available during application for immediate washing of hands and eyes (if necessary).

f) Effectiveness of the requested pesticide for the proposed use:

According to the Department of Plant Protection's "Guia de Pesticidas Registados em Moçambique" (1994), Actellic is "registered for use in public health and to control pests in stored products". It has a toxicity level of "Ligeiramente" (USE WITH CAUTION). As per the SEA completed for USAID/Mozambique in 1994, Actellic is most appropriate to be used with stored grain (see attached table and presentation of Actellic uses).

g) Compatibility of the proposed pesticide with target and non-target ecosystems:

The proposed application of Actellic by WV and INIA staff will take place on the trials stations only. The use of Actellic powder within a controlled area is recommended (see attached information). Because of the conditions under which application will take place, no contact with non-target ecosystems is expected.

h) Conditions under which the pesticide are to be used, including climate, flora, fauna, geography, hydrology and soils:

The use of Actellic as presented for post-harvest storage protection (within an controlled area) will not contact flora, fauna, open water sources or fragile soils.

i) Availability and effectiveness of other pesticides or non-chemical management methods:

While there are other pesticides available that are effective for the proposed use, it has been determined that Actellic is the least toxic and has been used successfully for similar purposes within Mozambique (post-harvest storage protection of seed). Due to the length of time required to store seed, it has also been noted that exclusive non-chemical storage management strategy results in significant losses due to pest infestation and damage.

j) Requesting country's availability to regulate or control the distribution, storage, use and disposal of the requested pesticide:

As presented in the SEA for USAID/M, there is limited control of pesticide use in the country and "...much of the responsibility for safe and effective pesticide use by PVO's must be borne by the PVO Support Project and the PVO's themselves (page 38)". Limited support has been provided to the Ministry of Agriculture in warehouse inspection and plant quarantine, but this has not covered the entire country. WV's own contacts in the target provinces indicates that very little, if any, regulation of pesticide use takes place on a regular basis. The Provincial Directorates of Agriculture will be informed of this pesticide application and requested to inspect the facilities and preparations prior to application.

k) Provisions made for training of users and applicators:

Actellic will be applied by WV and INIA technicians under the supervision of WV and INIA agronomists who have experience working in agricultural development projects and in the correct handling and use of pesticides. They have been involved with research activities and on-farm trials of different chemical inputs in small-scale agricultural initiatives and have worked with Actellic previously. The whole seed multiplication and seed storage trials program is under the control of Dr Brian Hilton (Soil Scientist) who has worked with Actellic.

l) Provisions made for monitoring the use and effectiveness of the pesticide:

Actellic is available within the target provinces in sufficient quantities to complete this application (with detailed instructions in Portuguese). It will be transported to the application sites in the back of WV vehicles, well-secured to ensure no spillage if there are sudden stops, starts or turns. There will no sharp objects in the vehicle that could puncture the containers during transport. Only the amount necessary to protect the multiplied seed will be acquired; no additional containers of Actellic will be purchased and stored (in the medium term) by WV.

During application, preparations to apply Actellic powder to the seed will follow the instructions on the label, in the proper sequence. No one will handle the product without the proper protective clothing and soap and water will be available for immediate cleaning of hands and eyes. Partially-used containers will be securely sealed during the application process and returned to storage. After completing the application, the empty containers will be punctured and burnt (per the Mozambican "Pesticide Guide"). The clothing and other equipment used during the application will be thoroughly cleaned (the clothes will be washed separately from other clothes). They will be stored in the WV warehouses.

Because the application will take place within a controlled area using sacks and drums, there should not be "drifting" problems (movement of pesticide dust away from the seed to be treated). Application will take place in the early morning (prior to 10:00 AM), avoiding the hottest part of the day. No food or drink will be consumed within the warehouse during application. Should anyone show signs of pesticide poisoning, the application will be stopped and first aid will be immediately sought. First aid kits are stored on site and individuals will be trained in basic first aid procedures.

The treated seed will be sealed for 15 days prior to initiating the bagging or silo storage. There will be no subsequent applications during the storage period. The storage trials will set up following prescribed protocols and closely monitored by the trials agronomists who will collect and analyze the data and present the findings in the annual WV trials report.

