OAPA Tracking 3: OAPA-13-SEP-AFG-0064

USAID FROM THE AMERICAN PEOPLE | AFGHANISTAN

AFGHANISTAN 2013 PROGRAM PESTICIDE EVALUATION REPORT AND SAFER USE ACTION PLAN (PERSUAP)

FIRST PROGRAMMTIC PERSUAP COVERING PROGRAMS IN AGRICULTURE AND ECONOMIC GROWTH

AUGUST 2013

This report was produced for review by the United States Agency for International Development (USAID). It was prepared under contract with Checchi and Company Consulting, Inc. for USAID's Afghanistan "Services under Program and Project Offices for Results Tracking Phase II" (SUPPORT II) project.

Approval of Recommended Environmental Actions:

Afghanistan PERSUAP

Clearances:

Office Director – Office of Agriculture:

_____ Date: 8/19/2013

Dawn Thomas

Office Director – Office of Economic Growth and Infrastructure:

_____ Date: 8/20/13

Charles Drilling

Office Director – Stabilization Unit:

_____ Date: 8/20/13

Michael McCord

Mission Director:

_____ Date: 8/24/2013

William Hammink

Regional Environmental Adviser/Asia, Middle East & OAPA:

_____ Date: 08 – 14 – 2013

Andrei Barannik

Mission Environmental Officer:

_____ Date: 8-14-2013
Harry Bottenberg

Concurrence:

OAPA Bureau Environmental Officer:

_____ Date: 9/4/13
Gordon Weynand

Approved ✓ Disapproved _____

OAPA Tracking #: OAPA-13-SEP-AFG-0064

TABLE OF CONTENT

I. Executive Summary 1
1. The USAID Program And The Need For A PERSUAP 1
2. The Pesticide Evaluation Report 3
II. Introduction 6
1. USAID Environmental Compliance 6
2. The Pesticide Evaluation Report & Safer Use Action Plan 10
1. Analysis Of PERSUAP Precedents For Afghanistan 12
III. Afghanistan Country Background 16
1. Introduction 16
a. Agriculture in Afghanistan 18
2. Environmental And Wildlife Conservation In Afghanistan 25
a. Environmental Regulation 25
3. USAID-Supported Agriculture And Sectors With Potential Pesticide Use In Afghanistan 37
a. The USAID Agricultural Program 37
4. Other donor-supported agriculture and sectors with potential pesticide use in Afghanistan 43
a. GIZ 43
b. IBRD (World Bank) 43
c. FAO 44
5. Afghanistan pesticide sector and evaluation of Afghanistan pesticide risks 44
a. The Afghan Agrochemical Sector 44
6. Pesticide Regulation 47
a. Current regulatory environment 47
7. Conclusion 50
IV. Pest Management Plans For Major Crop Value Chains 50
1. Wheat (*tritium spp*) 50
a. Fungal diseases 50
2. Oilseeds 53
3. Potato (*Solanum tuberosum*) 54
4. Vegetables 56
5. Grapes (Vitis ViniferA) 61
6. Stone Fruit & Almond (Prunus spp) 65
7. Pomegranate (*Punica Granatum*) 68
8. Apple (*Malus Domestica*) and Other Pome Fruit 68
V. Pesticide Handling And Use 70
1. Pesticides 70
2. Transporting, Storing And Selling Pesticides 74
3. Using Pesticides 76
4. Pesticide Accidents 80
5. Protective Clothing 81
6. Food Safety 83
VI. Pesticide Evaluation Report 84
1. Analysis Of Pesticide Uses 84
2. Acute Toxicity Classification 85
3. Fungicides 86
4. Herbicides 115
5. Insecticides/Acaricides 129
6. Molluscicide 166

7. Rodenticides 168
8. Fumigants 177
9. Microbicides 180
VII. Pesticide Safe Use Action Plan (Suap) For Afghanistan Usaid Assistance Projects .. 191
1. Selection Of Pesticides 191
2. Promotion of IPM and GAPs 191
3. Support to Retailers 192
4. Training Program 192
Annex I: Pesticide Retailer Handbook 194
Annex II: List of protected Species 256
Annex III: List of Pesticides Prohibited in Afghanistan 259
Annex IV: Draft Pesticide Act 261
Annex V: Species At Risk In Afghanistan 277
Annex VI: Imported Pesticides Found For Sale With Country Of Origin 283
Annex VII: USAID Agricultural Projects In Afghanistan 287
Annex VIII: Human Toxicology of Selected Pesticides 289
Annex IX: Ecotoxicology of Selected Pesticides 293

TABLE OF FIGURES

Figure 1: Deforestation in eastern Afghanistan 28
Figure 2: Proposed Protected Areas of Afghanistan 28
Figure 3: Afghanistan, Elevation 30
Figure 4: Afghanistan River Basins 31
Figure 5: Afghanistan Land Use 32
Figure 6: Afghanistan Soils 33
Figure 7: Afghanistan Average Seasonal Precipitation 34
Figure 8: Afghanistan Average Seasonal Rainfall 35
Figure 9: Afghanistan Average Seasonal Temperature 36

TABLE OF TABLES

Table 1: Pesticide Selection 3
Table 2: Project PERSUAPs 12
Table 3: Current and proposed USAID projects that use or may use pesticides (all have a Negative Determination with Conditions for pesticides) 13
Table 4: Status of Terrestrial Biomes in Afghanistan 27
Table 5: Pesticide Uses Identified from Pest Management Plans 84
Table 6: Non-agricultural Uses of Pesticides 85
Table 7: USEPA System of Classification of Acute Toxicity 85
Table 8: WHO Classification 86
Table 9: Status of selected pesticides in PERSUAPs for Uzbekistan, Pakistan, Tajikistan and Zimbabwe 188

I. EXECUTIVE SUMMARY

1. THE USAID PROGRAM AND THE NEED FOR A PERSUAP

This Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP) addresses the needs of all those USAID projects in Afghanistan that require the use of pesticides, defined by the United States Environmental Protection Agency (USEPA) as "chemicals used to prevent, destroy, or repel pests. Pests can be insects, mice and other animals, weeds, fungi, or microorganisms such as bacteria and viruses."

A valid approved PERSUAP is a legal requirement to comply with US Regulation 22 CFR 216. The purpose of the PERSUAP is to ensure that the use of pesticides overseas by USAID projects adheres to the same standards of safety as those regulated by USEPA within the United States and adheres to the laws of the host country. It is the responsibility of project management, including USAID staff, to ensure compliance with this regulation and individual projects have previously prepared and submitted their own PERSUAPs. But, in order to avoid duplication of effort and to ensure consistency across programs, USAID has increasingly prepared and approved program-wide PERSUAPs to cover the needs of all projects in one country. Such Mission-wide PERSUAP or Programmatic PERSUAPs have recently been developed for Pakistan (2013), Tajikistan (2011), Uzbekistan (2012) and Zimbabwe (2012).

The main need for pesticides in the Afghanistan program is in the agriculture sector, which requires insecticides, herbicides, fungicides, molluscicides, rodenticides and fumigants to protect crops in the field and commodities in storage. It is USAID policy that plant protection activities by projects should be based on the principles of Integrated Pest Management (IPM). Certain chemicals, such as disinfectants, used in the health sector, are also regulated by USEPA as pesticides and so require a PERSUAP if used by a USAID project.

U.S. assistance in Afghanistan to the agricultural sector focuses on helping to create farm and non-farm jobs, increasing incomes, and strengthening Afghans' confidence in their own government. USAID programs improve productivity, regenerate agribusiness, rehabilitate watersheds and irrigation infrastructure, and increase the capacity of the Afghan Ministry of Agriculture, Irrigation and Livestock (MAIL) to deliver services effectively. By working with farmers and agricultural businesses, USAID assists them to overcome obstacles hindering production, processing, marketing or sales of agricultural products.

In partnership with the Ministry of Public Health, as well as international and Afghan non-governmental organizations (NGOs), USAID supports the delivery of essential health services and pharmaceuticals through 540 health facilities in 13 of the country's 34 provinces. Services are provided through the Basic Package of Health Services (BPHS) and the Essential Package of Hospital Services (EPHS).

The scale of the USAID program constitutes both a responsibility and an opportunity to improve the use of pesticides in Afghanistan.

Afghanistan

Afghanistan is a land-locked country with a low resource base (although there are considerable unexploited mineral reserves), recovering from a generation of conflict and with a rapidly growing population. It ranks 155th out of 169 countries in the UNDP Human Development Index (HDI), a composite measure of welfare. Although nearly 80% of the workforces are employed in agriculture, it has to import food. It is, in effect, an agricultural country with a food deficit.

Afghanistan has a fragile environment. The government has addressed this by passing an Environment Law that gives overarching powers to the National Environmental Protection Agency (NEPA). All other laws, including any governing pesticides, must comply with the Environmental Law. Any activity that threatens an adverse environmental impact must be licensed by NEPA. NEPA is also responsible for Afghanistan's National Biodiversity Action Plan, whose goal is to conserve all aspects of Afghanistan's biodiversity, and to ensure that future utilization of Afghanistan's biodiversity resources is sustainable. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. There is a high degree of plant endemicism. Afghanistan lies on the important flight way for bird migration between Siberia and the Indian subcontinent. Wetland habitats in Afghanistan are vital to the conservation of these migrating birds. In the High Pamirs of Badakhshan, there are rare and endangered species such as the Snow Leopard and Marco Polo Sheep. Probably Afghanistan's greatest environmental challenge is the use of its meager water resources, needed for domestic use, agriculture and industry as well as to sustain wildlife. Afghanistan has acceded to a number of international environmental conventions.

Farming systems in Afghanistan can be characterized as complex, diverse and risk-prone. Farmers with small landholdings are largely dependent on their own production for their household's food. With obsolete technology, yields are low and production costs high. There are unresolved land tenure problems, lack of credit and lack of access to high quality inputs of all kinds. The lack of extension advice is exacerbated by the low level of education.

Most of the area under wheat is rainfed, and drought is a regular occurrence, causing failure in about three years out of ten. Weeds, pests and diseases cause heavy losses, even in years of adequate rainfall. Climate change threatens to increase the risk of drought in the future.

Wheat is the main crop, grown for subsistence, but fruit and nuts are of a high quality and command a ready export market. The growing cities offer an expanding market for high value vegetables. Since only 12% of the land area is arable, large areas of the country are pasture, mainly used by transhumant pastoralists (*kuchis*). Melons, once a major cash and

export crop, are threatened by an invasive pest, the Baluchistan Melon Fly (*Myiopardalis pardalina*).

As well as the USAID program, agricultural development in Afghanistan is supported by other agencies and donors such as the International Bank for Reconstruction and Development (IBRD), German International Assistance (GIZ), European Commission and the Food and Agriculture Organization of the United Nations (FAO). A large number of smaller NGOs also implement agricultural projects.

2. The Pesticide Evaluation Report

The major value chains can be classified as wheat, oilseeds, potatoes, cucurbits (melons etc.), vegetables, grapes, perennial fruit crops and nuts. In preparing this PERSUAP, the approach adopted has been to analyze these crops and their associated weeds, pests and diseases and identify outline Pest Management Plans, based on IPM, on which the need for pesticides can be based (see Section 3). Table 1 shows the selected pesticides and their uses.

Table 1: Pesticide Selection

Active Ingredient	category	Use
Aluminum phosphate	fumigant	Fumigant for control of storage pests in commodities
Tebuconazole Iprodione Kresoxim-methyl Azoxystrobin Quinoxyfen	fungicide	Systemic fungicide for treatment of powdery mildew on grapes
Carboxin Thiram	fungicide	Seed treatment against bunt in cereals
Copper oxychloride	fungicide	Fungicide for prevention of anthracnose in grapes
Mancozeb	fungicide	Systemic fungicide for treatment of Early Blight in potatoes
Mancozeb Metalaxyl Copper hydroxide boscalid	fungicide	Systemic fungicide for treatment of fungal diseases in vegetables & in nurseries
sulfur	fungicide	Preventive treatment against powdery mildew on grapes and cucurbits
sulfur	fungicide	Post-harvest preservative for apricots
Copper sulfate	fungicide	Fungicide for prevention of anthracnose in grapes
Copper sulfate	fungicide	Dormant season treatment against shot hole in apricots & other stone fruit, fungal canker in all tree crops
clethodim	herbicide	Selective herbicide against grass weeds in

		broad-leaved crops.
2,4-D Bromoxynil fenoxaprop-p-ethyl dicamba	herbicide	Selective herbicide against broad-leaved weeds in cereals
glyphosate	herbicide	Broad-spectrum to kill all weeds,
sethoxydim	herbicide	Selective herbicide against grass weeds in broad-leaved crops.
Imidacloprid Acetamiprid	insecticide	Systemic insecticide for foliar application against aphids and sucking insects on vegetables
Abamectin (Avermectin)	insecticide/acaricide	Contact acaricide for control of spider-mite
lambda cyhalothrin cypermethrin Spinosad malathion	insecticide	A non-persistent, quick knock-down insecticide for use against a range of pests when crop monitoring indicates damagingly high pest levels.
Diflubenzuron	insecticide	Persistent IGR for control of locusts in nymphet stage
mineral oil	insecticide/acaricide	Dormant season treatment against soft-bodies insect pests of fruit trees
Imidacloprid	insecticide	Systemic insecticide for seed treatment against soil insects and aphids
Diflubenzuron	insecticide	Persistent IGR for control of Grapevine Moth
Deltamethrin Spinosad	insecticide	Contact insecticide for control of Melon Fly
Deltamethrin	insecticide	Contact insecticide for control of locusts and Sunn Pest
azadirachtin (neem oil) *Bacillus thuringiensis* *Beauvaria bassiana*	insecticide/acaricide	Low toxicity insecticide for vegetables
Carbaryl	insecticide	Insecticide for control of cutworm on vegetables
Splat-EC [(Z, E)-7, 9, 11-Dodecatrienyl formate]	Pheromone	Control of Carob Moth by mating disruption.
Splat-Cydia [(E, E)-8, 10-Dodecadien-1-ol]	Pheromone	Control of Codling Moth by mating disruption
Metaldehyde	molluscicide	Molluscide for control of snails on vegetables
Warfarin bromadiolone brodifacoum zinc phosphate	rodenticide	Rodenticide for control of rats in stores and warehouses
Chloroxylenol	microbicide	Clinical disinfectants and antiseptics

chlorhexidine Sodium hypochlorite Sodium hydroxide Phenol Ethanol Soap		
chlorine	microbicide	Water treatment

The choice of specific chemicals that can be safely and effectively used for these purposes has been made taking into account availability on the local market, the desirability of introducing new and better pesticides, the need for a variety of modes of action to prevent resistance and potential effects on human health and the environment.

Safer Use Action Plan

If pesticides are incorrectly applied, not only do they create a hazard, but they also do not work. The Safer Use Action Plan must therefore cover the need for effective use. Safe practice does not begin and end in the field, but must embrace the entire supply chain, including transport, storage, retail sale, application and the disposal of containers and unused material. Section 4 outlines the elements of good practice in handling, selling and using pesticides. The principal mitigating measure is a knowledgeable farmer, who can apply IPM principles to his fields, select appropriate pesticides and use them safely and effectively.

Although direct farmer extension training is an important element in this, it must be accepted that most farmers, especially those with a low level of education, will depend for their advice for plant protection on the retailer from whom they buy their inputs. Strengthening the retail sector is therefore an indispensible element in promoting safe and effective use. Retailers can be encouraged to raise their standards by promoting the concept that "Good Service Means Good Business."

Not only must this PERSUAP address the requirements of projects that use pesticides directly, but also those who recommend them, provide training in their use and finance them. These latter projects do not have direct managerial control over use and so must fulfill their responsibilities under 22 CFR 216 by indirect means, of which the most important is farmer and retailer training.

This PERSUAP therefore makes the following recommendations.

1. Only those pesticides included in Section 5 and listed in Table 1 may be used by USAID projects unless or until this PERSUAP is revised.
2. USAID agriculture projects will base their plant protection activities on the principles of IPM.
3. The USAID Mission will establish a program-wide training capacity, to be managed by one of the projects, to provide uniform and high quality training to beneficiaries of all projects whose resources may be used for pesticides. An example of such training

is given in Annex I. The training will be implemented by a dedicated team, which should include government Plant Protection and Quarantine staff, and will receive training in participatory training methods and in the technical syllabus of the course. The course materials will include pre- and post-course evaluation. No other training on pesticides will be permitted without the approval of the MEO.

4. The USAID program will support pesticide retailers at the local level to raise standards of service to farmers and promote good practice in handling, storing, selling and using pesticides.
5. The USAID program will encourage and promote research into innovative IPM techniques to tackle intractable plant protection problems such as Melon Fly, Sunn Pest and Colorado Beetle that attract excessive pesticide use. It will pay particular attention to the use of pheromones, attractants and insect pathogens.
6. This PERSUAP will be updated annually or as needed.

II. INTRODUCTION

1. USAID ENVIRONMENTAL COMPLIANCE

From 1974 to 1976, over 2,800 Pakistan malaria spray personnel were poisoned (five fatally) by insecticide mishaps on a USAID/WHO anti-malaria program. In response to this and other incidents arising from USAID programs, a lawsuit was brought by a coalition of environmental groups against USAID's lack of environmental procedures for overseas projects. In response, USAID drafted US 22 CFR 216. This regulation, which was updated in 1979 to include extraterritorial affairs in response to changes in the scope of the application of the National Environmental Policy Act (NEPA), now guides most USAID activities that could have potentially negative environmental impacts.

All USAID activities are subject to evaluation through, at minimum, an Initial Environmental Examination (IEE). But because of risk concerns presented by pesticides, the USAID environmental regulations require that at least the 12 factors outlined in the Pesticide Procedures described in 22 CFR 216.3 (b)(1)(i) (a through l) be addressed in the IEE for any program that includes assistance for the procurement or use of pesticides. These factors are examined in a particular type of document, termed a "Pesticide Evaluation Report and Safer Use Action Plan" (PERSUAP), which is submitted as an attachment to the IEE or to an amendment to the IEE. The IEE or amendment itself can be very brief, with the analytical work contained in the attached PERSUAP. The PERSUAP focuses on the particular circumstances of the program in question, the risk management choices available, and how a risk management plan would be implemented in the field

USAID's Regulation 22 CFR 216 3

b) Pesticide Procedures

(1) **Project Assistance**. Except as provided in §216.3 (b)(2), all proposed projects involving assistance for the procurement or use, or both, of pesticides shall be subject to the procedures prescribed in §216.3(b)(l)(i) through (v). These procedures shall also apply, to the extent permitted by agreements entered into by A.I.D. before the effective date of these pesticide procedures, to such projects that have been authorized but for which pesticides have not been procured as of the effective date of these pesticide procedures.

(i) When a project includes assistance for procurement or use, or both, of pesticides registered for the same or similar uses by USEPA without restriction, the Initial Environmental Examination for the project shall include a separate section evaluating the economic, social and environmental risks and benefits of the planned pesticide use to determine whether the use may result in significant environmental impact. Factors to be considered in such an evaluation shall include, but not be limited to the following:

(a) The USEPA registration status of the requested pesticide;

(b) The basis for selection of the requested pesticide;

(c) The extent to which the proposed pesticide uses is part of an integrated pest management program;

(d) The proposed method or methods of application, including availability of appropriate application and safety equipment;

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

(f) The effectiveness of the requested pesticide for the proposed use;

(g) Compatibility of the proposed pesticide with target and no target ecosystems;

(h) The conditions under which the pesticide is to be used, including climate, flora, fauna, geography, hydrology, and soils;

(i) The availability and effectiveness of other pesticides or nonchemical control methods;

(j) The requesting country's ability to regulate or control the distribution, storage, use and disposal of the requested pesticide;

(k) The provisions made for training of users and applicators; and

(l) The provisions made for monitoring the use and effectiveness of the pesticide.

In those cases where the evaluation of the proposed pesticide use in the Initial Environmental Examination indicates that the use will significantly affect the human environment, the Threshold Decision will include a recommendation for the preparation of an Environmental Assessment or Environmental Impact Statement, as appropriate. In the event a decision is made to approve the planned pesticide use, the Project Paper shall include to the extent practicable, provisions designed to mitigate potential adverse effects of the pesticide. When the pesticide evaluation section of the Initial Environmental Examination does not indicate a potentially unreasonable risk arising from the pesticide use, an Environmental Assessment or Environmental Impact Statement shall nevertheless be prepared if the environmental effects of the project otherwise require further assessment.

(ii) When a project includes assistance for the procurement or use, or both, of any pesticide registered for the same or similar uses in the United States but the proposed use is restricted by the USEPA on the basis of user hazard, the procedures set forth in §216.3(b)(1)(i) above will be followed. In addition, the Initial Environmental Examination will include an evaluation of the user hazards associated with the proposed USEPA restricted uses to ensure that the implementation plan which is contained in the Project Paper incorporates provisions for making the recipient government aware of these risks and providing, if necessary, such technical assistance as may be required to mitigate these risks. If the proposed pesticide use is also restricted on a basis other than user hazard, the procedures in §216.3(b)(l)(iii) shall be followed in lieu of the procedures in this section.

(iii) If the project includes assistance for the procurement or use, or both of:

(a) Any pesticide other than one registered for the same or similar uses by USEPA without restriction or for restricted use on the basis of user hazard; or

(b) Any pesticide for which a notice of rebuttable presumption against reregistration, notice of intent to cancel, or notice of intent to suspend has been issued by USEPA,

The Threshold Decision will provide for the preparation of an Environmental Assessment or Environmental Impact Statement, as appropriate (§216.6(a)). The EA or EIS shall include, but not be limited to, an analysis of the factors identified in §216.3(b)(l)(i) above.

(iv) Notwithstanding the provisions of §216.3(b)(l)(i) through (iii) above, if the project includes assistance for the procurement or use, or both, of a pesticide against which USEPA has initiated a regulatory action for cause, or for which it has issued a notice of rebuttable presumption against reregistration, the nature of the action or notice, including the relevant technical and scientific factors will be discussed with the requesting government and considered in the IEE and, if prepared, in the EA or EIS. If USEPA

initiates any of the regulatory actions above against a pesticide subsequent to its evaluation in an IEE, EA or EIS, the nature of the action will be discussed with the recipient government and considered in an amended IEE or amended EA or EIS, as appropriate.

(v) If the project includes assistance for the procurement or use, or both of pesticides but the specific pesticides to be procured or used cannot be identified at the time the IEE is prepared, the procedures outlined in §216.3(b)(i) through (iv) will be followed when the specific pesticides are identified and before procurement or use is authorized. Where identification of the pesticides to be procured or used does not occur until after Project Paper approval, neither the procurement nor the use of the pesticides shall be undertaken unless approved, in writing, by the Assistant Administrator (or in the case of projects authorized at the Mission level, the Mission Director) who approved the Project Paper.

(2) **Exceptions to Pesticide Procedures**. The procedures set forth in §216.3 (b) (l) shall not apply to the following projects including assistance for the procurement or use, or both, of pesticides.

(i) Projects under emergency conditions.

Emergency conditions shall be deemed to exist when it is determined by the Administrator, A.I.D. in writing that:

(a) A pest outbreak has occurred or is imminent; and

(b) Significant health problems (either human or animal) or significant economic problems will occur without the prompt use of the proposed pesticide; and

(c) Insufficient time is available before the pesticide must be used to evaluate the proposed use in accordance with the provisions of this regulation.

(ii) Projects where A.I.D. is a minor donor, as defined in §216.1(c)(12) above, to a multi donor project.

(iii) Projects including assistance for procurement or use, or both, of pesticides for research or limited field evaluation purposes by or under the supervision of project personnel. In such instances, however, A.I.D. will ensure that the manufacturers of the pesticides provide toxicological and environmental data necessary to safeguard the health of research personnel and the quality of the local environment in which the pesticides will be used. Furthermore, treated crops will not be used for human or animal consumption unless appropriate tolerances have been established by EPA or recommended by FAO/WHO, and the rates and frequency of application, together with the prescribed pre harvest intervals, do not result in residues exceeding such tolerances. This prohibition does not apply to the feeding of such crops to animals for research purposes.