Annex 2

Pesticide Evaluation Report and Safe-Use Action Plan

Demonstrations of Integrated Cashew Management to Control Powdery Mildew

Activity

Demonstration to farmers of an integrated package of cashew management practices which includes but seeks to minimize the use of pesticides for the control of powdery mildew disease (PMD) (*Oidium anarcardii* Noak) in cashew. The project will also train the applicators of pesticides in safe storage, handling, application and disposal techniques

Background

Over the past few years World Vision Mozambique (WV-Moz) has been working with the National Institute for Agricultural Research (INIA) and the National Institute for Cashew (INCAJU) to test appropriate new technologies which have the potential to improve cashew production in a sustainable manner. Last year, as part of this research program a total of 17 trials were implemented by a partnership of nine Government, private sector and NGO agencies to test the efficacy of three fungicides for the control of cashew powdery mildew (*Oidium anarcardii* Noak) in Nampula and Zambezia provinces. Additionally a further nine sanitation (pruning) trials were undertaken in the same sites to prove that the application of the correct management practices can also reduce the number of applications of pesticides needed to control PMD.

The series of trials in 1999/2000 were a continuation of the 1998 program which was directly funded by USAID-Mozambique through the AMIS II project. This Pesticide Evaluation Report and Safe-Use Action Plan (PERSUAP) references the report "Development of Pest Management Strategies for Cashew in Mozambique" by Professor E. A. Hendrichs, an entomologist from the University of Nebraska working through the Office of International Research and Development, IPM Collaborative Research Support Program, Virginia Polytechnic Institute and State University, Blacksburg, VA, USA. The report was prepared for USAID-Mozambique in collaboration with USAID/Agribusiness and Marketing Improvement Strategies (AMISII), Mozambique Cashew Sub-sector Rehabilitation Study, Production and Propagation and is dated 14th Nov 1997. The consultancy produced a 64 page report which included a full PERSUAP for the entire trials program funded by USAID (including the type of trials mentioned in this document) and contains substantial detail on the target pests and diseases as well as the trials protocols and pesticide data.

The 1999 trials program was coordinated by Dr Clive Topper, who also acted in a similar role in the 1998 program which was directly organized and funded by USAID via the AMISII program. Dr Topper is an British entomologist and was for six years the Chief Scientific Adviser to the Overseas

Development Agency (ODA) funded Cashew Research Program undertaken at the Naliendele Research Station in Southern Tanzania. The recent series of trials was designed to test the results of the Tanzanian experience under local conditions in Mozambique. The results from the trials have shown beyond doubt that the control of PMD can significantly improve cashew yields and WV-Moz after obtaining approval of an amended IEE in FY99 demonstrated the application of pesticides as part of an Integrated Management Package to farmers. It is important that these demonstrations continue as part of the proposed DAP.

Analysis

The following analysis follows the recommended outline, as per 22 CFR 216.3 (b) (1) (i) (a-1):

a) USEPA's registration status of the requested pesticide:

The USEPA registration of the pesticides proposed for use in the trials is indicated in Table 2 below. All of the pesticides proposed are registered with the USEPA for use on various crops grown in the USA. All the pesticides are available in Mozambique and will be obtained through local suppliers.

Table 2:

Common Name	Trade Name	Action	Toxicity Class	Oral LD50	EPA signal word	Mozambique signal word	EPA registration No
Triadimenol	Bayfidan (ec)	Fungicide	III	700 mg/kg	Caution	Perigroso II	7501-91
Hexaconazole	Anvil (ec)	Fungicide	IV	6,071 mg/kg	Caution	Cuidado III	EPA import tolerance 40 CFR 180
Sulfur	Dusting Sulfur (dust)	Fungicide	IV	>5,000 mg/kg	Caution	Cuidado III	Non-toxic

b) Basis for selection of the requested pesticide:

The insecticides selected for the demonstrations are listed in Table 2 above. The pesticides were selected as based on the results of the last two years trials, biological efficacy, human health and environmental factors. The fungicides, triadimenol (Bayfidan), hexaconazole (Anvil) and sulfur will be used for the control of the powdery mildew disease (*Oidium anarcardii* Noak)..

Non-chemical control methods consisting of cultural methods will also be demonstrated. These demonstrations will be conducted by World Vision staff on farmer's trees. The objective of part of these demonstrations is to show a non-chemical method for controlling PMD, which consists of the removal of non-productive cashew leaves or branches that serve as a source of PMD inoculum. In all of the demonstrations weed control under and around the trees will be conducted manually by hand removal.

No herbicides will be used.

c) *Extent to which the proposed pesticide is part of an IPM:*

The approach to the control of PMD which is being advocated will use an integrated package of practices already developed and broadly applied in Tanzania and more recently tested in Mozambique. An IPM approach will be used which is aimed combining various cultural practices which will reduce or delay the spread of the disease and only if really necessary using the minimum amounts of pesticide needed to control PMD. Farmers will be trained in scouting methods to identify the threshold levels at which the pesticides should be applied as well as safe handling, storage, application and disposal techniques. Non-chemical methods are used as far as possible for PMD control though in most cases it has been shown that pesticides must finally be used to effectively control the disease. The package of practices to be demonstrated, including the sanitation activities, have been shown to retard the onset of PMD thus reducing the number of pesticide applications necessary to control PMD. Where clearly identified threshold levels have been reached safe and least-toxic pesticides will be used for further control. These pesticides are safe to applicators when used properly and have a minimum impact on natural enemies. The cultural control methods which were tested and proven effective in the earlier trials will be taught in IPM workshops and Farmer Field Schools. Additionally the program will seek to reduce the number of people handling pesticides by recommending that farmers groups appoint only one or two persons to do the applications and that these people will be trained by the program in safe handling, application, storage and disposal of pesticides.

d) *Proposed methods of application, including availability of appropriate application and safety equipment:*

The pesticide application and safety equipment which will be used in these demonstrations are the same as those previously tested and selected by Dr Clive Topper who oversaw the trials program of the past two years and have also been used previously in Tanzania. Motorized mist blowers will be used for foliar applications of fungicides. Two WV experienced agronomists who have been involved in the earlier trials will train all workers involved in the use of the equipment and properly trained WV technical staff will supervise applications. Technicians and everyone involved in the application will also be trained in the safe handling, usage, storage and disposal of the pesticide containers.

The following equipment will be used during the applications:

- Protective goggles
- A dust/mist filtering respirator
- Coverall over long-sleeved shirts and long pants
- Chemical resistant headgear
- Chemical resistant apron when cleaning equipment or mixing pesticides
- Chemical resistant gloves and boots with socks

Applicators will :

- Wash hands before eating and drinking
- Remove clothing immediately if pesticide gets under protective coverings and put on clean clothing
- Remove personal protective equipment as soon as possible after application and change into clean clothing

The precautionary recommendations included on the packaging of these products will be strictly followed including the burning of used containers. Prior to application and as per recommendations on the containers, the product will be stored in its original container in specific storerooms which will not be used for the storage of food items. The storerooms will be locked and well-ventilated. Any person entering the storerooms will be informed of its existence and be aware of the toxicity of the product.

e) *Any acute and long-term toxicological hazards, either human or environmental, associated with the proposed use and measures available to minimize such hazards:*

The oral LD₅₀ of the proposed pesticides for the use in the program is given in Table 2 above. As indicated the pesticides have a high LD₅₀ value, indicating that they have a low toxicity to humans. All of the pesticides have the signal word of caution. The safety precautions mentioned above will be employed to minimize and mitigate the acute toxicological hazards involved in using pesticides.

The proposed pesticides are not expected to pose a problem in regard to residues. Most photodegrade and are metabolized in the soil. There will be rapid degradation in the environment and a lack of accumulation and persistence.

Possible Adverse Effects on the Environment: For the pesticides to be used in this program these are expected to be minimal when the instructions on the label are followed. Applications will be made early in the morning when bees are inactive and the pesticides have been shown to have minimal effects on natural enemies. It is recognized that heavy and continuous use of sulfur on trees can acidify the soil beneath the trees. This may or may not be a significant problem, depending on whether the soil is acid or alkaline. Sulfur will only be recommended for use in the few areas where there is no water for mixing with the organic pesticides and it is not expected that the limited applications involved will have a significant adverse impact. Minimum levels of sulfur will be used to accomplish PMD control and in a number of sites the soil will be tested before and after the demonstrations to assess the effects on the soils, if any.