(3) **Non-Project Assistance**. In a very few limited number of circumstances A.I.D. may provide non project assistance for the procurement and use of pesticides. Assistance in such cases shall be provided if the A.I.D. Administrator determines in writing that

(i) Emergency conditions, as defined in §216.3(b) (2) (i) above exist; or

(ii) That compelling circumstances exist such that failure to provide the proposed assistance would seriously impede the attainment of U.S. foreign policy objectives or the objectives of the foreign assistance program. In the latter case, a decision to provide the assistance will be based to the maximum extent practicable, upon a consideration of the factors set forth in §216.3(b)(l)(i) and, to the extent available, the history of efficacy and safety covering the past use of the pesticide the in recipient country.

2. The Pesticide Evaluation Report & Safer Use Action Plan

The purpose of the PERSUAP is to ensure that the use of pesticides overseas by USAID projects adheres to the same standards of safety as those regulated by USEPA within the United States.

When registering a pesticide product, USEPA specifies the purpose for which it may be used (crops, pests), the method by which it may be applied, including precautions such as Personal Protective Equipment (PPE) and safety periods, and, in the case of a Restricted Use Pesticide (RUP), the qualifications of the user. USEPA makes these stipulations within a context of adequate education, an effective technical training capacity, legislative protection of workers and the general public, and law enforcement.

These conditions may not apply in many host countries of USAID projects and this is notably true of Afghanistan. The PERSUAP therefore gives an opportunity to consider what additional risks exist within the host country and what mitigating measures need to be taken.

Program managers are generally responsible for assuring that environmental review requirements for their programs are met, including PERSUAPs. As for all environmental reviews, guidance and assistance for PERSUAPs is available from the appropriate Mission Environmental Officer (MEO), Regional Environmental Officer (REO), the Bureau Environmental Officer (BEO), or the BEO/DCHA if Title II (PL 480) funds are involved..

A PERSUAP consists of two parts, a “PER” and a “SUAP.” The Pesticide Evaluation Report (PER) section addresses the 12 informational elements required in the Agency’s Pesticide Procedures. The Safer Use Action Plan (SUAP) puts the conclusions reached in the PER into a plan of action, including assignment of responsibility to appropriate parties connected with the pesticide program.

a. **USEPA registration status of the proposed pesticide**. Pesticides are registered in the U.S. by active ingredient and by formulation. “Registration status” possibilities of the

active ingredients and the formulated products include registered, never registered, and cancelled.

b. **Basis for selection of the pesticide**: This refers to the economic and environmental rationale for choosing a particular pesticide. In general, the least toxic pesticide that is effective is selected.

c. **Extent to which the proposed pesticide use is, or could be, part of an IPM program**: USAID policy promotes the development and use of integrated approaches to pest management whenever possible. This section discusses the extent to which the proposed pesticide use is incorporated into an overall IPM strategy.

d. **Proposed method or methods of application, including the availability of application and safety equipment**: This section examines in detail how the pesticide is to be applied and the measures to be taken to ensure its safe use.

e. **Any acute and long-term toxicological hazards, either human or environmental, associated with the proposed use, and measures available to minimize such hazards**: This section of the IEE examines the acute and chronic toxicological data associated with the proposed pesticide. In addition to hazards, this section of the IEE also discusses measures designed to mitigate any identified toxicological hazards, such as training of applicators, use of protective clothing, and proper storage.

f. **Effectiveness of the requested pesticide for the proposed use**: This section of the PERSUAP requires information similar to that provided in item b, but more specific to the actual conditions of application. This section also considers the potential for the development of pest resistance to the proposed insecticide.

g. **Compatibility of the proposed pesticide use with target and non-target ecosystems**: This section examines the potential effect of the pesticide on organisms other than the target pest (for example, the effect on bee colonies kept in the area). Non-target species of concern also include birds and fish. The potential for negative impact on non-target species should be assessed and appropriate steps should be identified to mitigate adverse impacts.

h. **Conditions under which the pesticide is to be used, including climate, flora, fauna, geography, hydrology, and soils**: This section examines issues such as the potential for contamination of surface and groundwater sources.**Availability of other pesticides or non-chemical control methods**: This section identifies other options for control of pests and their relative advantages and disadvantages.

i. **Host country's ability to regulate or control the distribution, storage, use, and disposal of the requested pesticide**: This section examines the host country's existing infrastructure and human resources for managing the use of the proposed pesticide. If the host country's ability to regulate pesticides is inadequate, the proposed action could result in greater harm to the environment.

j. **Provision for training of users and applicators**: USAID recognizes that safety training is an essential component in programs involving the use of pesticides. The need for

thorough training is particularly acute in developing countries, where the level of education of applicators may typically be lower than in developed countries.

k. **Provision made for monitoring the use and effectiveness of this pesticide**: Evaluating the risks and benefits of pesticide use should be an ongoing, dynamic process.

1. Analysis Of PERSUAP Precedents For Afghanistan

Of the projects mentioned below, ASAP, ADP/N and ADP/SW are closed. IDEA-NEW, CHAMP and ACE are currently active.

No PERSUAP was submitted or approved for USAID projects in Afghanistan until June 2008 when ADP/N and ASAP submitted documents. ADP/N received approval for a limited PERSUAP covering three insecticides: novaluron (IGR), lambda-cyhalothrin (parathyroid) and imidacloprid (neonicatoid). ASAP submitted a PERSUAP for 144 pesticides, which included three rodenticides, two molluscicides, 52 fungicides, 61 insecticide/ acaricides and 22 herbicides. For a list of project PERSUAPs, see Table 2. For a list of current projects requiring PERSUAP approval, see Table 3.

A PERSUAP for ADP/SW was approved on 10th November 2009. This also analyzed 144 pesticides. In November 2009, IDEA-NEW submitted a PERSUAP for 21 pesticides, seven acaricide/ insecticides, six fungicides, six herbicides and two mating disruptants,

CHAMP submitted a PERSUAP in January 2011, but this was not passed to the MEO until March 2013. In April 2013, a memorandum granting retrospective authority to use these products was approved pending the development of a Mission-wide PERSUAP. ACE, which is a finance project some of whose funds are disbursed for the purchase of pesticides, received MEO permission to use the IDEA-NEW and CHAMP PERSUAPs pending the approval of a Mission-wide PERSUAP.

Table 2: Project PERSUAPs

Project	Status	PERSUAP
(Accelerating Sustainable Agriculture Project)ASAP	Closed	2008
Alternative Development Project North (ADP/N)	Closed	2008
Alternative Development Project South-West (ADP/SW)	Closed	2009
Incentives Driving Economic Alternatives – North, East, West (IDEA-NEW)	Active	2009
(Commercial Horticulture and Agriculture Marketing Program)CHAMP	Active	2013
Agricultural Credit Enhancement (ACE)	active	None[1]

[1] ACE is allowed to use PERSUAP of IDEA-NEW and CHAMP until August 31, 2013, or until Mission-wide PERSUAP is approved , whichever is soonest.

These PERSUAPs adopted two very different approaches. Those for ADP/N, IDEA-NEW and CHAMP requested a very limited list of products specifically selected for the needs of their work programs. Those for ASAP and ADP/SW gave approval for the use of a wide range of available products, immediately banning the use of those with Toxicity Class I and suspending the use of Class II products until adequate mitigating measures, such as training, could be introduced. This reflected a difference in the scope and work plans of the projects. Whereas CHAMP and IDEA-NEW needed a specific selection for the recommended IPM programs for their training locations, ASAP was supporting a large agricultural retailing program (AgDepots).

Table 3: Current and proposed USAID projects that use or may use pesticides (all have a Negative Determination with Conditions for pesticides)

Project	Sector	Start date	End date
Incentives Driving Economic Alternatives for the North, East, & West (IDEA-NEW)	Agriculture	Mar-09	Mar-14
Commercial Horticulture and Agriculture Marketing Program (CHAMP)	Agriculture	Oct-09	Oct-13
Regional Agriculture Development Program (RADP)	Agriculture	Oct-13 (est.)	Oct-18 (est.)
Agriculture Research &Extension Development Program (AGRED)	Agriculture	Oct-10	Jul-17
Agricultural Credit Enhancement (ACE) Program/Agriculture Development Fund (ADF)	Agriculture	July 10	January-15
Assistance in Building Afghanistan by Developing Enterprises (ABADE)	Private Sector	Jun-12	May-16
Financial Access for Investing in the Development of Afghanistan (FAIDA)	Private Sector	Oct-09	Sep-14
Kandahar Food Zone (KFZ)	Democracy & Governance	Sep-13	Sep-15

Integrated Pest Management—USAID Policy

In the early 1990s, USAID adopted the philosophy and practice of Integrated Pest Management (IPM) as official policy. IPM is also strongly promoted and required as part of Regulation 216.3. Since the early 2000s, IPM—which includes judicious use of 'safer' pesticides—has been an integral part of GAPs and is increasingly considered to constitute best management practice in agriculture.

A good definition of IPM from UC-Davis is as follows:

> "Integrated pest management (IPM) is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials [pesticides] are selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the environment."

Integrated Pest Management in Afghanistan

IPM has a long, if somewhat chequered, history in Afghanistan. During the 1970s, FAO supported the PPQD in developing plant protection and adopted what was essentially an IPM approach which included, among other activities, the identification of pests and diseases and the introduction of *Aphelinus malii* as a natural enemy of Woolly Aphid (*Eriosoma lanigerum*). These activities fell into abeyance during the years of conflict and although FAO maintained a presence through the 1990s, after the departure of Soviet forces, the emphasis was, of necessity, on emergency control of migratory pests such as locusts and Sunn Pest. Even so, non-chemical methods, such as the use of sweep nets to control Sunn Pest and mechanical control of locusts were introduced.

An IPM element was included in the World Bank Horticulture and Livestock Project, which commenced in 2008. This focused on perennial crops such as almonds, apricots and grapes. The project as a whole was implemented by GTZ (now replaced by GIZ) with FAO implementing the IPM element. This project now continues as the National Horticulture and Livestock Project, implemented by GIRoA MAIL. Its scope extends to annual as well as perennial horticulture and it continues to promote IPM.

FAO currently implements an IPM project funded by the government of Norway. Here, the emphasis is on Farmer Field Schools (FFS) and is directed towards specific crops, so far: potatoes, wheat, melons and rice. The methods adopted are entirely non-chemical and include, for example, animal-drawn hoes for weed control in wheat, plastic mulch and bagging for control of melon fly (*Myiopardalis pardalina*). This project works closely with PPQD and the DAILs.

USAID projects have adopted an IPM approach to pest and disease control where these have been needed by their activities. ADP/N implemented control of Codling Moth based on pesticide application timed from the UC Davis online development model using pheromone traps and temperature data from the Afghanistan Dept. of Meteorology. It also introduced dormant season spraying of fruit trees to prevent Shot Hole disease in apricots and bacterial canker in several species.

Afghanistan PERSUAP Methodology

USAID Afghanistan is currently implementing or planning to implement a number of agriculture and health projects that either are using pesticides or have the potential need to do so (for details of current projects, see above). It has been decided that an “umbrella "or program-wide PERSUAP will avoid duplication of effort and ensure a consistent approach across the program.

The COR for the Checchi-implemented SUPPPORT II project and the Mission Environmental Officer (MEO) took an active role in this PERSUAP process. The MEO provided specific technical guidance and direction, reviewed progress and other draft materials produced by the PI/PMS and performed liaison functions. The Regional Environmental Officer (REO), also collaborated in the technical review to provide information, perspective and links to EPA.

SUPPORT II recruited an expert team of consultants consisting of a Principle Investigator (PI) as Pesticide Management Specialist (PMS), two national expert staff and a home-based Pesticide Regulatory Specialist to provide Quality Control. The PI/PMS was primarily responsible for expanding an existing PERSUAP for the IDEA-NEW project to cover all of the Mission’s key projects as included in the project’s contracting documents from USAID, and any new projects that may come up in the next five years.

The National Environmental Protection Agency (NEPA) was the primary point of contact for PERSUAP analysis. In addition, the Plant Protection and Quarantine Dept. (PPQD) within the Ministry of Agriculture Government of Afghanistan also constituted an important source of information.

The expert team carried out the following tasks.

- Reviewed EPA registration and toxicity data on all active ingredients listed in the current PERSUAPs.
- Reviewed existing and previous project IEEs and PERSUAPs.
- Conducted a survey of pesticide retailers to determine currently available products and the conditions under which they are sold, including the availability of PPE and application equipment.
- Interviewed pesticide wholesalers regarding access to international markets, demand for pesticides, quality of available pesticides, the regulatory environment and local language labeling.
- Held meetings with MAIL officials to determine the current status of pesticide legislation, current regulatory practice, planned registration system and the role of provincial and district DAILs in promoting IPM and GAP.
- Held meetings with CoPs and CORs of currently active projects to determine requirements for use of pesticides.

- Held meetings with officials of other concerned agencies such as FAO, UNEP, NHLP, and WB.
- Reviewed crop value chains to identify appropriate IPM and GAP.
- Outlined program-wide training strategy.
- Conducted a roundtable presentation to OAG staff, summarizing the conclusions of the study and the recommendations to be incorporated into the PERSUAP.
- Submitted a first draft PERSUAP to MEO and incorporated feedback into a second draft.
- Submitted final draft incorporating feedback from peer review and REO.

III. AFGHANISTAN COUNTRY BACKGROUND

1. INTRODUCTION

Afghanistan is a landlocked country north and west of Pakistan, east of Iran, also bordering China, Tajikistan, Turkmenistan, and Uzbekistan. It lies between latitudes29° N and 39° N, and longitudes60° E and 75° E. With an area of 652,230 square kilometers (251,830sqmiles), it is slightly smaller than Texas.

It has a continental climate with very harsh winters in the central highlands, the northeast (around Nuristan) and the Wakhan Corridor, where the average temperature in January is below −15 °C (5 F), and hot summers in the low-lying areas of the Sis tan Basin of the southwest, the Jalalabad basin in the east, and the Turkestan plains along the Amu River in the north, where temperatures average over 35°C (95 F) in July.(see **Fig. 9**). **Fig. 4** shows the river systems.

Afghanistan has a highly diverse environment, extending from hot sub-tropical desert to permanent snow. As well as the effect of altitude, its biodiversity is increased by its location at the junction of several biogeographically regions: the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian, which all contribute elements to its flora and fauna. There is also a high degree of floral endemics, estimated to be approximately 25-30%.In addition; its biological importance is enhanced by its position on the migratory pathway of birds between Siberia and the Indian subcontinent. Fragile wetlands in Afghanistan, such as Ab-i-Estada, are crucial to the survival of migrating birds, some of which, such as the Siberian Crane, are endangered.

In the Human Development Report 2010 (UNDP), Afghanistan ranks 155th out of 169 UN member states on the Human Development Index, which is a composite measure of welfare? The population was estimated at 26.5 million (World Bank 2011). Gross national Income per capita was approximately $1,419 with 42% living below the poverty line. Life expectancy was estimated at 44.6 years. The less than five mortality rate in 2007/08 was 161 per 1,000 live births. The maternal mortality rate of 1,600 deaths per 100,000 live births is the second highest in the world.

Agriculture employs 78.6% of the workforce. At present, it contributes about 30% of GDP. Only 12% of its total land is arable. Production is constrained by an almost total dependence on erratic winter snows and spring rains for water (See **Fig. 7** & **8)**. The country is not self-sufficient in the major staple, wheat. In 2007, the country's fruit and nut exports were at $113 million per year but it was said that this could grow to more than $800 million per year in 10 years given the proper investment. Afghanistan is known for producing some of the finest fruits, especially pomegranates, apricots, grapes, melons, and mulberry. (See **Fig. 5** for land use and **Fig. 6** for soils)

Other natural resources include natural gas, petroleum, coal, copper, chromate, talc, barites, sulfur, lead, zinc, iron ore, salt, precious and semiprecious stones The government of Afghanistan claims that the country holds up to $3 trillion in proven untapped mineral deposits, which could make it one of the richest mining regions on earth.

Afghanistan is a party to a number of international environmental agreements including Biodiversity, Climate Change, Desertification, Endangered Species, Environmental Modification, Marine Dumping, and Ozone Layer Protection. It has signed, but not ratified the Hazardous Wastes, Law of the Sea and the Marine Life Conservation agreements. The Stockholm Convention and the Rotterdam Convention were recently ratified.

Infrastructure, despite massive recent investment, remains poor. There are 12,350 km of paved road and 29,800 km of unpaved. Communications have been revolutionized by mobile phone systems developed by private companies.

Afghanistan is an Islamic republic consisting of three branches, executive, legislative and judicial. The UN-sponsored Bonn Conference in 2001 established a process for political reconstruction that included the adoption of a new constitution, a presidential election in 2004, and National Assembly elections in 2005. In December 2004, Hamid Karzai became the first democratically elected president of Afghanistan and the National Assembly was inaugurated the following December. Karzai was re-elected in August 2009 for a second term. Despite gains toward building a stable central government, a resurgent Taliban and continuing provincial instability - particularly in the south and the east - remain serious challenges for the Afghan Government

The international community remains committed to Afghanistan's development, pledging over $67 billion at nine donors' conferences between 2003 and 2010. In July 2012, the donors at the Tokyo conference pledged an additional $16 billion in civilian aid through 2015.

Despite the progress of the past few years, Afghanistan is extremely poor, landlocked, and highly dependent on foreign aid. Much of the population continues to suffer from shortages of housing, clean water, electricity, medical care, and jobs. Criminality, insecurity, weak governance, lack of infrastructure, and the Afghan Government's difficulty in extending rule of law to all parts of the country pose challenges to future economic growth

a. Agriculture in Afghanistan

Farming systems in Afghanistan can be characterized as complex, diverse and risk-prone. Farmers with small landholdings, largely dependent on their own production for their household's food and with limited access to markets, have to make complex decisions about the allocation of their scarce resources of land, capital and labor if they are, literally, to survive. Their objectives are significantly different from those of even small farmers in developed economies. They are dominated by the need for household food security and by avoidance of risk. Limited access to markets, caused by poor roads and chronic insecurity oblige them to assign priority to wheat for their own household consumption, even when it is not the most suitable crop for their land. There are three main farming systems.

Rain fed annual crops

Large areas of northern Afghanistan are under rain fed cultivation, but the rainfall is marginal for the major crop, wheat, and it can be expected to fail in about three years out of ten. To this risk must be added those from pest outbreaks (see below). This high risk and low average yields mean that there is little incentive to invest in inputs such as fertilizer, herbicide or improved seed. Wealthy and powerful individuals are able to cultivate large areas using tractors, often alienating land designated as pasture, but many households plant a hectare or less, using minimum inputs and with no great expectation of achieving high yields. Frequently, steep slopes are cultivated, creating the risk of soil erosion. Nonetheless, in a good year, yields may approach those of irrigated land. Rainfed cultivation remains the major farming system for food security over extensive areas.

In spite of its importance, rainfed cultivation has been overlooked by aid agencies and research organizations. No wheat varieties have been developed specifically for its needs and the old ones widely used remain vulnerable to drought and disease. Similarly, the needs for appropriate mechanization and watershed management have been neglected.

The alternatives to wheat on rainfed land are flax and sesame. To these may be added safflower, which is becoming more common. Melons are frequently grown as a cash crop in rotation with wheat, but this crop has been seriously affected by the spread of Melon Fly (see below).

The yields of rainfed land can be raised and the risks of failure from drought reduced by introducing advanced agronomic techniques such as conservation tillage, weed control, the identification of appropriate seed varieties and the placing of fertilizer with the seed. Diversification into more drought resistant crops is also a desirable objective. These improvements, however, are likely to be inaccessible to the very small subsistence cultivators, especially those cultivating slopes.

Irrigated annual crops,

Irrigated areas also vary widely being characterized by their water availability and predictability, sometimes only being sufficient for a single irrigation, sometimes through the whole year. Broadly however, the choices available to farmers are more varied. The predominant form of irrigation is flood, with beds sometimes used and scaled to different sizes to provide a water storage function as well as appropriate support or environment for the crop.

There is a greater variety of crops that can be grown and the possibility, where water is sufficient, of two crops, usually first wheat followed then by a cash crop. This may be rice, beans, maize, millet, mung bean, sesame or vegetables such as cauliflower and carrots. Sometimes a single spring crop is grown. Melons and cotton are important cash crops. Sesame and sunflower are important oilseeds. Vegetables include tomatoes, egg plant, okra, chili pepper, cucumber, cabbage, cauliflower, onions and carrots. The choices are not always purely financial. Crops may be rotated for reasons of weed and pest control or soil improvement. Choices may also be restricted by water availability, knowledge, ability to protect a valuable crop, access to market or the availability of inputs. Families may also depend on crop residues, for example cotton stalks, for fuel.

Often the available irrigation water is insufficient for even one crop, is highly unpredictable, and can only supplement rainfall. In some areas farmers practice a form of communal rotation in which a proportion of their land is selected for cultivation each year and all the available irrigation water is diverted to it. The whole village moves their cultivation to this location which is divided into sub-plots for each owner. The following year, a second area is selected. In this way the village's land may be cultivated once in two or three years.

Depending on the availability of water, irrigated land may support either one or two crops a year, rainfall almost always has a significant impact on yields, regardless of the availability of irrigation water. The first crop is usually wheat.

Irrigated land offers the opportunity to diversify into a wide range of high value vegetables where there is good access to the market. The following crops are those most commonly grown on irrigated land.

- Wheat
- Cotton (the growing season is too long for it to be planted as a second crop)
- Rice (second crop)
- Melons (spring crop)
- Vegetables (tomatoes 1st, potatoes 1st, carrots 1st /2nd, onions 1st, cabbage, cauliflower 2nd, okra 1st etc.)
- Beans (second crop)
- Maize. (second crop)

- Oil crops: sesame 1st/ 2nd; Flax (small areas of irrigated, 1st) Sunflower, also small areas 1st.
- Cumin 1st

The use of valuable irrigated land for such unsuitable crops as cotton and sugar beet has been encouraged by donors in support of national commercial interests – happily without much success.

Massive weed burdens, lack of knowledge about the use of basic inputs, flood irrigation, and lack of farm power are amongst the major barriers to increased yields and improved cultivation, leading to the high costs and low profitability of agriculture in Afghanistan

Farmers of irrigated land are quickly learning to exploit the opportunities of high value horticulture and are using such techniques as low plastic tunnels to lengthen their season. It is in raising the productivity of irrigated land that the major economic gains are to be made.

Opium Poppy

The cultivation of opium poppy (*Papaver somniferous*) has been a traditional practice in Afghanistan for many years. However, since its market is the illicit trade in heroin, whose beneficiaries are organized crime and insurgents, its replacement by legitimate crops is an important objective of US funded agricultural development projects.

Irrigated perennial crops

Dried fruit and nuts were previously Afghanistan's major exports and still enjoy a cachet in the large markets of India, Pakistan and the Asian communities around the world. The main tree crops are: almond, stone fruit (apricots, peaches & cherries), apple, pomegranate and grapes. Grapes require less water than the others and are grown under wide ranging systems depending on the location. Citrus is grown successfully in the south-east. Grapes can also be dried and sold as raisins. However, improved roads have expanded the demand for fresh grapes, though poor post-harvest practices result in large losses.

There has been extensive planting of orchards over the last ten years and the EC funded Perennial Horticulture Development Project (PHDP) has done extensive work in characterizing varieties, introducing good nursery practices and certification.

The main problem remains orchard management. Basic knowledge of pruning and preventive plant protection is widely lacking. It is not uncommon to see entirely unproductive orchards because of simple failures such as the inclusion of pollinator companions, or an absence of pruning.

Grapes exhibit a particular problem. Vines are grown on the ground or as bushes, rather than on trellises, which is the practice elsewhere. Yields can be more than doubled by trellising,

but this change also requires improvements in other aspects of management such as pruning, preventive plant protection, canopy management, harvesting and packaging.

As a major producer of valuable export commodities, perennial horticulture has attracted a great deal of donor interest. PHDP has made an invaluable contribution in establishing a sound technical basis for germplasm, but the real challenge is in raising productivity through improved management, a process requiring years of sustained effort.

Livestock

Livestock also form part of the mix for nearly all farming households, from chickens to camels, providing meat, milk, transport, dung (fuel & fertilizer) and by products such as wool, cashmere and skins. Flocks are seldom managed to maximize income, rather they are often used as a store of value. Veterinary services are still not sufficient to meet the need. Droughts cause frequent heavy losses. There is no pasture management to speak of, beyond the rule of the gun.

There are large areas of the country where pastoralism is the only viable economic activity and livestock provide important export products such as hides, Karakul pelts and live animals for meat (especially during religious festivals).

The expansion of veterinary services to cover the more remote areas is a clear need. MAIL policy is that veterinary services should be provided by private businesses, known as Veterinary Field Units (VFUs) and this model, with training and support from donors through the Dutch Committee for Afghanistan (DCA) has proved highly effective. There is also need to improve general herd management to optimize productivity. This includes culling, winter feed and more efficient harvesting of by-products such as wool and Cashmere. The problems of pasture management also need to be addressed.

Land Tenure

Title

Owing to the disruption of 30 years of conflict, there is much confusion relating to land title and rights. Various power brokers and governments have granted title to the same piece of land. Alienation of government land has been a particular target for this. As a consequence, there are multiple “owners” who each believe they have valid title to the same piece of land and, given the current state of the judicial system, these conflicts are resolved by force or influence, thus fuelling insurgency.

What were often community lands are now deemed to be government land. The consequence of this is that such land may be alienated by corrupt officials. In any case, the previously existing system of land management has fallen into abeyance leaving free-for-all overexploitation in a classic “Tragedy of the Commons.”

Share-cropping

Share cropping is widespread in Afghanistan and may be the most important form of land tenure. This creates important distortions of the incentives to invest in higher productivity. There are traditional ways of dividing the yields of a crop between the land-owner, provider of water, cultivator and reaper, but these cease to apply once modern methods are introduced. The introduction of completely new methods of cultivation needs to take into account the need to agree on the distribution of costs and returns.

Land Use

Notionally, land is legally classified according to its use. However, in the absence of effective enforcement, conflicts arise between communities who wish to put the same land to different uses, e.g. rangeland or cultivation. Since traditional land use is linked to ethnicity, conflicts provide potent fuel for insurgency.

Grazing rights can complicate the picture and the conflicts between cultivators and pastoralists often arise. It is common for pastoralists to have rights to graze following harvest. In some areas this is paid for and may be controllable, but not in others.

Drought

There is a high variation in annual precipitation in northern Afghanistan. As well as rainfall over the cultivated area, snowfall in the mountains during winter is essential to provide the river flow during summer necessary to support irrigation. Drought therefore is a regular feature in the life of an agricultural household, an expected part of the cycle and not an unexpected event. Drought must therefore be managed through the development of resilient systems rather than responded to with ‘emergency’ programes that come into effect 12 months too late.

Accepting this reality would be a major step in working towards a resilient, more stable, functional agricultural industry rather than developing one that does not function with limited water resources and depends on a cyclical emergency response.

The expectation of drought must be factored into the farming system and the policy, institutional, and aid environment. .

Priorities for this would include:

- Improving natural resource management
    - Watershed development approaches
    - Enhancing organic matter and nutrient cycling in soils
- Adopting drought resistant crops and agronomy,
- Assessing risk in committing inputs,
- Making more efficient use of irrigation water,

    - Laser land leveling and increased bed furrow irrigation areas rather than flood systems
    - System of Rice Intensification for rice producing areas
- Understanding and developing coping strategies
    - Diversified livelihood strategies including within agricultural systems balancing livestock, perennial and annual cropping elements.
    - Savings

Pests and diseases

Agriculture in Afghanistan suffers from heavy losses from weeds, pests and diseases and the available plant protection services available to farmers, both public and private, are inadequate.

Migratory pests

The region suffers from intermittent outbreaks of two species of locusts, the Moroccan Locust (*Dociostaurus maroccanus*) and the Italian Locust (*Calliptamus italicus*). Both can be readily controlled by teams from the Plant Protection and Quarantine Dept. of MAIL

The northern region also suffers from outbreaks of a species of Sunn Pest, *Dolycoris pennicillatus*. This insect has an annual migration between the high mountains in Sari Pol, Faryab, Badghis and Herat provinces, where it hibernates above an altitude of 2,000 meters, and the desert areas of Turkmenistan, where it breeds on the ephemeral spring vegetation. Other species of Sunn Pest, such as *Eurygaster integriceps* and *Aelia* spp. are found throughout the country. They do not pose the same migratory epidemic threat. ICARDA, in cooperation with the University of Vermont, has studied the use of a fungal pathogen, *Beauvaria bassiana*, as a biological control agent and an element in an IPM system for wheat and other affected crops.

Melon Fly

A new pest that has spread across the region over the last 10 years is the Melon Fly, *Myiopardalis pardalina.* Melons are the traditional cash crop in the rainfed areas and are usually rotated with wheat. This pest, which has spread across the north from west to east, causes up to 70% losses and is leading to the abandonment of this important crop in many areas. It has been little studied and no satisfactory strategy for its control exists. Basic research on its life-cycle is required, as well as to identify a chemical attractant that can be developed as a lure for monitoring and control.

Weeds

Weeds are a major cause of low agricultural yields in Afghanistan. Most fields carry a heavy burden of weed seeds and it is sometimes difficult to see the crop because of the density of

weeds. Effective weed control is hampered by lack of machinery for tillage and row sowing and ignorance of the correct use of herbicides.

Diseases

Plant diseases, mainly fungal, cause extensive losses, especially to perennial and annual horticulture. The lack of new varieties of field crops also increases vulnerability to disease.

Agronomy, Mechanization and Water Use

Existing agricultural practices are only just beginning to progress from those that have been followed for centuries. They are characterized by dependence on animal or hand powers, local varieties of seed retained by the farmer, sowing by hand and complete utilization of all plant residues as fuel or fodder. Families who left the land as refugees often lost some of the skills of traditional agriculture and also lacked the capital to invest in equipment and draught animals.

Improving agronomic practices requires an understanding of the context in which the existing ones developed. For example, the excessive seed rates customarily used are a method of weed control and to compensate for poor germination. However, they are an obstacle to the adoption of improved seed since they raise the cost prohibitively. This cannot be overcome unless improved weed control, including the correct application of herbicides, is introduced.

Investment in inputs, such as improved seed , fertilizer and pesticides, is constrained by a justified lack of confidence in what is offered for sale in the local bazaars. However, an equal or greater problem is ignorance of the correct use of inputs, both with regard to choosing whether and when to apply them and also the method of application. Poor application renders even high quality inputs ineffective. Failure tends to be blamed on the quality of the material, thus reinforcing the lack of confidence in it.

Farmers receive advice from each other, NGOs and input retailers. Over the last ten years, advice from NGOs has been very important and appreciated by those farmers who have benefited from it, but has tended to be limited in its effect to the small number of project beneficiaries. Also, the technical quality has been very variable.

The level of knowledge of inputs retailers is very low and characterized by a lack of understanding of the basic features of the products that they are selling. This results not only in lack of effectiveness, but a positive danger to the user, the consumer and the environment.

Formal extension advice tends to adopt an industrial or extractive approach to agriculture, possibly an inheritance of the Russian era. However, the deterioration of soils caused by loss of organic matter, heavy weed burdens, poor water management, and restricted choice of crops and poor fertility requires an approach with more emphasis on the conservation of the agricultural environment to create healthy and resilient systems.

Water is a major constraint on production, but the water resources that exist are not efficiently used. The irrigation structures themselves are usually unlined and poorly engineered, causing heavy losses. The system of distribution is out of the control of the farmer, who is obliged to apply water when it is available rather than when it is needed. The methods of irrigation, large beds, ditches and flood systems are themselves inefficient. A further level of inefficiency arises from heavy weed burdens, high seed rates, poor timing and uneven beds. Poor as the traditional system of irrigation is, it has further deteriorated through neglect and conflict.

There are a number of appropriate and practical improvements to water use that can readily be applied. They include lay flat pipe, laser land leveling and intensification of rice cultivation (making more water available downstream).

Although animal power is gradually being replaced by imported Russian tractors, they do not deliver the real gains of mechanization, such as controlled seed and fertilizer application rates. Moreover, they are unsuitable for small fields, expensive to rent and often unavailable at the optimum time for operations. The arrival of two-wheel tractors provides affordable and accessible farm power to small farmers, enabling them to improve their agronomic methods by mechanical weed control, metered seed and fertilizer application, making the use of fertilizer in conditions of limited moisture economically worthwhile. Combined with research and extension, the introduction of two-wheel tractors offers a revolution in agronomy with large gains in yields and reduced costs.

The Market

Afghan agriculture suffers from low yields and high production costs. Its isolation and the high cost of transport have until recently protected it from competition and so domestic prices has been higher than those on the world market. This is changing. Afghan produce is being increasingly exposed to competition by imports from neighboring countries with higher yields and lower production costs. Its access to the Indian market is threatened by the tightening of India's food standards and its access to high value markets such as Europe limited by the need to comply with EU food standards. The problem is exacerbated by an overvalued currency shored up by the massive expenditure of the international presence.

2. Environmental And Wildlife Conservation In Afghanistan

a. Environmental Regulation

Environmental regulation falls under the 2007 Environment Law. It is the overarching framework into which all sector specific environmental and natural resource legislation must fit. The National Environmental Protection Agency is the authority primarily charged with implementing it.

The Environment Law assigns NEPA the responsibility for coordinating and monitoring conservation and rehabilitation of Afghanistan's environment. This mandate gives NEPA

overall responsibility for implementation of the National Biodiversity Strategy and Action Plan (from which the following information is taken), in partnership with MAIL and other government organizations, and with the technical and financial assistance of international organizations and NGO partners.

Certain activities that have an adverse impact on the quality of environmental resources require licenses or permits from NEPA. These are:

- undertaking an activity or implementing a project, plan or policy that is likely to have an adverse environmental impact;
- discharging into the environment a polluting substance which is likely to cause a adverse impact on the environment or human health;
- constructing or operating a waste management storage or treatment facility;
- storing or disposing of hazardous waste;
- hunting or otherwise exploiting a protected or endangered species (see Annex II) for list of protected species);
- exporting protected or endangered species;
- Accessing the genetic resources of Afghanistan's biodiversity.

Other line ministries and agencies, for example MAIL, have responsibility for the management of resources within their respective sectors.

Biodiversity

The fauna and flora of Afghanistan is not exceptionally diverse. There are 137 - 150 species of mammals, 428 - 515 birds, 92 – 112 reptiles, only 6 – 8 amphibians, 101 – 139 fish, 245 butterflies, and 3500 – 4000 vascular plant species native to Afghanistan. The range in numbers results from uncertainty in taxonomy and the questionable validity of some records. Only seven vertebrate species (**Mammals**, none; **Birds,** Afghan Snow Finch (*Montifringilla theresae*); **Reptiles**, Leviton's Gecko (*Asiocolotes levitoni*), *Cyrtopodion voraginosus*, *Eremias aria*, Point-snouted Racerunner (*Eremias afghanistanica*), **Amphibians**, Paghman Mountain Salamander (*Batrachuperus mustersi*); **Fish**, *Triplophysa farwelli*) are known to be endemic to Afghanistan, but estimates for endemic plant species range as high as 30% (Breckle 2007). Much more basic biological survey work and synthesis needs to be done to fully understand the diversity of the country's organisms.

Biodiversity appears to be declining at an accelerating rate throughout Afghanistan. Satellite image analysis and assessment of commercial wood volumes show that forests, both closed forest and open woodlands, are rapidly disappearing. Overgrazing and shrub collection for fuel is markedly reducing plant biomass and altering plant communities. Diversion of water and increasingly frequent drought is drying wetlands and rivers with unknown effects on aquatic biodiversity. The ubiquity of weapons following years of war is leading to the loss of large mammals throughout much of the country. Ecological footprint analysis shows that

Afghanistan's per capita bio capacity is declining. Large scale remote sensing analysis suggests that nearly 8000 km² of land was degraded between 1981 and 2003 (see **Fig. 1**).

Immediate threats to Afghanistan's biodiversity are land encroachment, over-hunting, deforestation, over-grazing, shrub collection, dry land farming, water diversion and climate change. All of these have worsened in recent years. Exploitation by warlords have aggravated all these and prevented the enforcement of conservation measures.

A vital aspect of Afghanistan's biodiversity is its importance for bird migration between Siberia and the Indian sub-continent. Twice a year, vast numbers of birds of many species, including waterfowl, raptors and cranes, pass through the country and depend for their survival on wetlands and other critical habitats in Afghanistan.

Vulnerable habitats

The following vulnerable habitats are identified in Afghanistan's National Biodiversity Strategy and Action Plan.

Desert and grassland these dry habitat types are widespread in Afghanistan, and are often degraded by livestock grazing

Woodlands Closed oak and conifer forests are limited to the eastern, monsoon-influenced part of Afghanistan, where they are threatened by illegal logging see **Fig. 1**).

Wetlands Afghanistan has only a very limited area of lakes and marshlands. The Kol-e-Hashmat Khan wetland is the only remnant of the once extensive Kabul marshes. It was declared a waterfowl reserve in the 1930s but is currently threatened by water diversion, indiscriminate hunting and other disturbances.

Rivers River systems and associated seasonally flooded areas also are very limited in extent in Afghanistan, but nevertheless provide important biodiversity habitat.

Table 4: Status of Terrestrial Biomes in Afghanistan

Biome	Area (km^2)	% of country	% of biome endangered	% of biome vulnerable	% of biome stable
Subalpine & Alpine	106,584	17	0	100	0
Desert & Semi-desert	252,044	39	27	73	0
Open Woodlands	240,745	37	60	38	2
Evergreen Forest & Woodland	49,124	8	70	26	4

The eco-regions at highest threat are in an arc around the country's mountain chain and are comprised of open and closed woodlands. Afghanistan's rapidly increasing human population

presents the major underlying challenge to biodiversity conservation and ultimately to the quality of life of Afghans.

Deforestation in eastern Afghanistan

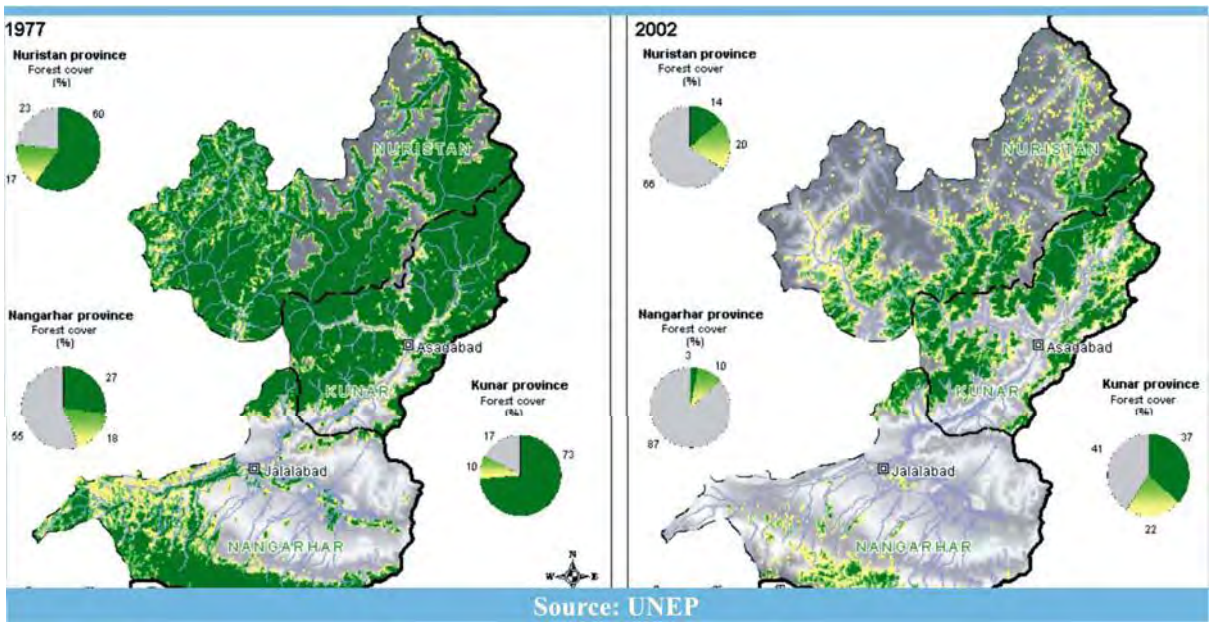


Figure 1: Deforestation in eastern Afghanistan

Protected areas

Only one National Park, Band-e Amir,in Bamiyan province, has been legally protected, but there plans to create a National Park in Pamir-i-Buzurg (Badakhshan). Other important areas which receive some level of protection are shown in **Fig. 2**

Figure 2: Proposed Protected Areas of Afghanistan

Climate change

Mean annual temperature has increased by 0.6^{o}C since 1960 and mean rainfall has declined by about 2% per decade. It is projected that by the 2060s, mean annual temperature will increase by between 1.4^{o}Cand 4.0^{o}C and by the 2090s, between 2.0 and 6.2^{o}C.

Climate change is expected to have a number of adverse effects on Afghanistan. Reduced snow cover and melting glaciers will reduce resources for hydropower and water supplies. Drier conditions throughout the country will impact on rain-fed agriculture. The impact on pasture will reduce livestock numbers. Human health is expected to be effected by increases in vector-borne diseases such as malaria

.