Measures to minimize and mitigate hazards: The choice of least toxic chemicals suitable to effectively control PMD, the use of protective equipment by the applicators and the training of staff and those who will apply the pesticide in the safe and proper use of pesticides will minimize potential hazards. Longer term environmental monitoring will be applied to areas where sulfur will be used to monitor its effect on soil pH levels.

f) *Effectiveness of the requested pesticide for the proposed use:*

1) Triadimenol (Bayfidan):

Triadimenol is a systemic fungicide that provides effective control of PMD and will be used as a foliar spray in chemical control of PMD trial. Literature indicates that this fungicide is highly effective against PMD in cashew as based on trials conducted by Topper and Bema in Tanzania, in the control of grape fungi in South Africa and against powdery mildew of apple in Israel. It was safe to predatory arthropods in South African vineyards.

2) Hexaconazole (Anvil):

Hexaconazole is a fungicide that provides effective control of PMD of cashews. It will be used as a foliar spray in chemical control of PMD trial. Literature indicates that this fungicide is highly effective against PMD in cashew as based on trials conducted by Topper and Bema in Tanzania. It

was also shown to provide excellent control of powdery mildew in apples in Israel and was safe to predatory insects.

3) Sulfur (Dust)

Sulfur is a fungicide that provides effective control of PMD on cashew and will be used as a dust in chemical control trial. Literature indicates that this fungicide is highly effective against PMD in cashew based on trials conducted by Topper and Bema in Tanzania.

The inorganic mineral-based fungicidal product to be used in the proposed program has been selected as optimum to effectively control PMD. None of the registered botanical insecticides are sufficiently effective to control the disease in question. The application rates selected are based on experience achieved in previously conducted trials and will be applied at a rate as low as possible whilst still meeting controlling PMD.

g) Compatibility of the proposed pesticide with target and non-target ecosystems:

Adverse impacts on the environment which may be caused by the use of the proposed pesticides are not expected because of the intrinsically low toxicity of the pesticides selected and the safe manner in which they will be applied. Site selection and dosage rates will be such that run-off will be minimized and pesticides will not contaminate bodies of water. Applications will be made early in the morning when wind speed is reduced and the atmosphere is most humid so improving the adherence of the pesticide to the leaves of the target trees and reducing run-off. Most pesticide applications will also be made in the dry season.

h) Conditions under which the pesticide are to be used, including climate, flora, fauna, geography, hydrology and soils:

The demonstration sites where pesticide applications will take place are in the major cashew production areas in Nampula and Zambezia provinces in northern Mozambique. Rainfall is moderate to high, around 1,000 mm per annum, beginning in November and ending in April/May. Soils vary from low fertility sands along the coast to more fertile sandy loams in the interior. Pesticide applications will be mainly in the dry season when there is little or no rainfall. The demonstration sites will be limited to areas of less than two hectares each and all operations will be conducted under the control of appropriately trained and supervised WV technical staff. The blocks are normally of mono-culture cashew trees and any surrounding flora or fauna will not be adversely affected due to the low toxicity of the pesticides selected and the use of correct application procedures. All applications will be made in the early morning to avoid wind drift. Dosage will be minimized to reduce run-off.

i) Availability and effectiveness of other pesticides or non-chemical management methods:

The pesticides selected for use in the program are considered to be the least toxic yet suitable for achieving the objective of PMD control. They have been extensively tested in similar agro-ecological areas in southern Tanzania and Mozambique and in similar farming systems. A non-chemical control (sanitation) method is being simultaneously promoted and can assist in the reduction of the quantity of pesticide required to control PMD.

j) Requesting country's availability to regulate or control the distribution, storage, use and disposal of the requested pesticide:

As presented in the SEA for USAID/M, there is limited control of pesticide use in the country and "...much of the responsibility for safe and effective pesticide use by PVO's must be borne by the PVO Support Project and the PVO's themselves (page 38)". Limited support has been provided to

the Ministry of Agriculture in warehouse inspection and plant-quarantine, but this has not covered the entire country. WV's own contacts in the target provinces indicates that very little, if any, regulation of pesticide use takes place on a regular basis. The Provincial and District Directorates of Agriculture will be informed of this pesticide application and requested to inspect the facilities and preparations prior to application.

k) Provisions made for training of users and applicators:

All pesticides will be applied by fully trained applicators under the supervision of WV technicians and agronomists who have previous experience working in agricultural development projects and in the correct handling and use of pesticides. They have been involved with research activities and on-farm trials of different chemical inputs in small-scale agricultural initiatives and have worked previously with similar trials. The cashew program will be under the supervision of one expatriate agronomist Eliezer Camargo BSc and one Mozambican agronomist, Amaral Chibeba BSc, both of whom have had several years of experience working with cashew trials..

l) Provisions made for monitoring the use and effectiveness of the pesticide:

The pesticides are available within the target provinces in sufficient quantities to complete this application (with detailed instructions in Portuguese). They will be transported to the application sites in the back of WV vehicles, well-secured to ensure no spillage if there are sudden stops, starts or turns. There will no sharp objects in the vehicle that could puncture the containers during transport. Only the amount necessary for the demonstrations and training sessions will be acquired.