Figure 3: Afghanistan, Elevation

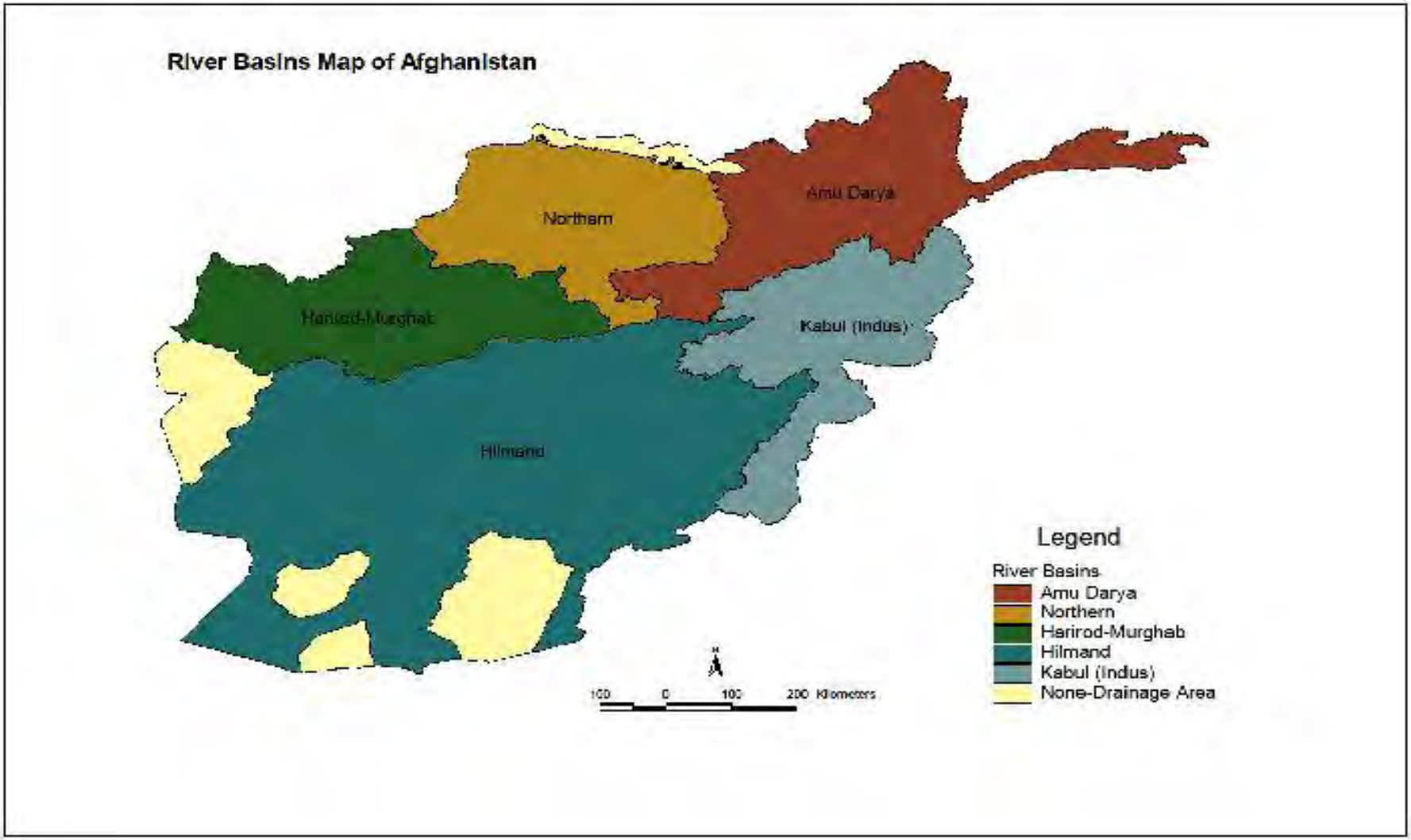


Figure 4: Afghanistan River Basins

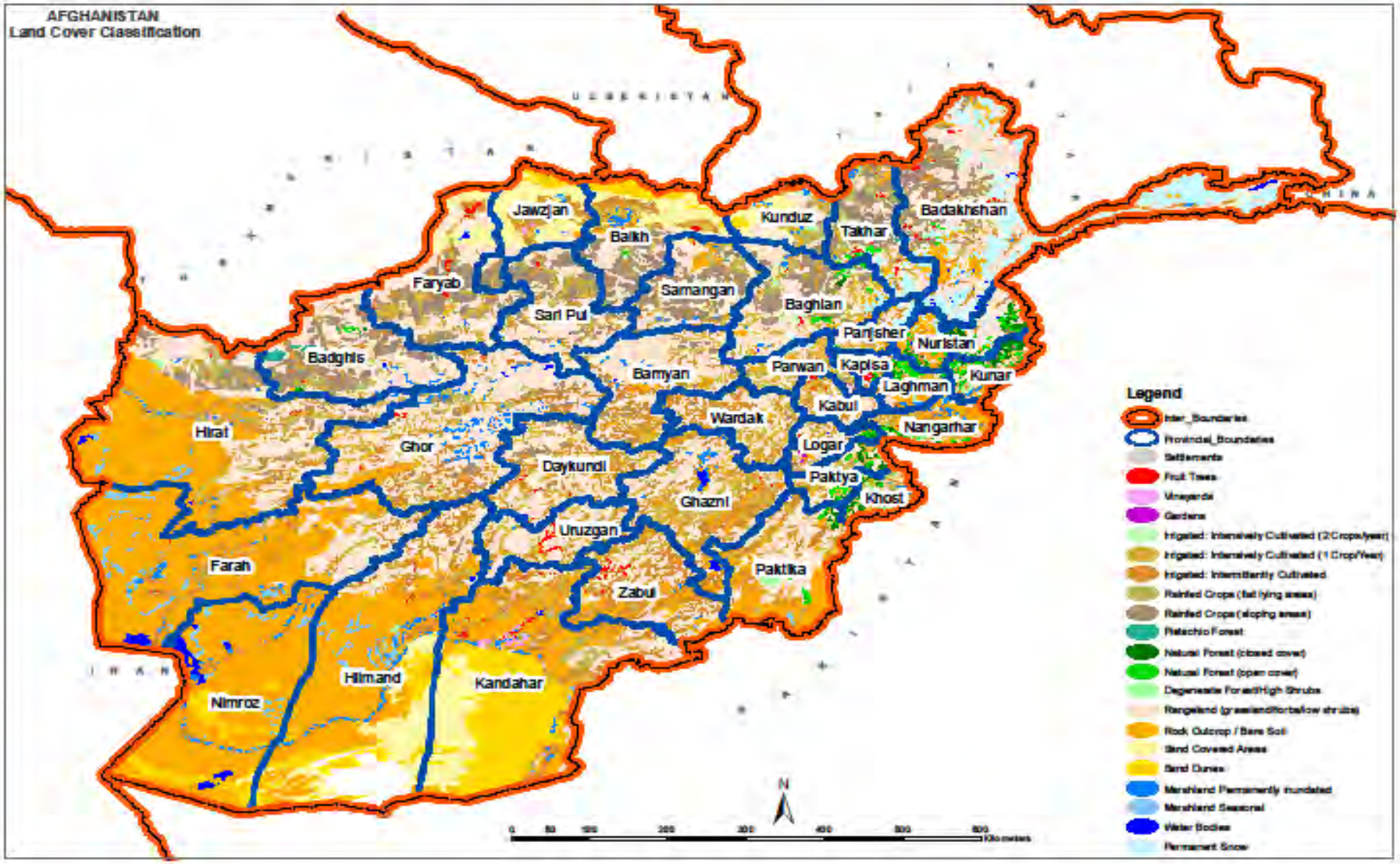


Figure 5: Afghanistan Land Use

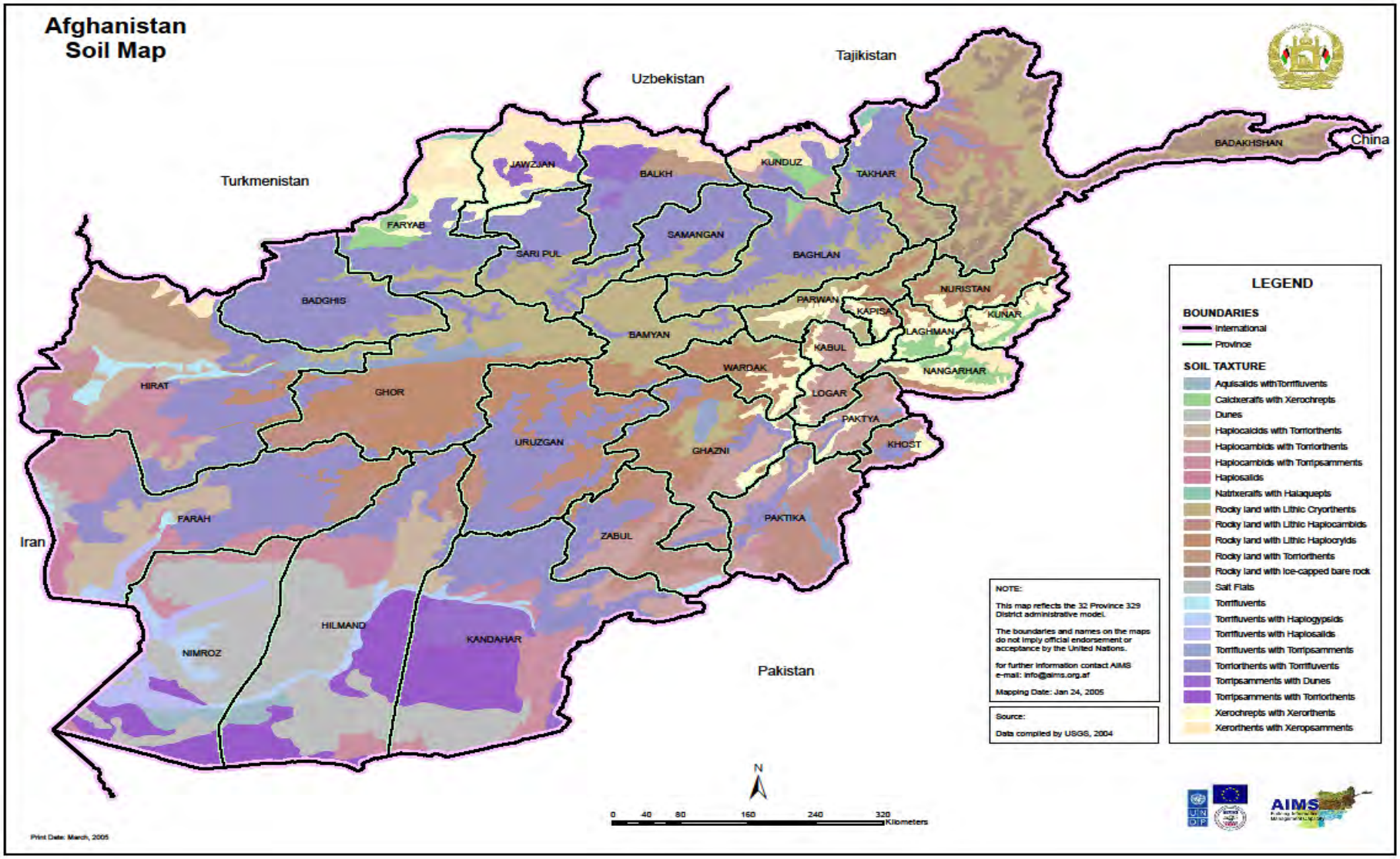


Figure 6: Afghanistan Soils

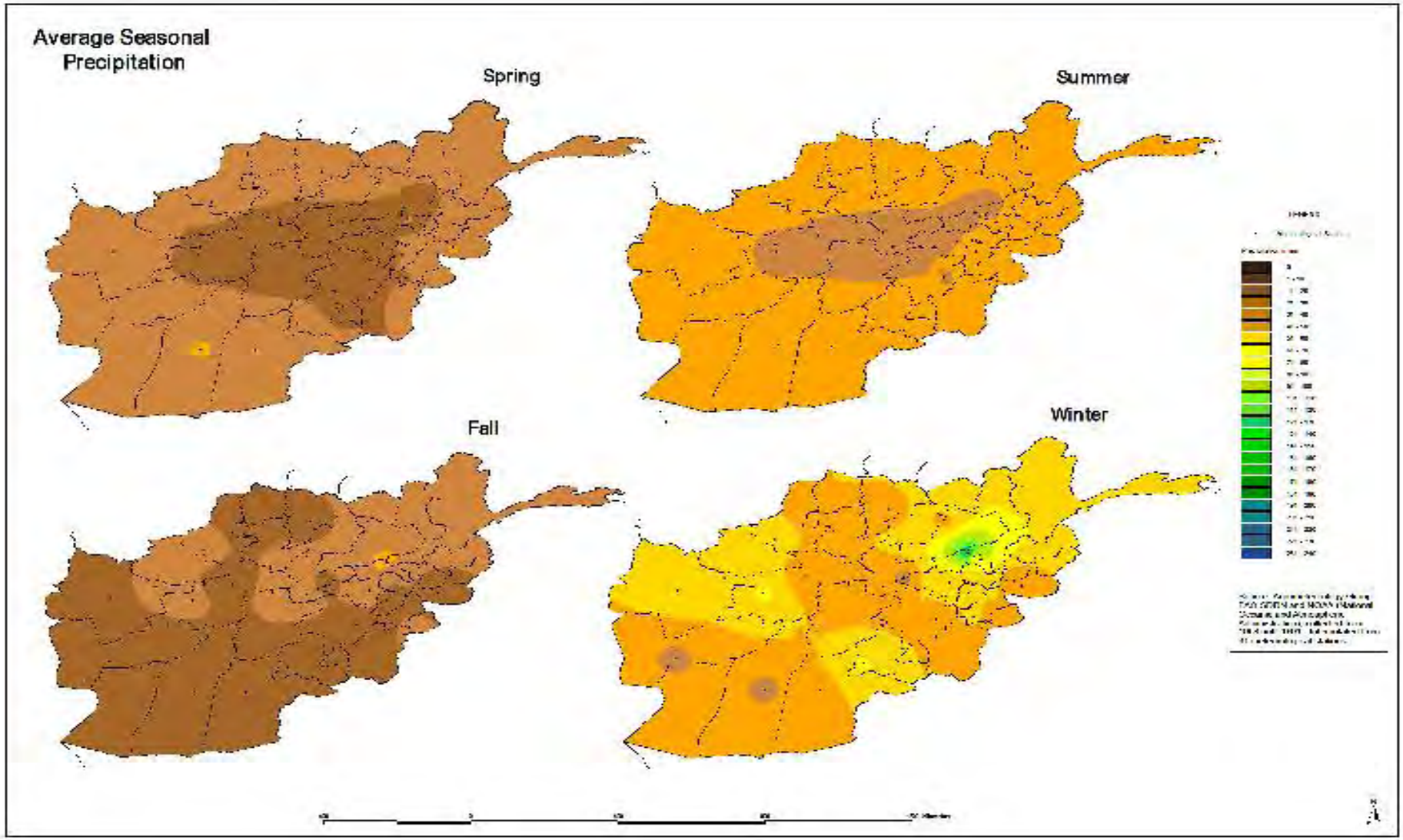


Figure 7: Afghanistan Average Seasonal Precipitation

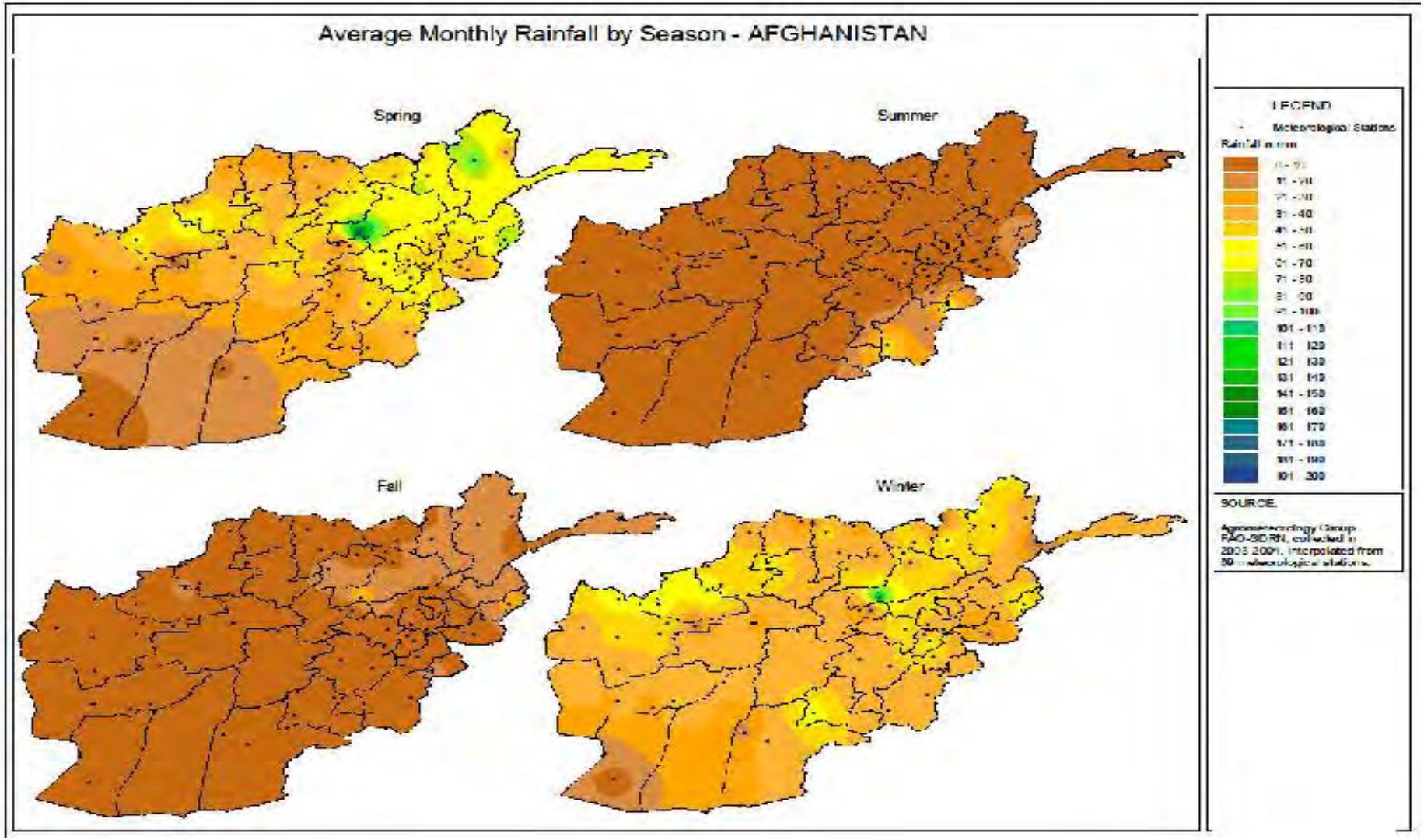


Figure 8: Afghanistan Average Seasonal Rainfall

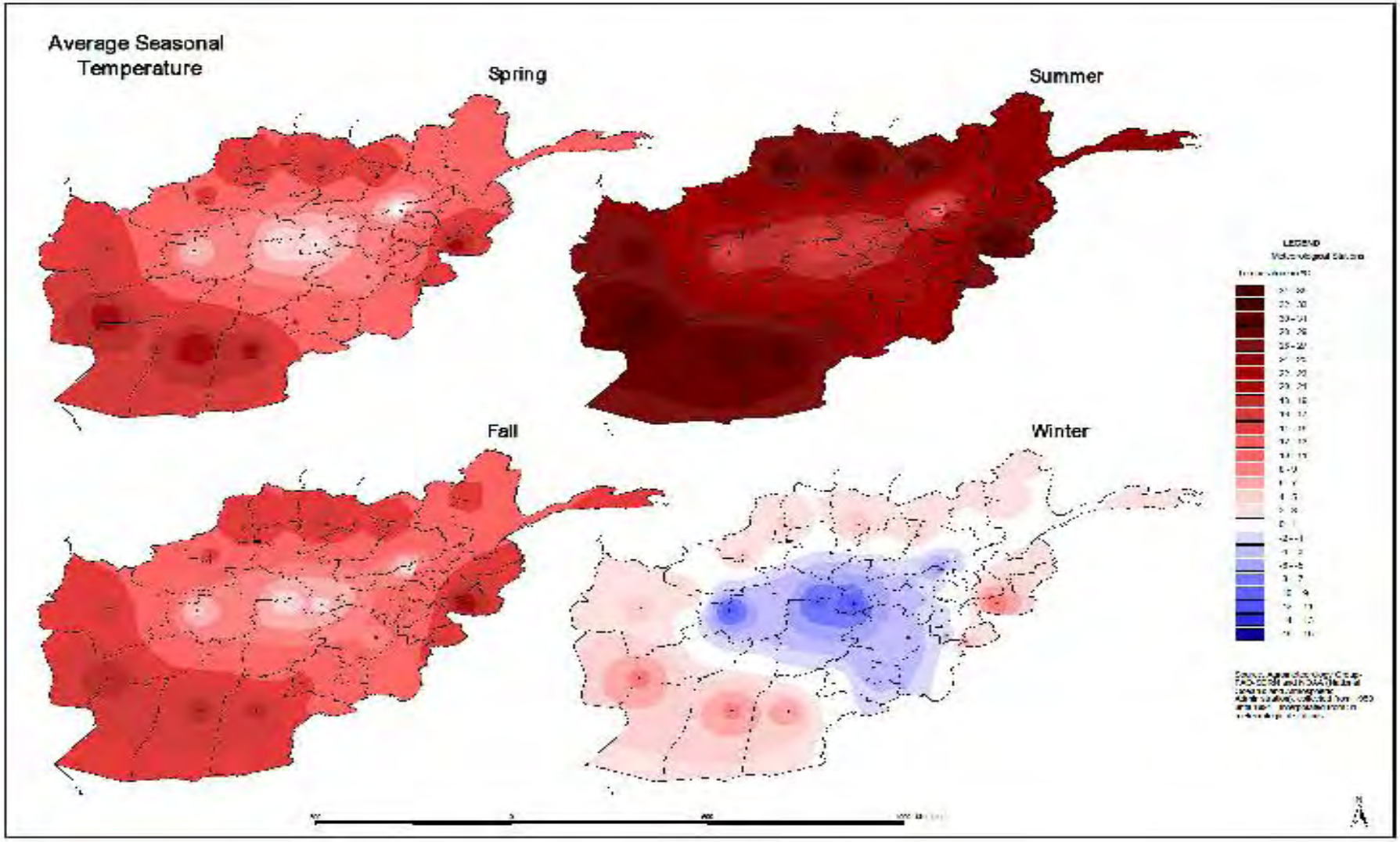


Figure 9: Afghanistan Average Seasonal Temperature

3. USAID-Supported Agriculture And Sectors With Potential Pesticide Use In Afghanistan

a. The USAID Agricultural Program

U.S. assistance in Afghanistan to the agricultural sector focuses on helping to create farm and non-farm jobs, increasing incomes, and strengthening Afghans' confidence in their own government. USAID programs improve productivity, regenerate agribusiness, rehabilitate watersheds and irrigation infrastructure, and increase the capacity of the Afghan Ministry of Agriculture, Irrigation and Livestock (MAIL) to deliver services effectively. By working with farmers and agricultural businesses on the continuum from "farm to fork" or agricultural value chains, USAID assists them to overcome obstacles hindering production, processing, or marketing and sales of agricultural products. By intervening in critical bottlenecks – such as providing assistance in improving packaging or helping to connect farmers to markets – USAID is helping Afghans achieve significant impacts on agricultural yields, incomes, and jobs

The USAID Agriculture Program has established more than 446 veterinary field units, administered 26 million vaccinations to livestock, trained more than 633,000 men and women in improved farm and business skills in 2010, established a $100 million Agricultural Development Fund to provide loans to Afghan farmers, brought 310,121 hectares of alternative crops under cultivation, established 18 farm service centers that provide access to high quality materials, and serve as centers for access to market and technical information and facilitated $268,275,909 in increased sales of legal farm and non-farm products. A list of current and completed USAID agricultural projects is given in Annex VII.

Current and Planned Projects with Potential Pesticide Use in Afghanistan

Agricultural Research and Extension Development Program (AGRED)

The objective of the five-year AGRED program is to provide extension and advisory services to Afghan farmers and build the capacity of GIRoA, MAIL and its Provincial Directorates (DAILs) to develop sustainably, technology and knowledge-based solutions and provide extension and advisory services.

The IEE for this project determines that a PERSUAP will be required for part of its activities, which will include variety trials and other field experiments. Its requirement can be inferred from the known crops and their associated pest, disease and weed problems. Therefore, subject to annual revision, this PERSUAP can make provision for the project's needs.

Commercial Horticulture and Agriculture Marketing Program (CHAMP)

CHAMP began in February 2010 to help farmers shift away from relatively low-value annual crops, such as wheat, to high-value perennial crops, such as almonds, grapes, and pomegranates.

The project objective is to increase production and quality of orchard and vineyard crops for more effective domestic marketing and export. CHAMP focuses on traditional Afghan crops, which have a proven market share, and on key value chains, as such pomegranates, apples, almonds, grapes, and apricots. During the Transition to 2014, CHAMP will focus on strengthening farm to market linkages to improve farm community livelihoods. The program will focus heavily on post-harvest activities through marketing to increase exports and increase import substitution in domestic markets. CHAMP has an approved PERSUAP, which will be superseded.

Incentives Driving Economic Alternatives – North, East, West (IDEA-NEW)

The objective of the IDEA-NEW program is intensive value chain development leading to increased incomes and employment in the agricultural sector. IDEA-NEW's interventions boost agricultural productivity, thereby increasing incomes, jobs and stability in rural areas, including strategic Key Terrain Districts (KTD) and poppy-prone areas. Value chain development to increase licit incomes in poppy-prone areas is the priority for IDEA-NEW through the transition to 2014. IDEA-NEW local procurement practices support USAID's Afghan First Policy by prioritizing local procurement and staffing, and working through line departments and private Afghan agribusiness firms.

IDEA-NEW provides training and extension advice to farmers and runs training plots. It also supports agricultural retailers by training and upgrading of premises. It has an approved PERSUAP covering these activities, which will be superseded.

Agricultural Credit Enhancement/Agricultural Development Fund (ACE/ADF)

In July 2010, a 100-million-dollar USAID grant to Afghanistan's Ministry of Agriculture, Irrigation and Livestock (MAIL) established the Agricultural Development Fund (ADF) to provide credit to small commercial farmers and agribusinesses. This grant also launched a technical assistance effort under a 50-million-dollar Agricultural Credit Enhancement (ACE) project. This project manages ADF lending and supports value chains in the agricultural sector, especially those engaged in the production, processing and export of high-value crops. The ADF channels credit through financial and non-financial institutions.

ACE provides finance to agricultural input suppliers, agricultural processers and small farmer credit unions which may be used to purchase pesticides. As such it requires a PERSUAP. At this time it is, with MEO approval, operating under the terms of the IDEA-NEW and CHAMP PERSUAPs until it is superseded.

Improving Livelihoods and Governance through Natural Resource Management (ILG-NRM)

This three-year program improves the livelihoods of the rural poor in north-eastern and central Afghanistan by building Afghanistan's capacity to manage its natural resources sustainably, while also improving governance by strengthening linkages between local communities and regional and national government bodies. The program focuses on two

geographic areas, Band-e-Amir National Park, the Hazarajat Plateau of Bamyan province, and the Wakhan Corridor of Badakhshan province. It also includes a national capacity building component involving the Ministry of Agriculture, Irrigation, and Livestock (MAIL) and the National Environment Protection Authority (NEPA). The program is seeking to achieve its overall objectives through work in five thematic areas.

1. securing sustainable employment for local communities;
2. building stronger community governance so that citizens can better manage natural resources and profit from them;
3. building technical capacity for natural resource management;
4. working in support of laws and policies that ensure effective natural resource management and equitable revenue sharing from natural resource development; and,
5. Reducing conflict and disease transmission between wildlife, domestic animals, and people.

None of the project's activities involve the use of pesticides. In the unlikely event of this project requiring make emergency use of pesticides, this contingency is likely to be covered by the provisions of this PERSUAP.

Assistance in Building Afghanistan by Developing Enterprises (ABADE)

Assistance in Building Afghanistan by Developing Enterprises (ABADE) is a four-year project which commenced in October 2012. ABADE primarily works with the private sector to strengthen the productivity of enterprises focused on sustained growth and job creation. ABADE's objectives are to increase domestic and foreign investment, stimulate employment and improve sales of Afghan products. Furthermore, ABADE is designed to complement other USAID programs that are focused on improving the business enabling environment, increasing the workforce, and facilitating access to finance. ABADE's alliances with Small and Medium Enterprises (SMEs) will accelerate productivity and job creation by mitigating risk, and leveraging contributions from private companies via alliances.

Component 1: SME and Public-Private Innovation Alliances:

1A). SME Alliances: ABADE makes awards to existing, productive SMEs, consortia, or joint ventures, through a competitive application process designed to mitigate business expansion risks, encourage private investment, and expand markets. Alliance partners should have a substantial financial stake in the venture, by matching ABADE funding on at least a 1: 2 basis.

1B). Public-Private Innovation Alliances: ABADE also establishes public-private alliances (PPAs) to stimulate innovation-focused initiatives. Both for-profit and non-profit entities, foreign and domestic, are encouraged to apply. Partners should match ABADE funding on at least a 1:1 basis.

Component 2: Technical Assistance and Business Advisory Services:

ABADE provides technical assistance (TA) for sub-award recipients and program stakeholders to improve their operations and management, and to solve technical issues related to market access, production, access to finance, and achievement of quality standards.

Component 3: Business Enabling Environment:

ABADE works to improve the business climate by addressing specific regulatory and procedural barriers that affect the competitiveness of PPA partners. This may include assessments and analytical studies driven by the sub-award applicants, as well as support for relevant ministries by drafting policy memoranda and regulatory guidelines for specific industries.

Grants to food processing enterprises may include expenditure on hygiene and pest control using materials registered by USEPA as pesticides. This PERSUAP therefore addresses the need to control storage pests in industrial premises.

Financial Access for Investing in the Development of Afghanistan (FAIDA)

The FAIDA program is helping the Afghan Government and the private sector develop a robust financial sector. FAIDA seeks to build the capacity of Afghan institutions to deliver finance, as well as develop a financial legal framework and market infrastructure that will foster economic growth and generate employment opportunities. FAIDA also directly assists Afghan women entrepreneurs by providing targeted business development, training, and mobile money support.

Activities

- Enterprises: Work with partner institutions to provide tailored financial solutions that help complete value chains and increase competitiveness. Link lenders to businesses in need of financing, with a special focus on the agricultural sector and remote areas. Provide Islamic and conventional financial products to lenders and the private sector.

- Banking Capacity: Build the organizational capacity of Afghanistan's financial sector by providing training to financial professionals and banking institutions.

- Regulatory: Create an enabling lending environment that reduces risk and increases certainty. Develop new or updated regulations across all financial sectors and key institutions.

- Mobile Money and branchless Banking: Provide technical assistance to Afghanistan's mobile network operators to introduce innovative products and services, as well as expand the use of mobile money.

• Agriculture in the South: Promote financial activities in southern Afghanistan to support a sustainable, commercially viable, agribusiness-based economy.

• Gender: Ensure that women are integrated in financial sector activities and are provided access to financing and opportunities for economic and professional growth.

FAIDA is engaged in activities, such as finance and farmer training that relate to pesticides and so require PERSUAP approval. FAIDA submitted a draft PERSUAP to USAID recently the useful elements of which will be incorporated into the current Mission-wide PERSUAP.

Kandahar Food Zone Program (KFZ)

The purpose of KFZ is to strengthen and diversify legal rural livelihoods in targeted districts by identifying and addressing the root causes and sources of instability that lead to opium poppy cultivation. This will be accomplished through stabilization and alternative livelihood activities that will encourage licit behavior on the part of targeted communities. KFZ is one component of a multi-agency and multi-sectoral effort to address opium poppy cultivation and processing in Kandahar Province. USAID's KFZ efforts will complement additional efforts by the State Department's Bureau for International Narcotics and Law Enforcement Affairs (INL) in the areas of counternarcotics public information, governor-led eradication, and drug demand reduction. There are two components to the KFZ program. The first component focuses on local level interventions to be implemented through a mechanism that identifies and addresses the drivers of poppy cultivation in targeted districts. This KFZ component will be achieved through a tailored package of interventions developed in close collaboration with affected communities and under the leadership of the Ministry of Counter Narcotics (MCN). The second component will support capacity building within the Ministry to improve management of its Alternative Livelihood program, including policy development, stability assessment, program design, implementation, management, and monitoring and evaluation. The KFZ program is anticipated to support counter narcotics efforts in areas with high levels of poppy cultivation in Kandahar province. As with other short-term stabilization programs targeting contested areas, KFZ will emphasize both speed and flexibility in program mobilization and implementation to adapt to rapidly changing security environments. To optimize effectiveness, KFZ interventions will be carefully aligned with the poppy production timeline and the governor-led eradication program.

Although the IEE of KFZ states that pesticides will not be used, any project engaging in agriculture or horticulture may find an unexpected need to do so. This PERSUAP will make provision for the likely use of pesticides in this sector.

Integrated Health Services and System Strengthening Program, Phase 1 (IHSSSP 1)

USAID's new program of assistance is the first phase of a new, ten-year program that the Office of Social Sector Development (OSSD) has designed to meet ongoing health needs and challenges. It encompasses both on- and off-budget activities over a five-year period (2014-

18) and will result in the award of an on-budget project through the ARTF/SEHAT and off-budget technical assistance projects designed to support the accelerated transition of selected assistance activities to MoPH on-budget programs as well as the continued strengthening of MoPH capacity to manage its expanded on-budget program. IHSSSP 1 will continue to improve access to, and availability of, quality Basic Package of Health Services (BPHS) and Essential Package of Hospital Services (EPHS), particularly for women and children, and will place special emphasis on strengthening community participation in order to ensure improved governance and accountability, and increasing sustainability through health care financing schemes and public-private partnerships. In addition, the program will increase demand for quality services and promote healthy behaviors. Increased MoPH stewardship at both the central and provincial levels is a high priority that will result in increased sustainability and institutionalization of the health program. Finally, the program will further strengthen the private sector to provide quality services and products at affordable prices.

The Basic Package of Health Services (BPHS) and Essential Package of Hospital Services (EPHS) may include the provision of disinfectants that are classified by USEPA as pesticides. This PERSUAP will make provision for the procurement and use of such materials in the hospital environment.

Regional Agricultural Development Projects (RADP)

The objective of the RADP is to improve food and economic security for rural Afghans in targeted areas. Focus will be on improving the productivity and profitability for targeted value chains to be selected from the wheat, high-value crop, and livestock sectors. This sustainable agricultural development program will support the consolidation of licit economies to fuel economic growth, including providing alternatives to poppy cultivation.

USAID will issue four contracts in support of the Regional Agricultural Development Program (RADP), covering the South, North, and West. The three regional contracts will have a long-term, geographic agricultural development focus. They will utilize similar approaches, including working with DAILs. Another contract, for an activity called RADP-Central, will be made to facilitate coordination between the regional programs

RADP will almost certainly require the use of pesticides, but the requirement can be inferred from the known crops and their associated pest, disease and weed problems. Therefore, subject to annual revision, this PERSUAP can make provision for the project's needs.

It was noted, in preparing this PERSUAP, that the control of external arthropod parasites is now carried our using systemic insecticides administered by injection, thus obviating the need for dips or any other externally applied pesticide, which might pose an environmental hazard.

4. OTHER DONOR-SUPPORTED AGRICULTURE AND SECTORS WITH POTENTIAL PESTICIDE USE IN AFGHANISTAN

a. GIZ

GIZ is implementing the Baghlan Agricultural Project (from 2011) It works in Pul-i-Khumrin and Baghlan-i-Jedid districts and is, expected to extend to Nahrin, Dahan-i-Ghori and Doshi districts. There are four components:

- Plant Production: wheat, potatoes, onions and stone fruit
- Irrigation (small infrastructure, water users associations)
- Livestock, sheep meat, wool spinning, poultry, fish ponds
- Capacity Building DAIL, DRRD, intern programe.
- Farmer Field Schools and Farmer Business Schools

The project makes use of demonstration plots and provides seeds, tools, sprayers and PPE for these. All purchases of pesticides must be approved. The following pesticides have been purchased: Vitavax, Copper oxychloride, deltamethrin, , terapur (nitroaniline herbicide) cypermethrin, zineb and mancozeb.

b. IBRD (World Bank)

IBRD supported the Horticulture and Livestock Project that was initiated in 2008. It was initially implemented by GTZ but has since been handed over to MAIL. This project included an IPM component, implemented by FAO until 2010. This project made the first draft of the pesticide law now in process of legislation and has since drafted a quarantine law, which is also under process.

IBRD is now implementing the Improving Agriculture Inputs Delivery System project, with an emphasis on infrastructure and capacity building. It will strengthen the Quarantine system by establishing quarantine stations at Badam Bagh (Kabul HQ), Kabul Airport, Kabul Customs, Kabul Post Office, Sher Khan Bandar in Kunduz (for Tajikistan border), Hairaton in Balkh (for Uzbekistan border), Aqina in Faryab (for Turkmenistan border), Torgundi in Herat (for Turkmenistan border), Islam Qala in Heart (for Iran border), Zaranj in Nimruz (for Chahar Bahar port in Iran), Spin Boldak in Kandahar (for Pakistan border), Ghulam Khan in Khost (for Pakistan border) and Torkham in Nangahar (for Pakistan border).

This project will also develop regional diagnostic laboratories to serve the quarantine and plant protection services. Support to PPQD will include post-graduate training abroad for four plant quarantine technical staff, three pesticide technical staff, three IPM/diagnostic technical staff, two pesticide residue analysis technical staff, and two fertilizer technical staff.

c. FAO

FAO is currently implementing an IPM project funded by the Government of Norway. This is based on Farmer Field Schools and is covering a number of crops, including wheat, potatoes, rice and melons. This project does not use, or recommend the use of, any pesticides.

5. AFGHANISTAN PESTICIDE SECTOR AND EVALUATION OF AFGHANISTAN PESTICIDE RISKS

Afghanistan pesticide problems that contribute to a high-risk profile for users, their families, and their environment are discussed here.

a. The Afghan Agrochemical Sector

Before the war, the supply of agricultural chemicals was a monopoly of a parastatal, the Afghanistan Fertilizer Company. By 2001 it had ceased to be an effective enterprise. It was dissolved in the privatization reforms of the early 2000s and its assets (mainly premises) liquidated. For many years Afghan farmers had hardly any access to agricultural inputs, including machinery, seed, fertilizers, and pesticide, other than those supplied as humanitarian or development assistance and for most intents and purposes, there were no functioning agriculture extension systems other than those operated by NGOs and benefiting a relatively small number of people.

There was, however, a lively bazaar trade in low quality imported inputs. The importers were general traders, with no technical knowledge of agro-chemicals, who simply bought cheap and sold dear. Retailers had no knowledge and simply sold what they had in stock, often dangerous or ineffective products, irrespective of the needs of the customer. Few sellers knew the difference between an insecticide, an herbicide or a fungicide. Consequently, farmers had little faith in what was available and simply bought the cheapest product on sale in the faint hope that it might be of some benefit, or at least kill the offending pest.

Since then, a number of specialist agricultural suppliers have arisen. Some import under their own label from China, India, Iran and Pakistan. Others import reputable international brands, but face the difficulty that no major chemical company will do business in Afghanistan until there is a credible registration system, for fear of being accused of exploiting an unregulated market. Dealers are obliged to buy through agencies in Pakistan and import from there.

A list of pesticides, with their countries of origin, found in shops in Kabul, Jalalabad and Herat, is given in Annex VI.

Unregistered (Illegal) Products

Although MAIL makes some effort to control the importation of pesticides, banning a number of products such as Persistent Organic Pollutants (POPs) and those requiring Prior

Informed Consent (PIC) under the Rotterdam Convention, the borders are porous and such materials readily find their way to the bazaars of small towns.

Substandard Products

Even for those products imported legitimately there is no assured quality control. Afghanistan's neighbors, Iran, China and Pakistan, are notorious for the production of substandard pesticides. The products may not contain the active ingredients stated on the label, the active ingredient may be contaminated with dangerous by-products or they may be badly formulated. There are no analytical facilities in Afghanistan to counter these problems. Not the least of the problems is the "passing off" of pirated products under names or labels identical or similar to those of reputable brands.

Packaging and Labeling

Most pesticides for sale in Afghanistan do not have labels in the national languages - Persian and Pashtu -, except those from Iran, which are labeled in Persian. Urdu, the language of Pakistan, in which many pesticides are labeled, is widely understood. However, others are labeled in English or Chinese. This leaves out of account the fact that most farmers are illiterate.

The Retail Trade

Most farmers get their extension advice from the retailers from whom they buy their inputs. As described above, many of these are entirely ignorant. Previous USAID projects, including ASAP, IDEA-NEW and AFSC, have invested considerable efforts in improving this situation, by training retailers and upgrading shops. They have also tried to raise the quality of pesticides and application equipment and ensure the availability of PPE.

However, a great deal needs to be done in this area. It is essential that where USAID projects are recommending pesticides to farmers, or providing finance for inputs, support is given to retailers in the area to ensure that good quality products are available.

Agricultural retailers in Afghanistan seldom sell only pesticides. At the very least, they will be selling veterinary medicines and seeds. Often they will be selling fertilizers and possibly other commodities. Shops selling pesticides are likely to be sited in the bazaar close to food shops and bakeries, creating a danger of contamination.

One very considerable danger is the habit of retailers of dispensing small quantities of pesticides in unlabeled containers, sometimes recycled food containers. Since these are likely to be stored in the home, they may be mistaken for food items and result in poisoning.

Farms

Farm sizes in Afghanistan vary from less than 0.2 hectares to a (rare) maximum of 60 hectares, with most farms in the 0.5 to 5 hectare range, which is the maximum manageable size for an average farm family. Farms in Afghanistan are relatively small, and thus the scale of all operations is also small. Most Afghan farmers can be referred to as smallholders. Many are tenants or sharecroppers. Such farmers tend to have a low level of education, lack of working capital to invest in inputs, lack of access to good extension advice and lack of access to high quality inputs at the retail level.

Most farmers in Afghanistan store their pesticides in their homes, because they consider them to be valuable resources that they need to protect and keep an eye on. In general, farmers do not lock the pesticides up to keep them out of reach of children.

Farmers may or may not be aware of the acute health risks from pesticides such as Aluminum phosphate, endosulfan, disulfoton, methamidophos, monocrotophos, azinphos methyl, metam sodium, metam potassium, zinc phosphate, and others, but even fewer are aware of the chronic risks.

Pesticide Use and Application

The objective of pesticide application is to protect the crop, not to avenge it. The correct decision to use a pesticide depends firstly on the identification of the target pest, weed or disease, secondly an estimate of the balance of benefits against costs, which include effects on beneficial organisms as well as financial costs, and finally the selection of the most appropriate product for the purpose. Such a decision is best made within the context of an IPM plan and based on regular monitoring of the crop.

Few farmers recognize beneficial insects. They may well mistake the natural enemies that are attacking the pests and even pollinators for the cause of the damage. Some pests, such as Red Spider-Mite and San Jose Scale, are symptomatic of pesticide misuse killing their natural enemies.

Pesticides, of however good quality are ineffective if badly applied. Effective application requires good equipment and good technique, which can only come with training. The elements of good technique are outlined in Section 4 and include care and maintenance of the equipment, calibration, the use of PPE, even distribution of the spray over the target and disposal of containers.

Human Poisonings and Health Risks

Although no figures are available, there have been reports of deaths and sickness resulting from pesticide poisoning. The reports have mainly been of consumers poisoned by fruit or vegetables contaminated by pesticides. It is likely that there are many other cases of pesticide users being poisoned. It is also likely that accidental poisoning of livestock occurs.

Obsolete and Expired Pesticides

The main source of obsolete pesticides tends to be stocks held by government, and usually provided by donors, for emergency campaigns. The private sector cannot afford such waste and turns its stock over quickly.

No obsolete stocks are currently held by MAIL. Until 2001, there were large stocks of BHC dust held in government warehouses, having been donated from the Soviet Union for locust control. However, during the fighting, all these stocks were looted and the chemical used. Whatever the consequences of that may have been, the problem no longer exists. MAIL has no obsolete stocks and maintains relatively small amounts of deltamethrin and diflubenzuron for locust control. Both the World Bank and the FAO have programs for disposal of obsolete pesticides.

6. Pesticide Regulation

a. Current regulatory environment

Pending the passage of a new pesticide law (see below), MAIL is applying a pre-existing law first drafted under the Najibullah regime, but passed into law under the Taliban. Under this, MAIL controls pesticide imports. Importers must be licensed by MAIL and each importation must be approved. It has been implemented by the Food Quality Control Dept. of MAIL, but it is now implemented by PPQD. In practice, products not on a banned list (see Annex III), are approved.

However, under the constitution of Afghanistan, no law passed under the Taliban regime is valid and so, in theory, this regime could be challenged in the courts. It is unlikely that this will happen.

The table in Annex III lists the pesticides whose import is currently banned by MAIL. It also indicates whether the chemical is a Persistent Organic Pollutant (POP) listed under the Stockholm Convention, or requires Prior Informed Consent (PIC) under the Rotterdam Convention.

Legislation

Legislation to govern pesticide import, sale and use is currently in process. The original draft was prepared under an FAO project. After consultation with National Environmental Protection Agency (NEPA) and other ministries, including Commerce and Health, a revised draft was submitted by MAIL to Ministry of Justice for amendment and approval before presentation to Parliament.

The new law will establish a Pesticide Registration Board, under the chairmanship of the Deputy-Minister of Agriculture for Technical Affairs with the Head of the Plant Protection and Quarantine Department as deputy chairman. The members will include: the Head of the

Agricultural Research Services (MAIL); the Head of the General Directorate of Livestock and Animal Health (MAIL), One member from the Ministry of Public Health (MOPH), One member from the National Environment Protection Agency (NEPA), One member from the Afghanistan National Standard Agency, One member form the Ministry of Commerce and Industries, One member from the Faculty of Agriculture (University of Kabul). The Head of the Pesticides Division of Plant Protection and Quarantine Department will act as secretary of the Board and organize its meetings. The Chairman, at the request of any member of the Board, may invite other public authorities from departments related to food safety, health, environment, crop and animal production or protection or other departments to its meetings. Invited experts shall not have voting rights.

The new law will require importers and dealers of pesticides to be licensed. The conditions for those licenses, such as those relating to qualifications and premises, will be established by regulation.

The law specifies requirements for packaging and labeling in granting registration. It provides for the regulation of storage, transport, advertising and disposal. The Pesticide Dept. of PPQD will be the executive agency of the Board. The Board will advise the Minister of Agriculture and Irrigation and Livestock, under whose authority the registration will be made.

The law provides for the appointment of inspectors and defines their powers. The following offences are defined:

1- Import, manufacture, sell, stock or exhibit for sale or distribute any unregistered pesticide, or a pesticide for a use or with a label except in accordance with the requirements set forth in the registration.
2- Function without a license or permit.
3- Use of banned pesticide.
4- Obstruct a Pesticide Inspector in the exercise of his powers or discharge of his legal duties.
5- Make false or misleading declarations or allowing or authorizing their entry in any relevant records.
6- Transfer permits or licenses without authorization.

There appears to be no provision for initiating registration under the new regime before the promulgation of the new law.

A copy of the new law is shown in Annex IV. It must be emphasized that this is a draft to be submitted to Parliament and is subject to amendment before being enacted.

Capacity

The effectiveness of any regulatory system must depend on the capacity of the institutions that implement and enforce it and here Afghanistan finds itself at a disadvantage. The end of the war and the establishment of a new government found the Ministry of Agriculture (now

the Ministry of Agriculture, Irrigation and Livestock) in a woefully weak state. The war had isolated it from the countryside and so deprived it of its main functions. Many of its best staff had left the country as refugees. The corresponding weakness in the Faculty of Agriculture of the University of Kabul had meant that a whole generation of staff lacked a sound educational foundation. These problems were compounded when most of the small numbers of competent staff were recruited by aid agencies and NGOs. The poor political leadership in the ministry itself failed to engage constructively with the donor community. USAID in particular focused its efforts on the private sector, while other donors concentrated on emergency projects rather than capacity building or looked to the new and more dynamic Ministry of Rural Reconstruction and Development (MRRD). The result is that the present more progressive leadership depends for the implementation of its policies on a technically inadequate Old Guard who yearn to turn the clock back and reinstate the statist policies of the early 1970s. Only when it is replaced by a new generation, adequately educated up to post-graduate level, will this problem be overcome. The problem is that government service, especially in what is seen as the less glamorous field of agriculture, no longer attracts, as it once did, the brightest and best young people.

Thus it is highly questionable whether MAIL will be able to carry out the trials and analyse the data necessary for a proper evaluation of candidate pesticides submitted for registration. The solution must be to make use of the work done in larger countries. This could involve accepting registrations from OECD and other countries with more advanced capacity. If this resulted in only high quality products appearing on the Afghan market, this would have some advantages, but removing competition from the low cost producers, not all of whom are bad, would raise prices to farmers.

It is not only the capacity of government institutions that is important. Importers, distributors and retailers, as has been emphasized above, also need a high level of technical competence to ensure that safe and effective pesticides are available to farmers. Fortunately, the profit motive makes it possible that talented and well educated young people are attracted to this.

Whether they are destined for the public or private sector, young people will need a higher quality of university education than is at present available to them if they are to achieve the necessary level of technical competence in this field.

Apart from the purely human capacity, it should be pointed out that there is no laboratory facility for the most basic pesticide analysis. The quality, and indeed safety, of pesticides does not depend only on the percentage of active ingredient, but also the inert ingredients and impurities present in the formulation. For the foreseeable future, pesticide samples will need to be sent to a recognized international laboratory for analysis. The cost of this will need to be borne by the importer seeking registration.

There is also the need to analyse pesticide residues in food commodities. Again the only solution is to send samples abroad.

7. CONCLUSION

The risks posed to human health and the environment in Afghanistan result from deficiencies in the entire supply chain, from importer to final user. The trade in and use of pesticides has been transformed beyond recognition over the last ten years, but this has, in itself, created new problems, not the least being the great increase in the availability and use of pesticides. This has not been adequately balanced by the ability of the government to regulate it, the capacity of the private sector to manage it nor the ability of the farmer to make informed choices on use and to apply pesticides safely and effectively.

Although improved regulation is essential, the most powerful instrument of mitigation must be education and training. Well-informed farmers will choose high quality, appropriate agro-chemicals and take their business to responsible and well qualified retailers, who will themselves source their stock from reputable suppliers.

USAID has an opportunity to contribute substantially to this, by supporting the retail sector through training and selective finance and ensuring beneficiary farmers receive training also.

IV. PEST MANAGEMENT PLANS FOR MAJOR CROP VALUE CHAINS

This section describes the IPM context in which the selected pesticides will be used. It does not purport to be a complete handbook of IPM techniques.

1. WHEAT (*TRITIUM spp*)

a. Fungal diseases

Fungal diseases are a problem on wheat in Afghanistan. CIMMYT has identified the following diseases as being of particular importance: Karnal Bunt (*Neovossia indica*), Common Bunt (*Tilletia caries, T. foetida*), Dwarf Bunt (*Tilletia controversa*) and Black Point (*Helminthosporium sativum, Alternaria* spp.).

<u>Control Strategy</u>

These diseases are best prevented by a fungicidal seed treatment with thiram, carboxin or a mixture of both.

Weeds

Weeds are the major plant protection problem on wheat in Afghanistan. Crops are typically heavily infested with a number of species. Major Graminaceous weeds are: Wild Oat (*Avena fatua*), Small Canary grass (*Phalaris minor*), Rye Grass (*Lolium* sp.), Wild Barley (*Hordeum* spp.), Johnson Grass (*Sorghum halepense)*, Brome (*Bromus* spp.), Foxtail (*Setaria* spp.), Cockspur (*Echinochloa* spp.), Bulbous Bluegrass (Poa *bulbosa),* Vernalgrass (*Anthoxanthum odoratum*) and Nutsedge (*Cyprus* sp.).

The main broad-leaved weeds are Bedstraw/ Stickweed (*Gallium* sp.), *Brassica cesum*, Blue Mustard (*Chorispora tenella*), Bindweed (*Convolvulous arvensis*), Shepherds Purse (*Capsella bursa-pastoris*), Cornflower (*Centaura cyanus*), Lambsquarter (*Chenopodium album*), *Salvia* spp., Sow Thistle (*Sonchus aspe*r) and Spurge (*Tithymalus turczaninowii*).

The most severe problems occur in continuous wheat cropping systems. Land tenure systems aggravate the problem where the farmer puts in the labor and inputs but the long term benefits of weed control accrue to the landowner. Sowing by broadcasting seed also makes weed control more difficult as it does not allow row weeding. Row planting also allows fertilizer to be banded so that it goes to the crop and not to the weeds.

The availability of quality seed is a problem. Production of certified seed is still much less than the country's needs and, in any case, farmers tend to retain their own seed or exchange it with neighbors (the role of farmers themselves in seed improvement should not be underestimated). However, retained seed tends to be heavily contaminated with weed seeds and so some local capacity for small scale seed cleaning would be a considerable advantage.