During usage, applicators will be trained to follow the instructions on the label, in the proper sequence. No-one will handle the product without the proper protective clothing and soap and water will be available for immediate cleaning of hands and eyes. Partially-used containers will be securely sealed during the application process and returned to storage. After completing the application, the empty containers will be punctured and burnt (as per the Mozambican Pesticide Guide). The clothing and other equipment used during the application will be thoroughly cleaned (the clothes will be washed separately from other clothes). The pesticides will be stored in the locked storerooms.

Application will take place in the early morning (prior to 10:00 AM), avoiding the hottest and windiest part of the day. No food or drink will be consumed on the site during application. Should anyone show signs of pesticide poisoning, the application will be stopped and first aid will be immediately sought.

The demonstrations will be set up following prescribed protocols and closely monitored by the WV-Moz agronomists who will collect and analyze the results of the program and present findings in the annual WV report.

Annex 3

Pesticide Evaluation Report And Safe-Use Action Plan

Application for use on World Vision-Mozambique's seed multiplication and trials sites

Background:

World Vision-Mozambique (WV-Moz) is working with both the small scale private sector and INIA (National Institute for Agricultural Research) to develop their capacity to identify, select, multiply, produce and market improved seed of the major basic crops. As part of this exercise a series of trials and limited seed multiplication, under direct WV-Moz control, are being conducted at selected sites to test new technologies and make improved seeds of some major crops available to farmers. However, during growth, these trials and seed multiplication fields may be attacked by diverse pests and diseases and possibly treated with the least toxic but most effective pesticide. It is necessary to protect crops against attack as early as possible and pesticides are thus used before a predefined threshold level of damage is reached.

Where botanical pesticides are themselves being tested results from trials will be analyzed and if they are found effective in the control of pests and diseases, approval will be sought from USAID to recommend them as inputs of a WV/INIA IPM package for adaptive research in farmers fields. In order to facilitate this process, the research program is working in collaboration with institutions such as the Natural Resources Institute (NRI), the Intermediate Technology Development Group (ITDG) and the Institute of Permaculture on standardization of biological efficacy and possible certification.

Authorization is being sought to use the following pesticides when appraised necessary: Karate, Ripcord, Rogor, Dithane M 45 and Malathion on selected trials and seed multiplication sites on sub-stations in Tete, Zambezia directly under the control of WV-Moz. Trials sites of less than one hectare each and not more than 100 hectares of seed multiplications may be treated depending on risk and severity of attack. A list of botanical pesticides to be used in trials is also provided below.

Analysis:

The following analysis follows the recommended outline, as per 22 CFR 216.3 (b) (1) (i) (a-1)

The tables below summarize characteristics pertinent to each pesticide:

a) *USEPA's registration status of the requested pesticide:*

Proprietary name	Active ingredient	Formula	LD 50 mg/kg Oral	Toxicity category	USEPA registration
Karate	Lambda-cyhalothrin	ec	183-320	II	yes
Ripcord	Cypermethrin	ec	203-295	II	yes
Rogor	Dimethoate	ec	200-300	II	yes
Dithane M45	Mancozeb	wp	7000	IV	Yes
Malathion	Mercaptothion	ec	2100	III	Yes

Karate is a synthetic pyrethroid for the control of cutworm in many crops and all species of bollworm, leaf-eating caterpillars and jassids. It is a Lambda-cyhalothrin with a USEPA Toxicity Class of II which is classified for restricted use and not acceptable for use by farmers.

Ripcord is a cypermethrin recommended to control American bollworm, leaf-eating caterpillars and weevils. It is selected to use alternately with Karate to minimize build up of pest resistance.