Weed IPM

USAID projects will adopt an integrated approach to weed management, combining cultural, mechanical and chemical. These include:

- Seed cleaning (projects should introduce small seed cleaners for farmers' own retained seed)
- Regular in-field observations, looking for small, emerging weeds and planning for early control.
- Spray herbicides when weeds are small, have not yet done their damage, and can be controlled.
- Crop rotation: particularly utilizing both fall and spring sown crops and breaks from cereals. This requires work on spring crops including spring cereals.
- Sowing wide spaced crops in lines allowing fertilizer placement for crop, not weeds, and inter row cultivating.
- Use shallow pre-cultivations to stimulate and control weeds, particularly for spring-sown crops when there is more time to do this.
- Banding fertilizer to increase crop competitively and reduce weeds.
- Grain for eating must not be cleaned washed into the irrigation system where weed seeds go straight into the fields.

These recommendations apply to other field crops such as oilseeds.

Locusts

Insect Pests are an intermittent but sometimes catastrophic cause of losses to wheat. The two most important are locusts and Sunn Pest. There are two species of locust, the Moroccan

Locust (*Dociostaurus maroccanus*) and the Italian Locust (*Calliptamus italicus*). The Moroccan Locust occurs between 500 and 1500m in northern Afghanistan, mainly in Kunduz, Baghlan, Samangan and Balkh provinces. The Italian Locust occurs at higher altitudes, mainly in Sar-i-Pol, Jawzjan, Badghis and Herat provinces.

Locust Control

Locust control is the responsibility of the PPQD of MAIL and there has been an effective strategy developed in cooperation with FAO. Both species have a similar life-cycle. They lay eggs in the ground on rangeland in early summer at the end of the growing season. These survive the summer and winter and hatch in spring. At high densities, the larvae or hoppers form marching bands that may enter crops and cause total loss. Once the hoppers have molted into the adult stage, they are able to fly tens of kilometers and at this stage pose the greatest threat, as the rangeland is usually drying up and the only green vegetation is in irrigated cultivations. Successful control at this stage is extremely difficult as a swarm may invade and destroy a crop in a matter of days, if not hours. Even if a swarm is successfully sprayed, it may be followed shortly afterwards by another. For this reason, locust control should consist of preventive spraying of hopper bands in the breeding areas. This must be done as soon as possible after hatching because the area occupied by a band of hoppers increases by a factor of 40 over the six week period of larval growth and so the quantity of pesticide required to control it increases in proportion.

Control of hoppers is carried out with diflubenzuron applied by Ultra-Low Volume (ULV). Diflubenzuron is an Insect Growth Regulator that inhibits the synthesis of chitin and so causes death at ecdydis. It has very low vertebrate toxicity (EPA III, carrying label “Slightly Toxic”), but is sufficiently persistent on the vegetation to be used as barrier treatments or to treat an identified egg field before all the hoppers emerge. This method is less environmentally destructive than mechanically digging up the eggs.

PPQD implements control with trained teams drawn from the local communities and equipped with ULV hand-held, battery-driven applicators and with protective clothing.

Sunn Pest

“Sunn Pest” is a blanket term that includes several species of Shield Bug from the Hemipteran family's Pentatomidae and Scutelleridae. The most important is *Dolycoris penicillatus*, which can cause devastating damage to wheat in Sar-i-Pol, Jawzjan, Badghis and Herat. Like the locusts, it is a migratory pest, but is much more difficult to manage.

The insects overwinter as adults above 2000m amsl in the Hindu Kush, sheltering in dense masses under stones and bushes. In the early Spring they migrate northwards and downhill to the plains of Turkmenistan, where they breed on the ephemeral desert vegetation. As this dries out, the adults migrate south to Afghanistan where they invade the wheat crop at the milky stage. The Sunn Pest population varies greatly from year to year for reasons that are not fully understood, but in some years the damage is catastrophic. Not only is the yield

reduced by the insect attack, but the proteolytic enzymes injected into the grain degrade the gluten and render the flour unusable for making bread. The insects also taint the straw with an offensive smell making it less acceptable for animal fodder.

Sunn Pest Control

Control of Sunn Pest is a responsibility of PPQD, but the suddenness of the invasion and the speed at which the crop is damaged mean that in practice effective control must be carried out by the farmers themselves. FAO promoted mechanical control of Sunn Pest using sweep nets, thousands of which were distributed across the region. However, they are labor intensive and unsuitable for the extensive areas of rainfed wheat that are grown across the region. The alternative is spraying with a quick knock-down insecticide, of which the safest and most effective is deltamethrin. ULV application enables larger areas to be treated more rapidly and does not depend on a supply of water.

Other species are *Eurygaster integriceps* and *Aelia* spp. *Eurygaster* has been the subject of research by University of Vermont in collaboration with ICARDA to develop alternative methods of control using fungal pathogens such as *Beauvaria bassiana*. It is not clear at this stage whether it is effective against *Dolycoris*. Were it to be so, it would need to be applied in the breeding areas of Turkmenistan or the hibernating sites in the Hindu Kush.

2. OILSEEDS

The oilseed crops grown in Afghanistan are: Flax (*Lignum usitatissimum*), Sesame (*Sesamum indicum*), Safflower (*Carthamus tinctorius*), Canola (*Brassica napus, Brassica campestri and Brassica Rapa*) and Sunflower (*Helianthus annuus*).

The main plant protection problem with oilseeds is weed infestation. Safflower also suffers from two insect pests, an aphid and a beetle.

Weeds

Oilseeds are grown in rotation with wheat and so suffer from the same weeds. Major Graminaceous weeds are: Wild Oat (*Avena fatua*), Small Canary grass (*Phalaris minor*), Rye Grass (*Lolium* sp.), Wild Barley (*Hordeum* spp.), Johnson Grass (*Sorghum halepense)*, Brome (*Bromus* spp.), Foxtail (*Setaria* spp.), Cockspur (*Echinochloa* spp.), Bulbous Bluegrass (Poa *bulbosa),* Vernalgrass (*Anthoxanthum odoratum*) and Nutsedge (*Cyperus* sp.).

The main broad-leaved weeds are Bedstraw/ Stickweed (*Galium* sp.), *Brassica cesum*, Blue Mustard (*Chorispora tenella*), Bindweed (*Convolvulous arvensis*), Shepherds Purse (*Capsella bursa-pastoris*), Cornflower (*Centaura cyanus*), Lambsquarter (*Chenopodium album*), *Salvia* spp., Sow Thistle (*Sonchus aspe*r) and Spurge (*Tithymalus turczaninowii*).

Control strategy

Control of weeds in oilseed crops is integrated into that for wheat, inasmuch as it depends on lowering the weed burden in the soil. However, since oilseeds are broad-leaved plants, the same herbicides cannot be used. If the crop is sown in rows, mechanical weeding can be effective. Herbicides selectively effective against grasses may also be used if necessary.

Safflower Aphid (*Uroleucon compositae*)

This can cause severe losses to safflower.

Control strategy

Treatment with soap solution can be effective. If a chemical pesticide application is necessary, imidacloprid would be most appropriate, but care must be taken to avoid harming pollinators. A seed treatment might be the best application method, protecting the young seedlings and minimizing contamination.

Flower Beetle (*Oxythyrea sp.*)

This insect feeds on the flowers of safflower.

Control strategy

Handpicking or sweep-netting is probably sufficient to prevent serious damage.

3. POTATO (*SOLANUM TUBEROSUM*)

Potatoes are an increasingly important crop, especially in Bamiyan, but they also have an important role in providing a cash crop and food security in high mountain valleys with limited irrigated land and poor access to markets. The major plant protection problems with potatoes are Early Blight, virus disease and Colorado potato beetle.

Early Blight (*Alternaria solani*)

Early blight is primarily a disease of stressed or senescing plants. Symptoms appear first on the oldest foliage. Affected leaves develop circular to angular dark brown lesions 0.12 to 0.16 inch (3–4 mm) in diameter. Concentric rings often form in lesions to produce characteristic target-board effect. Severely infected leaves turn yellow and drop. Infected tubers show a brown, corky dry rot. The fungus can overwinter on plant residues in the field, on tubers and on other solanaceous plants such as tomato, eggplant and some weeds. Spores germinate in warm and wet conditions.

Control Strategy

Field sanitation especially the removal and destruction of plant residues and removal of other solanaceous plants and use of certified and disease-free seed potatoes. Good crop management with regard to spacing and irrigation.

Monitor the crop for signs of the disease. If it appears early, treat with a systemic fungicide such as a strobilus.

Andean potato mottle virus (APMoV), Potato leaf roll virus (PLRV)

Virus disease is common where seed potatoes are retained over many years by farmers.

Control Strategy

Certified disease-free seed potatoes are now available from Bamiyan.

Colorado Beetle (*Leptinotarsa decemlineata*)

Colorado Beetle is a cosmopolitan pest of potato and other solanaceous crops such as tomato. It is a leaf-eating beetle that can cause severe defoliation and so reduce yields. It first appeared in Baghlan province in the 1990s, having probably been introduced from the Soviet Union, where it was endemic. Since then it has spread into Takhar, Badakhshan and Samangan, probably through farmers buying planting material from Baghlan. Its appearance in Badakhshan coincided with the distribution of seed potatoes by the USAID ADP/N project. Attempts by FAO to eradicate it from Baghlan so as to prevent its spread to Bamiyan were unsuccessful.

The beetle overwinters as an adult in the soil, emerging in the spring. There are several generations depending on the length of the growing season, usually three in Afghanistan.

Control Strategy

As with blight, field sanitation especially the removal and destruction of plant residues, removal of other solanaceous plants and rotation with non-solanaceous crops. Hand picking and destroying the emerging adults in spring may be effective in small fields. Once the plant becomes large it is impossible to locate and remove all the beetles. There are no specific natural enemies in Afghanistan, although general predators such as coccinellids may attack the eggs.

Insecticide treatment has been widely used to control Colorado Beetle, but it readily developes resistance. Imidacloprod is an effective systemic insecticide and Spinosad has been widely used against it.

More encouragingly, the fungus *Beauvaria bassiana* has been developed as a myco-insecticide and commercial formulations are available in US. This may prove to be the most appropriate method in the future as *B. bassianae* could be locally produced as well.

The FAO IPM project is currently preparing recommendations for potato.

4. VEGETABLES

Annual horticulture, growing a wide range of crops, is popular in Afghanistan. This is an important sub-sector for development assistance as it represents the most valuable use of irrigated land, is labour intensive and offers culturally acceptable economic opportunities for women.

Popular crops include: carrots, cauliflower, cabbage, broccoli, lettuce, onions, garlic, radish, spinach, turnip, eggplant, okra, peppers, tomatoes, squash, pumpkin, cucumber, zucchini and strawberries. Techniques such as the use of greenhouses and low tunnels are used to extend the cropping season and take advantage of higher prices.

The vegetable crops share a suite of problems which include fungal diseases such as Damping Off, Fusarium Wilt, Powdery Mildew and Downy Mildew. Insect pests are Cutworms (*Agrotis ipsilon*), Thrips, Whitefly and Aphids. Nematodes are also a problem, in greenhouses. Snails are reported to be a problem with leafy vegetables.

Soil and crop hygiene, including rotation and weed control, are important ways of reducing pest and disease infestation. Sterilising the soil by solarisation is a non-chemical method that may be effective in Afghanistan. During the hottest part of the year, the soil is tilled finely, irrigated, covered with a plastic tarpaulin and left for four to six weeks. The heat destroys weed seeds, bacteria and fungal spores. Planting pots filled with soil can be stacked on a pallet and covered (see UC Davis website for details). Otherwise the soil for propagating seedlings can be sterilised with boiling water or by, if necessary, a fungicide treatment.

It is particularly important, in the case of vegetable crops that are delivered fresh to market and consumed immediately, to avoid contaminating them with pesticide residues. It is very tempting to improve the appearance, and therefore the value, of fresh produce by spraying just before harvest, but this must be strongly resisted.

There are a number of good practices that can reduce the problems of pests and diseases on greenhouses:

- crop rotation to reduce disease transference
- composting manure to reduce pathogen and pest transfer to soil medium
- managed irrigation (by drip irrigation if possible) to control humidity and soil moisture and reduce vulnerability to fungal diseases; reduce water related diseases (mildew and others)

- control irrigation, as excess irrigation causes humidity which can increase plant vulnerability

Cutworm (*Agrotis ipsilon*)

The larvae of this noctuid moth conceal themselves in the soil and emerge to feed on the tender stems of young plants, often chewing through them (hence the name).

Control strategy

Carbaryl powder (5%) sprinkled on the surface around the plants.

Cotton Bollworm (*Helicoverpa armigera*)

Bollworm is a cosmopolitan and polyphagous pest of cotton, maize, tomatoes and other crops. The moth lays its eggs on flowers or young fruit and the larvae burrow into it.

Control strategy

Sanitation: removal and destruction of susceptible weeds (Malvaceae) and volunteer crops. Trap crops, susceptible crops planted to mature earlier than the target crop, can attract the moths. The trap crop should be uprooted and burned as soon as the eggs have been laid on it.

Natural enemies such as lacewings (Chrysoptera), coccinellids, *Trichogramma* and braconids can normally keep this pest within economic bounds. Bollworm should be monitored by pheromone traps. Should dangerously high moth numbers be detected, immediate application of either a non-persistent contact insecticide, or a persistent low toxicity insecticide, such as diflubenzuron, be made.

Thrips (Order *Thysanoptera*)

Thrips can be a serious pest of onions but otherwise rarely do serious damage to other crops although some species are vectors of virus disease. They may however, spoil the appearance of produce and so need to be kept under control.

Control strategy

Natural enemies should be encouraged and yellow colored sticky traps may be effective in greenhouses. Heavier infestations may be treated with a mild insecticide such as mineral oil emulsion or neem extract. Severe infestations of onions may be treated with an application of spinosad or a parathyroid.

Whitefly (Family I)

There are many species of Whitefly that are pests of horticultural crops and some, such as *Bemisia tabaci*, are vectors of virus disease. Severe infestations are often the result of pesticide misuse, killing their natural enemies, and so it is better to avoid, if possible, the use of such chemicals on crops which are susceptible to Whitefly. They are especially a problem in greenhouses (e.g. *Trialeurodes vaporariorum*.).

Control strategy

The main control strategy for Whitefly is to prevent infestation by encouraging natural enemies such as Coccinellidae, if necessary, in the case of greenhouses, by introducing them. Whiteflies are attracted to yellow and so yellow sticky or water traps may be effective in greenhouses. Infestations may also be treated with soap.

Aphids (Family *Aphidae*)

Brassicas, such as cabbage, broccoli and cauliflower, are extremely vulnerable to *Brevicoryne brassicae*, which forms dense colonies covered with a waxy secretion.

Control strategy

It is important to remove alternative hosts, which grow as weeds, and to keep the fields clean. There are many natural enemies such as syrphids, coccinellids and hymenopterans parasitoids, but these, though numerous, often fail to prevent damage. Spraying with a soap solution can be beneficial, but may be harmful to cabbage. The use of insecticides may create secondary pest outbreaks by killing beneficial insects. If there are signs of infestation, imidacloprid may be applied before head formation.

Nematodes (Family xxxx)

Nematodes are highly specific in their hosts and so rotation and field sanitation provide effective control. There is a problem in greenhouses where the same crops are crops over many years. Certain plants, such as marigolds, which secrete nematocidal chemicals, may be inter-planted. Sterilizing the soil will control nematodes and many other pests and diseases (see reference to solar sterilization above). The use of synthetic nematocides is not recommended or authorized under this PERSUAP.

Powdery Mildew (Family xxx)

Powdery mildew is a common disease on many types of plants. There are many different species of powdery mildew fungi (e.g., *Erysiphe* spp., *Sphaerotheca* spp.) and each species only attacks specific plants. Powdery mildew first appears as white, powdery spots that may form on both surfaces of leaves, on shoots, and sometimes on flowers and fruit. These spots gradually spread over a large area of the leaves and stems. An exception is one of the

powdery mildews that affect artichokes, onions, peppers, and tomatoes: it produces yellow patches on leaves but little powdery growth. Severely infected plants may have reduced yields, shortened production times, and fruit that has little flavor. Year-round availability of crop or weed hosts is important for the survival of some powdery mildew fungi. Special resting spores are produced, allowing overwinter survival of the species that causes the disease in cucurbits, lettuce, peas, and certain other crops. Moderate temperatures (60° to 80°F) and shady conditions generally are the most favorable for powdery mildew development. Spores and fungal growth are sensitive to extreme heat (above 30°C) and direct sunlight.

Control strategy

Powdery mildew is best controlled by prevention. Resistant varieties are available for many crops. Planting in the sun will prevent powdery mildew in many cases, but some crops, especially cucurbits, may require fungicide treatment. Sulfur may be applied as a preventive measure but is not effective once the disease appears. To avoid injuring the plant, do not apply sulfur when air temperature is near or over 30°C and do not apply it within two weeks of an oil spray. If further treatment is necessary, systemic fungicides such as azoxystrobin (or other strobilin) and quinoxyfen should be apply. If more than one application is necessary use different types of fungicide to prevent resistance.

Downy Mildew

Downy mildew is a disease of many plants caused by infection with fungi of the family Peronosporaceae. Its initial symptoms include large, angular or blocky, yellow areas visible on the upper surface. As lesions mature, they expand rapidly and turn brown. The under surface of infected leaves appears water soaked. The disease is favored by wetness and high humidity.

Affected vegetable crops include (with fungus species given in brackets): cucurbits (*Pseudoperonospora sp.*), onion and garlic (*Peronospora destructor*), lettuce (*Bremia lactucae*), cabbage and cauliflower (*Peronospora parasitica*) and spinach (*Peronospora farinosa*).

Control strategy

The most important available control strategy is the use of resistant varieties. Crop rotation and the destruction of volunteer plants may help. Seedlings should be treated in the nursery with a fungicide to prevent them bringing the disease into the field.

Monitor the crop for symptoms from an early stage and treat with a fungicide as soon as possible if they appear.

Verticillium Wilt

Verticillium spp. attack a very large host range including more than 200 species of vegetables, fruit trees, flowers, field crops, and shade or forest trees. Most vegetable species have some susceptibility, including: Oilseed rape(*Brassica napus*), Cauliflower(*Brassica oleracea* var. *botrytis*), Cabbage(*Brassica oleracea* var. *capitata*), Pepper(*Capsicum* spp.), Watermelon *Citrullus vulgaris*), Sweet melons(*Cucumis melo*), Cucumber (*Cucumis sativus*), Pumpkin(*Cucurbita pepo*), Strawberry (*Fragaria chiloensis*) and Eggplant (*Solanum melongena*).

The symptoms are similar to most wilts with a few specifics to *Verticillium*. Wilt itself is the most common symptom, with wilting of the stem and leaves occurring due to the blockage of the xylem vascular tissues and therefore reduced water and nutrient flow. In small plants and seedlings, *Verticillium* can quickly kill the plant.

Control strategy

There is no effective control once the disease has occurred in the field. Preventive measures include rotation with broccoli and soil sterilization. Solarisation is suggested as an appropriate method for Afghanistan. It should be noted that stressed plants are easier to attack than healthy plants, so any conditions that will stress the plant but not directly harm the *Verticillium* will be beneficial for Verticillium wilt development.

Fusarium Wilt

Fusarium wilt is a disease caused by infection with the fungus *Fusarium oxysporum* and produces symptoms such as wilting, chlorosis, necrosis, premature leaf drop, browning of the vascular system, stunting, and damping-off. It affects a wide range of crops and may occur at any stage of growth. It is a soil-borne pathogen but it can also spread through infected dead plant material.

Control strategy

The most effective method of control is to plant resistant varieties. Because it can live in the soil for long periods of time, rotational cropping is not a useful control method for this disease. Because, *F. oxysporum* spreads faster through soils that have high moisture and bad drainage, improving the soil will reduce the incidence of the disease, as will removing dead plant material at the end of the season.

"Damping Off"

Damping off is caused by several soil-borne fungi including *Pythium*, *Phytophthora*, *Rhizoctonia* and *Fusarium*, which infect seedlings and cause them to 'damp off' or collapse and decay.

Control strategy

Spores of the pathogens are present in all soils and so hygiene and sterilization are the key to control. If starting plants indoors, in low tunnels, or in greenhouses, plant seeds in sterilized soil. Soil mix must be held at 60°C for at least 30 minutes. Soil can be heated by raising the temperature with boiling water, or by placing moist soil in a clear plastic bag in direct sunlight. See also the reference to solarisation above. Using resistant varieties assists in preventing this disease.

Onion and Garlic Neck and Bulb Rot (*Botrytis allii*)

This disease generally shows itself in storage.

Control strategy

Do not apply excessive nitrogen fertilizer. Do not harvest before the crop is mature and the necks well cured. Avoid mechanical damage during harvesting and handling.

Snails

Snails are reported to be a pest of leafy vegetables such as spinach, lettuce, coriander and red radish. Hand picking may be an effective control, but the use of a molluscicide such as metaldehyde may be necessary.

5. GRAPES (VITIS VINIFERA)

Grape-vines are the major perennial crop in many parts of Afghanistan and USAID projects are engaged in developing the value chain for dried raisins and fresh table grapes. This involves, among other activities, increasing yields through the adoption of trellising and improved vineyard management. The principal crop protection problems on vines are fungal diseases (such as Powdery Mildew, Anthracnose and Botrytis) and insects (such as Mealy Bugs and Grapevine Moth)

Powdery Mildew (*Uncinula necator*),

Powdery Mildew attacks all green growing parts of the vine, including the leaves, bunches and shoots. The fungus normally survives the dormant period in either protective structures (cleistothecia) or as fungal hyphen inside the dormant buds. It starts to grow as soon as the bud opens and the new leaves and shoots develop. It is not visible with the eye at that early stage. Active growth and development starts with temperatures between 23°C and 32°C. It can grow at low or high humidity.

The first symptoms are normally only seen after fruit set by which time it is too late for effective control and severe losses are inevitable. Control of this disease requires an

integrated approach to vineyard management including preventative chemical control using elemental sulphur either as powder or in a wet table formulation.

Control Strategy

The program commences at 2-3 cm shoot length with applications at regular intervals of 14 days until the berry softening phase (depending on the vine vigour), thereafter it can be done every 21 days only.

- First application 15 kg/ha dusting sulphur
- Second application 20 kg/ha dusting sulfur
- Third application 30 kg/ha dusting sulfur
- Fourth application 30 kg/ha dusting sulfur
- Fifth application 30 kg/ha dusting sulfur
- Sixth application 30 kg/ha dusting sulfur

No applications should be made if the temperature is above 30°C during the day, because this can cause burning of the leaves and berries.

Sulfur should not be applied directly on bunches after pea berry size because the berries are very sensitive to sulfur burn. If disease pressure is high during this phase the dust should be applied on the soil surface, because SO_2 gas release will spread into the foliage and control the fungus.

A heavy application of sulfur is required after the harvest period if symptoms of powdery mildew appear on especially the leaves. These leaves are required for the uptake of reserves by the roots that are vital for the next growing season. The presence of powdery mildew will cause premature loss of leaves that will limit the uptake of nutrients by the roots due to the absence of active leaves.

The application of sulfur less than 42 days before harvest is not allowed.

Systemic fungicides suitable for control of powdery mildew should be used in conditions where sulphur gives inadequate preventative control. It should be understood that an IPM approach to control of powdery mildew includes correct pruning and canopy management to reduce conditions favorable to the disease.

Anthracnose (*Gloeosporium ampelophagum*)

Anthracnose is a disease associated with rainy weather during the spring period just after bud break and can cause severe crop losses if not controlled. It is of moderate importance for Afghanistan because there are very few areas in the grape production regions where these conditions prevail.

The Fungus survives the dormant winter period on dead shoots left in the vineyard from the previous growing season. It starts development during the spring when the temperature increases, infecting all new green parts on the vine (shoots, leaves) during conditions of regular light rainfall or heavy dew. The spores are splashed or carried by insects onto young shoots. It requires free water for development that can come from rain, over head irrigation, dew or fog. Cool wet weather during spring and early summer are particularly favorable for disease outbreaks. Hot and dry weather retards the spread of the disease.

Control strategy

Vineyard hygiene and the removal and burning of canes after pruning are essential for the prevention of this disease.

In a vineyard with a history of Anthracnose infection, a program of preventative chemical control is necessary using a combination of dormant and spring applications.

- Lime sulfur (1:9 mixes with water) 3 weeks before expected bud break.
- Copper fungicides (such as Bordeaux mix, cupric hydroxide, copper oxychloride) and appropriate synthetic fungicides in 2-3 early spring applications at 14 day intervals.

Botrytis Rot (*Botrytis cinerea*)

Also known as Grey Mould the fungus attacks many plants. In grapes the most common problem occurs when it attacks the bunch, especially on varieties with compact bunches or when successful fruit set results in more compact bunches than usual. It normally becomes a problem in the vineyard near harvest time when the berries are high in sugar, but also is a major concern after harvest during storage and transit of fresh table grapes.

The fungus overwinters on grapevines as *sclerotic* (resistant protective structures) on or within canes or old rotted bunches. Wet conditions in early spring are required for the *sclerotic* to sporulate. Wet weather followed by at least 12-24 hours of free moisture is usually required for infection of young shoots, flowering clusters and leaves. • Infection of intact berries depends on their sugar content, persistent free moisture on the surface and prevailing temperatures. Generally cool wet weather of 10-20 hours between 20 and 25 degrees Celsius favors *Botrytis* development. Growth of the fungus stops at more than 30°C. Vines with very dense canopies that restrict sunlight penetration and air movement is also more sensitive for infection.

Control strategy

IPM of *Botrytis* involves the application of well-timed fungicide treatments integrated with vineyard sanitation and vine canopy management practices. Vineyards in regions subject to late summer rains prior to harvest should apply preventative control strategies.

In vineyards with a history of *Botrytis* infection, it is necessary to remove sources of the fungus (old bunches that rotted during the previous season, infected canes) from the vineyard before bud break.

Preventative spray

- Systemic fungicide spray during flowering and again 14days later on the clusters.
- Further sprays should be on the clusters just before bunch closure (while sprays can still penetrate between the berries), at berry softening and if necessary 2 weeks before harvest on very sensitive varieties.
- Post harvest control on table grapes in cold storage destined for the fresh market depends on pre-harvest control strategies in the vineyard and sulfur dioxide during cold storage.

Mealy Bug (*Planococcus ficus*)

The most important insect pest of grapes in Afghanistan is mealy bug, a very common insect that is found world-wide in all grape growing regions. Its main effect is on the quality of the crop caused by secretion of honeydew causing bunches to become very sticky. Mealy bugs are also the main vector for the transmission of leaf roll virus between plants. Control of the insect is not easy and relies on a combination of chemical and biological methods.

The insect overwinters under the bark or in the soil around the roots, emerging in the Spring. There may be up to six generations and it can reach very high densities if not controlled.

Control strategy

Control requires a combination of chemical and biological methods.

- Insect numbers should be monitored early in the growing season by inspection and the use of pheromone traps. High trap catches of males are an indication of a possible outbreak.
- The most effective control is by the many natural enemies, including ladybird beetles and parasitoid Hymenoptera. Insecticide sprays will kill these and so should only be resorted to during the growing season as a last resort if there is a heavy outbreak.
- Ants tend mealy bugs and protect them from natural enemies and so control of ants in the vineyard may be necessary.
- Where vines are known to be infested, preventative dormant season treatment with Winter Oil should be used as this will not damage beneficial insects.
- Weed control in the vineyard will also reduce habitat for mealy bugs.

Grapevine Moth (*Lobesia botrana*)

Also known as Grape Berry Moth and Vine Moth it is known to occur in Europe and Central Asia and can result in heavy crop losses if not properly controlled. The insect damages grapes

by feeding on flower buds and fruits causing external damage, internal damage and subsequent rotting by fungi such as *Botrytis, Aspergillus*, *Alternaria*, *Rhizopus*, *Cladosporium*, and *Penicillium*.

The insect overwinters as a pupa in a cocoon on the fallen leaves, under the vine bark or in the soil. Adults emerge from April to May when temperatures start to increase. Mating occurs in flight and soon after, females lay eggs which hatch in 6 - 9 days. The larvae feed on the blossoms and young fruits for about 3 weeks and then spin a silky web inside and around grape bunches before pupation.

Numerous predators and parasitoids are reported in the European literature. Among the parasitoids are four species of tachinid flies and nearly 100 species of parasitic wasp in the ichneumonid, braconid, pteromalid and chalicidoid families. The parasites that are reported to cause the greatest impact are those attacking the overwintering pupa. In Spain these include the pteromalids *Dibrachys affinis* and *D. cavus*, which are reported to cause up to 70% pupal mortality, whereas in Italy the ichneumonids *Dicaelotus inflexus* and *Campoplex capitator* are the most important

At the end of June or early July the second flight occurs and adult moths begin laying eggs on the mature grape berries for the second generation. Each larva usually destroys several grapes. There can be up to three generations, depending on the region. In the third generation the eggs are laid in ripening fruit and this is where the serious *Botrytis* problems occur.

Control strategy

The basis of long term control lies in a combination of biological and chemical control strategies. It has similarities with mealy bug control, because any insecticide spray during the growing season will kill the natural enemies.

- Monitoring adult moth densities with pheromone traps.
- Monitor eggs and larvae by searching on the peduncles of the vines one week after the first moths appear in the pheromone traps.
- Time insecticide spraying to coincide with larval emergence. Use low toxicity insecticides such as insect growth regulators, spinosyns, and *Bacillus thuringiensis*. Apply insecticide before bunch closure

6. STONE FRUIT & ALMOND (PRUNUS spp)

The most commercially important stone fruit crop in Afghanistan is apricot (*Prunus armeniaca*). Peach (*Prunus persica*) is also widely grown. Cherry (*Prunus avium*) and plum (*Prunus domestica*) are becoming increasingly important as the high altitude areas, where they are best grown, gain access to the market. Almond (*Prunus amygdalus*), a major export crop, is closely related biologically to these and may be considered together with them. Most of the principles recommended here apply also to other minor perennial crops.

Before considering the control of individual pests and diseases, it is important to emphasise one aspect of IPM in orchards, namely healthy trees. Trees that are correctly pruned, irrigated, drained and fertilised resist many of the diseases and pests that are frequently seen. Orchard hygiene, the removal and burning of plant residues such prunings, fallen fruit and leaves, is an essential step in breaking the cycle of infection and infestation. Painting trunks white prevents sun scorching which leads to fissures allowing the entry of pathogens.

Orchards also require weed control. For preference this should be by mechanical means, but the use of appropriate herbicides may be necessary.

It is also important to mention the effects of pesticide misuse in orchards. Many recorded pests, notably Spider Mite and San Jose Scale, are linked to excessive or inappropriate spraying which kills their natural enemies. Inappropriate spraying also kills pollinators, without which no fruit will be set. As well as honeybees, which themselves produce a valuable product, there are natural pollinators such as *Osmia* spp.

Gummosis/Canker

Canker is an infection of the bark either by the bacterium *Pseudomonas syringae*or the fungus: Phytophthorasyringae.

It appears to affect peach most severely. There is no reliable treatment, but it can be prevented by good orchard management and the use of resistant varieties. Since it can also be spread by the use of contaminated pruning tools, care should be taken to disinfect them.

Shot Hole Disease (*Wilsonomyces carpophilus*)

Shot hole disease may kill buds during winter, and cause spots on fruit and leaves in spring. If severe, leaf drop may occur in spring. Fruit lesions are light brown with dark purple margins and usually are clustered on the upper sides of fruit. Fruit spotting can be severe, and as fruits mature, spots become scab-like and may flake off, leaving roughened areas beneath. Leaf spots fall out (shot hole).

The fungus survives within infected buds and on twigs. Spores are rain splashed, and disease increases during the rainy season. Fruit infection is favored by wet spring weather.

<u>Control Strategy</u>

Check in autumn for fungal fruiting bodies on the leaves. If these are present, spray with Bordeaux mixture before the winter rains. One application should be sufficient. Chlorothalonil is also recommended by UC Davis for control of this disease.

Aphids and Scale insects

There are several species of aphid that cause damage to *Prunus*. These include *Myzus persicae* (The Peach-Potato Aphid). *M. persicae* overwinters as eggs on *Prunus*. The eggs hatch at bud break and the leaves are damaged as they emerge. By the time damage is observed, it is too late to control.

Pterochloroides persicae is the Black Bark Aphid. Unlike *M. persicae*, it does not attack the leaves or green shoots but is found on second year or older bark.

San Jose Scale (*Diaspidiotus perniciosus*) is also found in Afghanistan. This pest is a typical symptom of pesticide misuse, as it is normally adequately controlled by natural enemies such as Coccinellid beetles (Ladybirds).

Control Strategy

Dormant season treatment with a mineral oil emulsion (Winter Oil) is the most effective preventative measure against all these sap-sucking insects.

Peach Twig Borer (*Anarsia lineatella*)

This pest is recorded in Afghanistan but its status and importance is unknown.

Control Strategy

Should this pest be a problem, its management can be incorporated into the overall orchard IPM programme. Although Winter Oil alone will not control it, this treatment can be combined with the application of an environmentally acceptable insecticide such as spinosad or diflubenzuron.

If control is necessary during the growing season, applications of Bt, spinosad or diflubenzuron should applied using the online UC Davis calculator to determine timing. Mating disruption with pheromones can also be used during the growing season.

Tree Borers (*Cerambycidae*)

These are usually found in badly managed or neglected orchards. Frass and bore holes are visible around the crotch of the tree.

Control Strategy

Monitor in spring for signs of frass around the crutch. If this is found hand-spray with Sevin 1ft above and below the crutch two or three times at six week intervals and then paint white.

7. POMEGRANATE (*PUNICA GRANATUM*)

Pomegranate is a high value export commodity which is being increasingly planted. Its major pest is the Carob Moth (*Ectomyelois ceratoniae*), which lays its egg in the calyx. The larva then burrows into the fruit, feeds on it and destroys it. *E. ceratoniae* is a cosmopolitan and highly polyphagous pest, whose hosts include almonds and figs, which, in northern Afghanistan, are grown with pomegranate in mixed orchards. Almond traders in Mazar-i-Sharif complain of "worms" in stored almonds. Pheromone traps for Carob Moth were placed in the store by IDEA-NEW and were found to catch moths and so it is highly likely that there is a linkage between these two problems. In southern Afghanistan, where pomegranates have been planted in monoculture, this problem is small or absent.

Control Strategy

Orchard hygiene, the removal and destruction of fallen fruit and "mummies" remaining on the trees is essential for an IPM approach. FAO has recommended bagging as a method of control. However, a mating disruptant formulation of a synthetic analogue of the Carob Moth pheromone has been developed for use on date palms in California. IDEA-NEW carried out trials over two years in Khulm district (Balkh) and achieved successful control. However the costs were uneconomic when compared with the yields of these poorly managed orchards. Should this pest become a problem in more productive orchards, this should be considered as an option.

8. APPLE (*MALUS DOMESTICA*) AND OTHER POME FRUIT

Apple is an increasingly popular crop with a strong demand in the home market. It is grown at higher altitudes such as in Badakhshan and Wardak. Pears (*Pyrus* spp.) and quince (*Cydonia oblonga*) are also grown.

It is necessary to repeat the remarks made above in relation to stone fruit regarding orchard management. Trees that are correctly pruned, irrigated, drained and fertilised resist many of the diseases and pests that are frequently seen. Orchard hygiene, the removal and burning of plant residues, such prunings, fallen fruit and leaves, is an essential step in breaking the cycle of infection and infestation. Painting trunks white prevents sun scorching which otherwise leads to fissures allowing the entry of pathogens.

Orchards also require weed control. For preference this should be by mechanical means, but the use of appropriate herbicides may be necessary.

Many recorded pests are linked to excessive or inappropriate spraying which kills their natural enemies. Inappropriate spraying also kills pollinators, without which no fruit will be set. As well as honeybees, which themselves produce a valuable product, there are natural pollinators such as *Osmia* spp

The most important pest species for pome fruit are Codling Moth and Woolly Aphid. Tree borers also attack pome fruit trees and the same recommendations as are given above apply.

Codling Moth (*Cydia pomonella*)

Codling Moth is the most serious pest of apples in Afghanistan. It also attacks walnut and so, where there are many walnut groves, as in Badakhshan, these are a constant reservoir of this pest. The insect overwinters as a pupa under the bark. The moths emerge in spring and lay their eggs on fruit. The larvae hatch and burrow into the fruit, leaving a visible "sting" on the surface. The larvae feed on the flesh of the fruit, rendering them unsalable or causing them to drop prematurely. There may be up to three generations per year.

Control Strategy

There are a number of mechanical and cultural methods to control Codling Moth but it is doubtful whether they are sufficient to deal with a heavy level of infestation, especially where reinvasion from walnut groves or unmanaged orchards is a problem.

Fallen fruit and those with visible stings and should be removed and destroyed (fed to animals). Corrugated cardboard can be tied round the trunk of the tree. The insects will pupate under the cardboard rather than in the bark and they can be removed and fed to chickens.

An essential element of Codling Moth Management is monitoring with pheromone traps. It is possible that a high density of pheromone traps (two per jerib) may itself be an effective control measure. There is, however, specific pheromone products designed as mating disruptants and these may be preferable and more effective.

Chemical control, if necessary, needs to be carefully timed using data from trap catches, daily minimum and maximum temperatures and the life-cycle calculator on the UC Davis website. Care needs to be taken to avoid killing pollinators and other beneficial insects. Spinosad is recommended by UC Davis and diflubenzuron is used in Europe. Malathion or a pyrethroid may be used in an emergency, but this risks damage to beneficial insects.

Woolly Aphid (*Eriosoma lanigerum*)

The Woolly Aphid is so called because its thread-like waxy secretion resembles wool. Woolly aphids infest roots, trunks, limbs, shoots, and occasionally fruit of apple trees. This aphid is found in colonies on the aerial portions of the tree and on roots during winter. The nymphs migrate up or down the trunk of infested trees during summer and fall. The main injury to young and mature trees is stunting due to the formation of root galls. If populations are high, honeydew and sooty mold will also be problems, and aphids may enter the calyx end of fruit.

Control Strategy

Woolly Aphid is attacked by natural enemies, of which the most effective is the chalcid parasitoid, *Aphelinus mali*. FAO, in collaboration with CIBC introduced this natural enemy in the 1970s, but misuse of pesticides has caused its disappearance.

A dormant season treatment with Winter Oil is also an effective preventative measure. A severe outbreak may be treated with oil during the growing season if necessary.

V. PESTICIDE HANDLING AND USE

The objective of the PERSUAP, to ensure that the use of pesticides overseas by USAID projects adheres to the same standards of safety as those regulated by USEPA within the United States, cannot be achieved simply by stipulating which pesticides are to be used for which purpose. They also depend on the knowledge and competence of those who handle and use them.

If pesticides are incorrectly applied, not only do they create a hazard, but they also do not work. This means that not only is the money and effort invested in them wasted, but also that unnecessary and equally ineffective repeat applications are liable to be made, compounding the problems. In Afghanistan, the knowledge and competence of farmers and dealers in this respect are deplorably low. Although MAIL plays an important role in developing recommendations and supervising compliance with the law, the fact remains that the vast majority of farmers get their advice from the retailers who sell them their inputs. Improving the quality of the retail trade remains fundamental to improving pesticide use.

This section summarizes what dealers and farmers need to know and do if pesticides procured, recommended or financed by USAID projects are to be used safely and effectively. It is by no means a complete guide. For further details, refer to Annex I.

1. PESTICIDES

The first step towards safe and effective pesticide use is to understand what pesticides are and their properties. A pesticide is a chemical used to prevent, destroy, or repel pests. Pests can be insects, mice and other animals, weeds, fungi, or microorganisms such as bacteria and viruses. Pesticides are sold as **products**, which consists of one or more **active ingredients** mixed together with other chemicals, referred to as "**inert ingredients**" in order to dilute the active ingredient, and to make the product safer and more effective, or easier to measure, mix and apply, or to improve storage. The quality of a pesticide product may depend as much on the inert ingredients as the active ingredients. Types of inert ingredients include the following.

Emulsifiers, help emulsifiable concentrates to mix better with water;

Wetting agents help wet able powders to mix better with water, and help formulations spread on water repellent surfaces;

Spreaders, help the pesticide to spread evenly over the sprayed surface;

Stickers, help the pesticide to stick to the sprayed surface.

Types of Pesticide

Pesticides can be classified in different ways. The first way is according to their use:

Insecticides	Control insects.
Fungicides	Control fungi.
Herbicides	Control weeds.
Acaricides	Control mites.
Rodenticides	Control rodents (rats, mice).
Molluscicides	Control snails.
Nematicides	Control nematodes.

The second way is according to their formulation. The following are the most common types of formulation.

Emulsifiable Concentrate (EC) Liquid formulations where the active ingredient is dissolved in a petroleum solvent. The formulation is diluted with water to form an emulsion for application. Usually contain 25 to 75 percent of active ingredient..

Wettable Powder (WP) Dry formulations of fine, insoluble powders, the active ingredient are combined with an inert carrier such as clay or talc, together with wetting and/or dispersing agents. The formulation is mixedwith water to form a suspension for application. Usually contain more than 50 percent active ingredient..

Seed Dressings (DS, ES, FS, LS, PS, SS, WS) Dry or liquid formulations for application to seeds prior to planting. Dry formulations usually require no further dilution (SS formulations require dilution with water), liquid formulations usually, but not always, require dilution with water. PS formulations are pre-dressed seed.

The third way is according to their chemical nature.

Inorganic Pesticides, which do not contain carbon, they commonly contain arsenic, copper, mercury, sulphur, tin or zinc. Many of these compounds are now banned or have severely limited uses. Examples are Kumulus-DF (sulphur)

Organic, Pesticides which contain carbon. They are the most commonly used pesticides.

Organophosphates, e.g Chlorpyrifos and Dimethoate

Carbamatese.g. Carbaryl.

Pyrethroids e.g. Deltamethrin and Lambda-Cyhalothrin

Triazines,

Substituted ureas,

Sulfonylureas

Dithiocarbamates e.g. Thiram

Biological/ Microbial contain bacteria, fungi, protozoa or viruses, such as *Bacillus thuringiensis*and Abamectin.

Botanical Obtained from plant extracts, such as rotenone, neem, and pyrethrum.

The fourth way is according to their mode of action.

Contact.The target pest is killed when it comes into direct contact with the pesticide. The pesticide is usually applied to a surface, such as leaves, but may be applied as aerial droplets, for example for flying mosquito or locust control.

Stomach The pest must eat the pesticide to be killed. Most insect contact pesticides are also stomach poisons.

Systemic Apesticide that is absorbed and moved within a plant. Insect pests are killed when they feed on the plant. Systemic fungicides kill the fungus inside the plant. Herbicides are largely systemic pesticides, which kill the weed when they are absorbed.

Vapour action. A pesticide in vapour or gas form in the air which the pest breathes in. This is used to fumigate enclosed areas such as stores, greenhouses, shipping containers, houses etc.

Pesticides differ in the range of plants, insects or disease that they affect. For example, glyphosate kills all plants, but 2,4-D only kills broad-leaved plants and not grasses or cereals. The selectivity of a pesticide is an important factor in deciding whether to use it.

How dangerous are Pesticides?

Since most (but not all) pesticides are poisons, they can be dangerous to humans. The toxicity of a pesticide is an important piece of information in deciding whether and how to use it. Pesticides are classified according to their toxicity.

WHO, Classification

- Class Ia, "Extremely Hazardous"
- Class Ib, "Highly Hazardous"
- Class II, "Moderately Hazardous"
- Class III, "Slightly Hazardous"
- [U], "Unlikely to Present Acute Hazard in Normal Use"
- [Obsolete], WHO do not classify obsolete pesticides
- [Fumigant], WHO do not classify fumigants

USEPA Classification

Class I, "DANGER"
Class II, "WARNING"
Class III, "CAUTION"
Class IV, Not required

See Section VI.2 for further details of Acute Toxicity classification.

The Container Label

The label on a high quality pesticide from a reputable manufacturer is the primary source of information about a product. Such a label has all the basic information that is needed:

- Product name of the pesticide.
- Name of the active ingredient(s) in the product.
- Percentage concentration of active ingredient in the product.
- Percentage concentration of inert materials in the product.
- Toxicity of the product.
- Crops and pests for which the product is registered for use.
- Dose or application rates to use.
- Safety precautions to follow when mixing and applying.
- First aid measures and antidotes.
- Pre-harvest interval.
- Date of manufacture, batch number, and expiry date.
- Product registration number
- Name of the manufacturer or importer and contact details.

2. Transporting, Storing And Selling Pesticides

Transporting Pesticides

Pesticides are in their most concentrated and dangerous form when being transported to or from the shop, warehouse, or farm. Accidents can result in broken containers, spills, environmental contamination, and poisoning. Care and attention to safety are thus needed.

Pesticides should never be transported by passenger carrying vehicles such as a bus or taxi.

Pesticides should never be transported with food, animal feed, or goods intended for consumption or human use (for example, clothing).

The best type of vehicle is a flat-bed truck, such as a pick-up. There should be no nails or other projections on the load bed, which can damage containers.

Passengers or animals should not ride with the pesticides in the load bed. Children should never be carried in a vehicle transporting pesticides.

Pesticides should not be carried in the passenger compartment of the vehicle.

The vehicle should carry the necessary safety equipment in case of an accident or spillage (protective clothing, shovel, soap and water, fire extinguisher, emergency telephone numbers).

Pesticides should only be transported in intact, undamaged containers, with readable labels. The containers should be checked for leaks and loose bungs before loading.

Load the pesticides carefully. Do not throw or slide the containers, as this may cause damage. Tie the load down, and cover the containers with a tarpaulin to protect the containers from the sun. Shelf life will be shortened if the pesticide becomes too hot.

Unload the pesticides carefully. Do not throw, slide, or drop the containers off the vehicle. If the containers are heavy, roll them down inclined planks onto some old tyres.

The main hazards involved with pesticide storage, whether in a warehouse or shop, are those of fire and environmental contamination. Many pesticides can easily catch fire or the vapours can explode, particularly oil based formulations. If a fire does occur, pesticides will release toxic smoke and fumes, which present severe risks to fire-fighters and bystanders. Environmental contamination can occur in case of spills, or from the run-off of water used in fire-fighting.

Location of Pesticide Stores and Warehouses

Stores and warehouses should be located away from schools, hospitals, markets, human and animal food stores, water sources, open water, or where there is a high water table or possible flooding.

The store or warehouse should be surrounded by a containment bund and drains and a sump should be provided into which spills and washings can flow. There should be no drainage access to public drains.

Access for emergency vehicles should preferably be from two sides, but must be at least from one long side.

Construction of Pesticide Shops, Stores and Warehouses

Walls, roof and shelving should be constructed of non-combustible material (concrete, steel).

For stores and warehouses, the roof should be of light-weight material that will collapse in the event of a fire.

Walls and floors should be of non-permeable material, such as concrete or tiles, smooth and without cracks or crevices, so as to allow easy cleaning.

Shelves should be of non-permeable material, such as metal or plastic, and without cracks or crevices, so as to allow easy cleaning.

There must be adequate natural or artificial lighting, sufficient to read all parts of the pesticide label.

The store should be well ventilated. For bulk stores this means upper and lower wall vents, in addition to opposing doors.

Display and Sale of Pesticides in Shops

Shops should be located away from stores selling food, clothing and other materials, and pharmacies.

An area separate from the main part of the shop should be available for storing stock not on display.

If physically separated from the shop, the store must meet all the necessary requirements for pesticide storage.

Stock received last should be kept in this store, with older stock on the display shelves so as to facilitate first-in, first-out stock rotation.

Pesticides must be stored and displayed separately. They must never be kept in the same area as food, drink, or medicines (including veterinary medicines) for human or animal consumption. They must also not be kept in the same area as any material that might become contaminated, such as seed, fertilizer, or clothing.

Pesticides must be kept out of direct sunlight, temperature extremes, water and moisture.

If stored on shelves, dry pesticides should be placed above liquid pesticides

Herbicides should be on the lowest shelves.