Rogor is a dimethoate, an organophosphate highly recommended for use to control aphids species in pigeon pea, potatoes and sorghum. It is a systemic and contact insecticide concentrate for the control of various species of insects, mites and mealybugs.

Dithane M45 is a Mancozeb recommended to control Powdery Mildew in potatoes and Scab in cassava.

Malathion is a mercaptothion with broad spectrum to destroy insect pests. Mancozeb and Malathion are general use pesticides effective for controlling specific pests if used as directed on the pesticide label.

All these chemicals are currently registered with USEPA with a low or moderate to high level of toxicity. However, when applied correctly and by trained people, they are found to have low to moderate effects on beneficial organisms.

The applied research program in collaboration with INIA is testing botanicals for pesticidal properties in controlled storage trials and in controlled field trials of vegetable crops.

Pesticide/Botanical	Active Ingredient	Trial type/Crop	Rate of application	# of Applications

Pesticide/Botanical	Active Ingredient	Trial type/Crop	Rate of application	# of Applications
Neem	Azadirachtin	Storage/maize	200-1000g leaves per 100kg seeds	01
Neem	Azadirachtin	Vegetables; Tomato, Cabbage	500g/20L water - 150 ppm a.i.	04 @ two wk. Interval.
<i>Eucalyptus spp.</i>	-	Storage/maize	150-200g leaves/100 kg seeds	01
<i>Tephrosia vogelii</i>	Rotenone	Storage/maize		01
<i>Capsicum frutescens</i> (Chili pepper)	Capsaicin	Cabbage. Tomato	80-100g/L water	04 @ two wk. Intervals

Authorization is requested to use these chemicals in the form as reported in the tables above.

b) Basis for selection of the requested pesticide:

Pesticides in the first table above are selected because they are proven to be some of the most effective chemicals against the pest and diseases identified at the research station. Their level of toxicity to humans and hazards to the environment are known to be low to moderate. They are recommended to control American bollworm, *Heliothis armiger*, aphid species and others insects and fungi in diverse crops such as sunflower, beans, groundnut, maize, sorghum, pigeonpea, millet, cassava and potatoes. They are registered by the Mozambican Ministry of Agriculture's Department of Plant Protection for use on infected plants and identified for general use in Mozambican law i.e Classes II and III. The Supplemental Environmental Assessment of the USAID/Mozambique PVO II Support Project identified some of them as restricted use insecticides thus they will not be promoted for use by the family farming sector.

c) Extent to which the proposed pesticides are part of an IPM:

Cultural practices such as proper time of planting, proper time of harvesting, crop sanitation, crop rotation, intercropping, cover crop, proper land preparation, adequate post-harvest techniques will be integrated with pesticide use in order to come up with the most economical, sustainable and environmentally safe system. The pesticides will only be used to protect WV-Moz/INIA trials and seed multiplication fields, and chemicals will be used only by WV-Moz and INIA trained staff.

d) Proposed methods of application, including availability of appropriate application and safety equipment:

The application of these products will take place only after the attack is identified as being a serious problem. Pesticides will be applied directly to the infected plants using a knapsack sprayer. Applications will be done in the morning or when it is less windy. The following protective equipment will be used by WV-Moz and INIA staff during the preparation and application of the pesticide:

- Protective mask
- Rubber gloves and boots
- A set of overalls

The precautionary recommendations included on the packaging of these products will be strictly followed, including the use of a mask over mouth and nose, immediate removal of protective clothing used during application and the burning of used containers. Prior to application and as per recommendations on the chemical container, the products will be stored in their original container in WV-Moz warehouses which will not be used for the storage of food items. The warehouses will be locked and well-ventilated. Any person entering the warehouses will be informed of its existence and be aware of the toxicity of the product.

e) Any acute and long-term toxicological hazards, either human or environmental, associated with the proposed use and measures available to minimize such hazards:

The lethal acute oral dosage (rats) for each chemical to be used is given in the first table above. Some chemicals are restricted use and poisonous to humans and hazard to the environment when not used properly. Therefore appropriate measures will be applied to minimize poisoning. Among these measures include wearing of protective clothing, application of chemical as required on the label, washing of hands or bathing immediately after pesticide application, proper disposal of the containers and proper cleaning up in case of accidental spillage. Pesticides will only be used on WV-Moz trials and controlled seed multiplication sites

f) Effectiveness of the requested pesticide for the proposed use:

These pesticides are listed as acceptable in the USAID/Mozambique PVO II Support Project Supplemental Environmental Assessment for use on cereals, leguminous and roots and tubers. Moreover, the same chemicals are registered to effectively control specific pests and diseases on specific crops by the Government of Mozambique.

g) Compatibility of the proposed pesticide with target and non-target ecosystems:

The proposed application of pesticides by WV-Moz and INIA trained staff will take place only in fields under the direct control of WV-Moz. Because of the closely controlled conditions under which application will take place, no contact with non-target ecosystems is expected. Applications will be made in the early morning to avoid drift. All pesticide use is for trials and seed multiplication, grain will not be used either for human or animal consumption.

h) Conditions under which the pesticide are to be used, including climate, flora, fauna, geography, hydrology and soils:

The use of the chemicals as presented, to kill insect, mite and mealybugs within a limited and controlled area with close management, will ensure that these pesticides do not contaminate other flora, fauna, open water sources or soils.

i) Availability and effectiveness of other pesticides or non-chemical management methods:

While there are a limited range of other pesticides available in Mozambique that are also effective for the proposed use, it has been determined that the requested pesticides have been used successfully to control the relevant insects and diseases. Due to high speed of infestation and the degree of damage that may result, the non use of chemical could result in significant losses. However, integrated cultural practices will be used to disturb disease and pest cycle in order to reduce the severity of attack.

j) Requesting country's availability to regulate or control the distribution, storage, use and disposal of the requested pesticide:

As presented in the SEA for USAID/M, there is limited control of pesticide use in the country and “...much of the responsibility for safe and effective pesticide use by PVO’s must be borne by the PVO Support Project and the PVO’s themselves (page 38)”. Limited support has been provided to the Ministry of Agriculture in warehouse inspection and plant quarantine, but this has not covered the entire country. WV’s own contacts in the target provinces indicates that very little, if any, regulation of pesticide use takes place on a regular basis. The Provincial Directorates of Agriculture will be informed of pesticide application and requested to inspect the facilities and preparations prior to application.

k) Provisions made for training of users and applicators:

Chemicals will be applied by WV-Moz and INIA technicians under the supervision of WV-Moz and INIA agronomists who have experience working in agricultural development projects and in the correct handling and use of pesticides. They have been involved with research activities and on-farm trials of different chemical inputs in small-scale agricultural initiatives and have worked with Karate previously. All sites will be directly managed, controlled, monitored and evaluated by appropriately trained WV-Moz or INIA agronomists. The WV-Moz technology adaption team is headed by Mr Patricio Agustin. WV-Moz Regional Programs are managed and advised by Dr C.Asanzi PhD Entomology, Dr B. Hilton PhD Soil Science and Dr S. Henderson, PhD Plant Physiology.

l) Provisions made for monitoring the use and effectiveness of the pesticides :

All these chemicals are available within the target provinces in sufficient quantities to complete the application (with detailed instructions in Portuguese). Chemicals will be transported to the application sites in the back of WV-Moz vehicles, well-secured to ensure no spillage if there are sudden stops, starts or turns. There will be no sharp objects in the vehicle that could puncture the containers during transport. Only the amount necessary to protect the crop will be acquired; no additional containers will be purchased and stored (in the medium term) by WV-Moz.

Preparations to apply chemicals will follow the instructions on the label, in the proper sequence. No one will handle the product without the proper training and protective clothing. Soap and water will be available for immediate cleaning of hands and eyes. Partially-used containers will be securely sealed during the application process and returned to storage. After completing the application, the empty containers will be punctured and burnt (per the Mozambican “Pesticide Guide”). The clothing and other equipment used during the application will be thoroughly cleaned (the clothes will be washed separately from other clothes). They will be stored in the WV-Moz warehouses.

Because the application will take place within a controlled area using a knapsack sprayer, there should not be “drifting” problems (movement of pesticide away from the area to be treated). Application will take place in the early morning (prior to 10:00 AM), avoiding the hottest part of the day. No food or drink will be consumed around the area during application. Should anyone show signs of pesticide poisoning, the application will be stopped and first aid will be immediately sought.

A monitoring pesticide use and application logsheet are utilized to follow up actions. The sheet comprises following information: name of pesticide, quantity used, crop applied, pest name, time of application, name of staff member preparing the solution and applying the pesticide.