Containers should be inspected regularly to ensure that there are no leakages.

Shelves should not be over-stocked, as this makes correct stock rotation and the detection of leaking containers more difficult, and increases the risk of shelves breaking due to the weight

Materials must be available for cleaning up spills – sawdust/sand, bucket, broom, shovel, drums/strong plastic bags for sweepings, overalls, gloves, boots, face mask.

Fire-fighting equipment must be available – fire extinguisher (foam or dry powder), bucket of sand.

Washing facilities must be available – water, soap, towel.

There must be no smoking, eating or drinking in the pesticide area.

No unauthorised access must be allowed into the pesticide area.

Warning notices should be displayed – 'No smoking', and 'Danger – Pesticides'.

3. Using Pesticides

The first step in using pesticides is to decide whether it is necessary and, if so, which one is appropriate, based on the knowledge of pesticide types. Pesticides should normally be used as part of an IPM programme, which means that the pest levels in the crop are being monitored by scouting or by pheromone traps. Due regard must be had for the effect of the pesticide application on beneficial organisms and the environment.

The second step is to read the label carefully and to understand the instructions for correct use. The formulation will determine the type of sprayer that must be used. Even if a good quality pesticide has been bought, it will not be effective if the spraying is badly done.

Types of sprayer

Pressure (Compression) Sprayers: In this type of sprayer, the spray liquid is pressurized by pumping air into the spray tank. Although very cheap, these sprayers are not recommended for agricultural use as the pressure rapidly drops as soon as spraying starts, with subsequent reduction in output and increase in droplet size. However, they are widely used in public health programes, such as for mosquito control.

U. Manual knapsack sprayers are continually pumped by hand to maintain spray pressure. A regular rate of pumping should be maintained. The cost of these sprayers ranges from cheap to moderately expensive. The cheaper versions should be avoided as they have a very short working life, and are very prone to breakdowns and leaks.

Knapsack sprayers are widely used in field and vegetable crops. The most effective method of use of the hand lance provided with the sprayer is to spray sideways into the foliage, or "up and under" the leaf surfaces. For spot spraying in tall orchard trees, an extension can be fitted to the hand lance.

Motorised Knapsack Mistblowers: Mistblowers is petrol motor driven knapsack sprayers that produce droplets by air force. The droplets are carried to the crop by a combination of the air forces produced by the sprayer and by natural wind forces. These sprayers are expensive to purchase and run, but they have a greater work output than manual knapsack sprayers.Mistblowers are widely used in field, vegetable and tree crops. However, they are not suitable for treating tall field or orchard crops, unless an additional pump is fitted to pump spray mix to the nozzle.

ULV and CDA Sprayers: Ultra Low Volume (ULV) and Controlled Droplet Application (CDA) sprayers use spinning discs to produce small sized droplets of similar size. The discs are driven by a battery powered motor. Pesticides may be applied undiluted or mixed with a small amount of water. Different sprayers are needed for the application of insecticides and fungicides, and for herbicides.

Different types of nozzles are used for different purposes. The size of the droplets produced depends on the size of the hole in the nozzle and the spray pressure. For any type of nozzle, the larger the hole and the lower the pressure, the larger the size of the droplets produced.

Calibration and Maintenance,. Accurate calibration of a sprayer is essential to ensure that the correct amount of pesticide is applied to the target area. A sprayer which is not regularly calibrated will apply either too much or too little pesticide, resulting in waste or poor control of pests. Calibration involves measuring the output of the sprayer, the width of the spray pattern produced, and the speed at which the spray operator is walking or the tractor is moving. Once these factors are known, the amount of spray mix applied to the target area can be calculated. If necessary, adjustments can then be made to one or more of the controlling

factors, or to the mixing rate of the pesticide in the water (or to the pressure), to ensure that the correct amount of pesticide is applied.

Regular sprayer maintenance is also essential to ensure that the sprayer is working correctly, and for safety by ensuring there are no leaks. Nozzles should be regularly replaced, at least at the beginning of the season, more often if the sprayer is used frequently or if abrasive formulations such as wet able powders are applied. Calibration of the sprayer with new nozzles fitted will give a base from which to determine when new nozzles should be fitted, as the output will gradually increase as the nozzles become worn.

Leaking sprayers are dangerous, and leaks should be repaired immediately. Seals should be inspected on a regular basis and replaced as necessary. A small toolkit (screwdriver, spanner) should be available in the field to effect immediate repairs. These tools, and some spare parts, may be provided with the sprayer on purchase.

Mixing Most formulations, such as Emulsifiable Concentrates and Wet able Powders must be mixed with water before they can be used. Mixing is the most hazardous operation when handling pesticides as the product is in a concentrated form. Precautions are thus essential to protect the handler and the environment.

- Protective clothing should be worn, as indicated on the label. The minimum is gloves, boots, overalls, and goggles (or a face shield for liquids only).
- Take care when opening containers. Plastic and paper bags should be cut with a knife, not ripped open.
- All containers should be placed on a level surface so that they do not tip over and spill pesticide.
- The container should be closed or the cap replaced immediately after the pesticide has been poured out.
- Identify any measures used by local farmers. The quantities of liquid and powders these hold should be calculated so that where necessary the conversion can be made in giving recommendations to farmers.
- Local measures include such things as spoons, matchboxes, cut-down plastic bottles. These measures should be washed after use, and never used for any other purpose.
- When mixing liquid formulations, the liquid can be added directly to the spay tank.
- When mixing powder formulations, the powder should be creamed first with a small quantity of water in a separate container, and then added to the spray tank.
- To mix the pesticide in the spray tank of small sprayers:
- Read the label.
- Half fill the tank with water, with the filter in the tank opening in place.
- Remove the filter and add the correct amount of pesticide to the tank.
- Rinse the measure with water and add the washings to the tank. Repeat twice more.
- Replace the filter and lid, and shake the sprayer.
- Fill the tank with the remainder of the water, with the filter in the tank opening in place.

- Replace the lid and shake the sprayer again.
- When the filter is removed from the sprayer, place it on a clean surface so that it does not become contaminated with dirt, which can cause wear to the sprayer pump and the nozzles or block filters and nozzles.
- To mix the pesticide for large sprayers:
- Read the label.
- Half fill the tank with water.
- Mix up the pesticide with some water in a small container. Stir with a clean stick, or similar, NOT the hand.
- Add the pesticide mix to the tank.
- Rinse the mixing container with water and add the washings to the tank. Repeat twice more.
- Fill the tank with the remainder of the water.

<u>After Spraying</u>

If there is spray mix left in the tank at the end of the spraying operation, it should be sprayed on the field, walking much faster than for the normal spray operation so that the amount of pesticide in the twice treated areas is not too high. Unused spray mix should NEVER be poured into canals or onto the ground.

When paper containers are empty, cut them open and shake all the remaining pesticide formulation into the spray tank.

When plastic or metal containers are empty, drain the container into the spray tank, fill one quarter full with water, replace the cap, shake for 30 seconds, and drain the water into the spray tank. Repeat this rinsing and adding to the spray tanks twice more. This procedure is known as triple rinsing.

The containers can then be disposed of.

Paper and plastic containers can be burnt in a hot fire. Be careful not to burn the containers close to buildings, and ensure that there are no people or animals downwind of the fire who could breathe in the smoke.

Metal containers should be punctured, crushed and buried in a hole at least one meter deep. Do not bury the containers close to water sources (canals etc), or close to buildings.

The hole should be fenced off and a warning sign erected.

Empty pesticide containers must NEVER be used for another purpose, such as holding water or food. It is impossible to remove all the pesticide, even with triple rinsing.

4. PESTICIDE ACCIDENTS

Spills of pesticide formulation can occur during transport, storage and mixing. There are three stages to dealing with spills – Control, Contain and Clean-Up.

Control

- Put on the necessary protective clothing.
- Stop the source of the spill if at all possible. If a container has fallen over, put it the right way up; if a small container is leaking, put it in a larger empty container. If a large drum is leaking or has fallen over, you may not be able to quickly stop the source.
- Keep other people away from the spill. Have someone stay at the site at all times to warn other people to keep away.

Contain

- Confine the spill to stop it spreading. Surround the spill with soil or sand as a dam to contain the spill.
- Absorb liquids by covering them with sand, soil, sawdust, newspaper.
- Stop dry pesticide from blowing away by covering with a plastic sheet, or spraying a light mist of water. Do not use too much water as this will make clean-up harder.

Clean-up

For liquid spills, sweep up the absorbent material with the pesticide, and place it in a heavy duty drum or bag.

For dry spill, sweep up and place in a heavy duty drum or bag.

If the spill area is non-porous, such as concrete or tiles, wash down the affected area with soap or detergent and water. Do not use too much water, as this will spread the contamination. Soak up the water with absorbent material and place in the drum or bag.

Wash all equipment and clothing used during the containment and clean up.
Wash yourself thoroughly.

Poisoning

Pesticides enter the body in three main ways or routes:

- Dermal exposure - Getting a pesticide on the skin, or in the eyes.
- Inhalation exposure - Breathing a pesticide into the lungs through the nose and mouth.
- Oral exposure - Swallowing a pesticide through the mouth.

Pesticide poisoning occurs when a pesticide enters the body and interferes with the essential systems of the body. Many of the signs and symptoms of acute pesticide poisoning are similar to those of other illnesses, such as flu. Anyone who has been handling or using pesticides and then develops suspicious signs and symptoms should immediately see a doctor, taking the pesticide label or container with them.

Depending on the type of pesticide and degree of exposure, only some of the symptoms may be apparent, and individual symptoms may appear at different times after the exposure. Symptoms can start anything from ½ hour to 24 hours after exposure. The typical symptoms and signs of pesticide poisoning are:

First:

- Nausea, vomiting
- Headache, dizziness
- General weakness or tiredness
- Tightness in chest

Later:

- Excessive sweating, salivation
- Vomiting, diarrhoea
- Stomach cramps
- Muscle twitches, cramps, aches
- Blurred vision
- Confusion
- Fits or unconsciousness

First Aid

First aid is the initial treatment of a person suffering from a pesticide exposure, before seeking proper medical attention.

In all cases of pesticide poisoning: Follow the product label instructions if they are available.

The **first action** is to remove the person from the source of the exposure by removing pesticide from the skin, removing contaminated clothing, or getting the person to fresh air. While doing this, be careful to avoid contaminating yourself.

Following the first aid, the victim must be taken to a doctor as quickly as possible, with the pesticide container or label so that the doctor can identify the active ingredient.

5. Protective Clothing

Protective clothing consists of clothing and devices that are worn to minimise exposure to pesticides and to keep pesticides away from the body. The minimum amount to wear for a specific pesticide formulation and activity is given on the label of a high quality pesticide, either in the text or the pictograms.

Protective clothing only protects if the pesticide remains on the outside and does not come into contact with the body. Protective clothing must be worn in the correct way to prevent this happening. Also, torn, damaged or broken protective clothing should not be used as pesticide can enter and be trapped next to the skin. Contaminated clothing should be removed immediately.

All protective clothing should be washed after every use.

Alternatives to dedicated protective clothing are indicated in the following sections. However, these alternatives give only limited protection, and should only be used if the correct protective clothing is not available.

Body protection:

Any time pesticides are handled, the minimum to wear is overalls. The collar should be fastened to protect the lower part of the neck.

An alternative to overalls is a long sleeved shirt and long legged trousers. The shirt collar should be fastened to protect the lower part of the neck.

A wide brimmed cotton or canvas hat can be worn during spraying to protect the head.

All work clothes, including hats, should be washed after every days use.

Hand and foot protection:

Rubber gloves and rubber boots should be worn when handling pesticide concentrates. They should be unlined, as fabric liners can trap pesticide and are impossible to clean adequately.

Trousers should be worn outside the boots, not tucked in.

Gloves should be washed with soap and water before removal, turned inside out and the inside washed. Boots should also be washed inside and out after use.

Do not use gloves with holes or tears, as the pesticide will get inside and be held next to the skin.

An alternative to rubber gloves is a plastic bag.

For spraying operations only, an alternative to rubber boots is canvas shoes. They should be thoroughly washed with soap and water after each days use.

Eye and face protection:

Non-fogging eyewear such as safety glasses and goggles should be worn when there is a chance of mists or dusts, for example during spraying or mixing dry formulations.

Face shields should be worn when there is a risk of being splashed with insecticide, such as when mixing liquid formulations.

An alternative is to use ordinary glasses or sunglasses. However, these give only minimal protection to the eyes.

Inhalation protection:

Dust/mist masks are usually shaped filters that cover the nose and mouth to filter out dusts, mists and particles.

Masks must be disposed of after each days use.

For spraying operations only, an alternative is a cloth tied over the nose and mouth. This should be washed after every spraying operation.

Respirators remove contaminants in the air by filtering dusts or mists, or by removing gases and vapours.

Respirators are usually only needed in specialised operations, or when mixing or applying more toxic products.

6. FOOD SAFETY

Pesticides are applied to food crops to protect them from pest damage or loss, but leave residues that may be eaten by people or animals. For this reason, a pre-harvest interval is needed between the time of the pesticide application and harvesting in order to allow time for the pesticide to degrade and for the crop to be safe to eat.

Pre-harvest intervals are given on the pesticide label as the number of days needed between the pesticide application and harvest. The length of the interval depends on the toxicity of the pesticide and its rate of degradation. Pre-harvest intervals are longer for pesticides of high toxicity or slow rates of degradation.

When a food crop is close to harvest, the pre-harvest interval must always be considered when deciding if a pesticide spray is to be applied. If the crop will be harvested within the pre-harvest interval, either the spray should not be applied, a non-toxic (biological) pesticide should be used, or harvesting of the crop must be delayed until the relevant numbers of days have elapsed after the pesticide application.

Re-entry intervals are also indicated on the product label. These give the number of days which must elapse before a treated field can be safely entered.

VI. PESTICIDE EVALUATION REPORT

This part of the PERSUAP, the PER (Pesticide Evaluation Report), addresses pesticide choices based upon environmental and human health issues, uses, alternate options, IPM, biodiversity, conservation, training, PPE options, monitoring and mitigation recommendations according to the twelve Regulation 216.3(b)(1) Pesticide Procedures Factors, outlined and analyzed below.

1. ANALYSIS OF PESTICIDE USES

This section analyses the requirements for pesticides as identified above, to provide a basis for the selection of pesticides for approval by the PERSUAP.

Table 5: Pesticide Uses Identified from Pest Management Plans

Broad-spectrum herbicide to kill all weeds,
Contact acaricide for control of spider-mite
Contact insecticide for control of aphids on vegetables
Contact insecticide for control of Grapevine Moth
Contact insecticide for control of locusts and Sunn Pest
Contact insecticide for control of Melon Fly
Dormant season treatment against shot hole in apricots & other stone fruit, fungal canker in all tree crops
Fungicide for prevention of anthracnose in grapes
Fungicide for prevention of Botrytis Rot in grapes
Fungicide for prevention of Botrytis Rot on grapes in cold storage
Insecticide for preventive control of aphids on fruit trees
Persistent IGR for control of Grapevine Moth
Persistent IGR for control of locusts in nymphal stage
Preventive treatment against powdery mildew on grapes
Seed treatment against bunt in cereals
Selective herbicide against broad-leaved weeds in cereals
Selective herbicide against grass weeds in broad-leaved crops.
Selective herbicide against wild oat in cereals (wheat)
Systemic fungicide for prevention of Botrytis Rot in grapes
Systemic fungicide for treatment of anthracnose in grapes
Systemic fungicide for treatment of Downy Mildew in vegetable nurseries
Systemic fungicide for treatment of Early Blight in potatoes
Systemic fungicide for treatment of Powdery Mildew in vegetables
Systemic fungicide for treatment of powdery mildew on grapes
Systemic insecticide for foliar application against aphids and sucking insects on

vegetables
Systemic insecticide for seed treatment against soil insects and aphids
Molluscicide for control of snails on vegetables

In addition, three further requirements for pesticides within the program were identified.

Table 6: Non-agricultural Uses of Pesticides

Rodenticides for control of rats in stores and warehouses
Microbicides for clinical use
Fumigants for control of pests of commodities in storage

2. Acute Toxicity Classification

In this section, reference is made to classification of acute toxicity. Two systems are referred to: the USEPA system and the WHO system. USEPA also requires that pesticides in categories I-III carry a signal word as in the table. The system used by USEPA is based on an evaluation of the formulated product. Therefore there may be more than one classification for an active ingredient depending on concentration and inert ingredients. In some cases there is no clear consensus between the various formulations containing a particular active ingredient. The system of WHO is based on the active ingredient alone.

Table 7: USEPA System of Classification of Acute Toxicity

Toxicity Categories	**Category I**	**Category II**	**Category III**	**Category IV**
Acute Oral	Up to and including 50 mg/kg	> 50 thru 500 mg/kg	> 500 thru 5000 mg/kg	> 5000 mg/kg
Acute Dermal	Up to and including 200 mg/kg	> 200 thru 2000 mg/kg	> 2000 thru 5000 mg/kg	> 5000 mg/kg
Acute Inhalation1	Up to and including 0.05 mg/liter	> 0.05 thru 0.5 mg/liter	> 0.5 thru 2 mg/liter	> 2 mg/liter
Primary Eye Irritation	Corrosive (irreversible destruction of ocular tissue) or corneal involvement or irritation persisting for more than 21 days	Corneal involvement or other eye irritation clearing in 8-21 days	Corneal involvement or other eye irritation clearing in 7 days or less	Minimal effects clearing in less than 24 hours
Primary	Corrosive (tissue	Severe irritation	Moderate	Mild or slight

Skin Irritation	destruction into the dermis and/or scarring)	at 72 hours (severe erythema or edema)	irritation at 72 hours (moderate erythema)	irritation at 72 hours (no irritation
Signal Word	DANGER	WARNING	CAUTION	None Required

Table 8: WHO Classification

WHO Toxicity Classification		**Rat LD_{50} (mg of chemical per kg of body weight)**			
Class	**Description**	**Solids (oral)**	**Liquids (oral)**	**Solids (dermal)**	**Liquids (dermal)**
Ia	Extremely hazardous	‹ 5	‹ 20	‹ 10	‹ 40
Ib	Highly hazardous	5-50	20-200	10-100	40-400
II	Moderately hazardous	50-500	200-2,000	100-1,000	400-4,000
III	Slightly hazardous	› 500	›2,000	›1000	› 4,000
U	Unlikely to present acute hazard in normal use	› 2,000	› 3,000	---	---
O	Not classified: believed obsolete				
F	Fumigants not classified by WHO				

3. FUNGICIDES

Thiram

a) USEPA's registration status of the requested pesticide

Thiram is a carbamate fungicide

EPA-PC No.:079801

There are 59 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Thiram has been selected as a seed treatment to prevent fungal diseases such as buntin wheat

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

The use of this pesticide is part of a Pesticide Management Plan for wheat as outlined in Section 3.

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

Thiram will be applied as a seed treatment in powder form or as a mixture with carboxin (Vitavax). Operators will wear gloves and dust masks. Thiram will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

Thiram is moderately toxic by ingestion, but it is highly toxic if inhaled. Acute exposure in humans may cause headaches, dizziness, fatigue, nausea, diarrhea and other gastrointestinal complaints. Thiram is irritating to the eyes, skin and respiratory tract. It is a skin sensitizer. Symptoms of acute inhalation exposure to thiram include itching, scratchy throat, hoarseness, sneezing, coughing, and inflammation of the nose or throat, bronchitis, dizziness, headaches, fatigue, nausea, diarrhea and other gastro-intestinal complaints. Persons with chronic respiratory or skin disease are at increased risk from exposure to thiram.

In addition to the symptoms of acute exposure, symptoms of chronic exposure to thiram in humans include drowsiness, confusion, and loss of sex drive, incoordination, slurred speech and weakness. Repeated or prolonged exposure to thiram can also cause allergic reactions such as dermatitis, watery eyes, sensitivity to light and conjunctivitis.

Thiram is toxic to fish but is not expected to bioconcentrate in aquatic organisms.

The application of thiram as a seed treatment, using appropriate methods and PPE will not expose operators to poisoning.

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

Thiram is used in Afghanistan by the FAO Seed Programme and is considered to be effective.

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

Thiram is non-toxic to bees. It toxic to fish, nearly immobile in clay soils and so seed treatment will not contaminate water.

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

Thiram will be used on rainfed and irrigated land, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the

country, being essentially Mediterranean in the north and sub-tropical in the south, subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographical regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Vitavax (a mixture of thiram and carboxin) and thiram powder are the only seed treatments against bunt available in Afghanistan. Seed treatment is the only preventive measure to protect wheat against bunt.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Sulfur

a) USEPA's registration status of the requested pesticide

Sulfur is a Inorganic fungicide

EPA-PC No.:077501

There are 258 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Sulphur has been selected as a preventive treatment against Powdery Mildew on grape-vines and cucurbits and as a post-harvest preservative for apricots..

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

The use of sulphur is part of Pest Management Plans for grapes and vegetables, as outlined in Section 3

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

Sulphur will be applied either as powder, using mechanical dusters, or as wettable sulphur by knapsack, foot or power sprayer. Sulphur will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

Sulfur is known to be of low toxicity, and poses very little if any risk to human and animal health. Short-term studies show that sulfur is of very low acute oral toxicity and does not irritate the skin (EPA Toxicity Category IV). Sulfur also is not a skin sensitizer. However, it can cause some eye irritation, dermal toxicity and inhalation hazards. Its use poses negligible risk to bystanders and no unacceptable risks to operators or other farm workers.

Chronic exposure to elemental sulfur at low levels is generally recognized as safe. Mine workers exposed to sulfur dioxide throughout their lives often had eye and respiratory disturbances, chronic bronchitis and chronic sinus effects. However, no known risks of oncogenic, teratogenic, or reproductive effects are associated with the use of sulfur. Also, sulfur has been shown to be non-mutagenic in microorganisms

Sulphur is considered to pose no hazard to non-target organisms.

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

Sulphur is effective as a preventive measure, if combined with other cultural measures, but in wet years may be insufficient.

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

This material has minimum impact on non-target organisms. Sulfur is considered non-toxic to birds and bees. In studies on ecological effects involving two fish species, daphnia, and mysid shrimp, sulfur has been shown to be practically non-toxic to the species tested.

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

Sulphur will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south, subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographical regions. USAIDwill always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Alternatives to sulphur as a preventive fungicide are synthetic fungicides.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Kresoxim-methyl

a) USEPA's registration status of the requested pesticide

Kresoxim-methyl is a strobin fungicide

EPA-PC No.: 129111

There are 6 products containing this active ingredient registered by USEPA.

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Kresoxim-methyl has been selected as a systemic insecticide for control of Powdery Mildew in grape-vines.

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

The use of kresoxim-methyl is part of a Disease Management Plan for grape-vines, as outlined in Section 3

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

Kresoxim-methyl will be applied by knapsack, foot or power sprayer. It is not currently available commercially in Afghanistan, but its introduction should be considered in order to provide a greater variety of fungicides. Agricultural retailers will offer PPE and suitable sprayers for sale. All retailers will receive training.

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

Kresoxim-methyl has a low acute mammalian toxicity (LD50>5000 mg/kg) and no unacceptable risk to operators and other workers has been identified.

It is moderately toxic to fish and other aquatic organisms.

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

Kresoxim-methyl is recommended for control of Powdery Mildew on grape-vines by UC Davis IPM programme.

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

Kresoxim-methyl has a low toxicity to birds and mammals and a moderate toxicity to fish. It is moderately toxic to bees but harmless to *Trichogramma*.

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

Kresoxim-methyl will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south, subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographical regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Cultural methods such as correct irrigation and canopy management are important cultural methods of preventing Powdery Mildew. Preventive treatment with sulphur is also valuable. However, in some conditions, infection may occur and the only remedy is the application of systemic fungicides. A variety of fungicides with different modes of action should be available to prevent resistance.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Azoxystrobin

a) USEPA's registration status of the requested pesticide

Azoxystrobin is a strobin fungicide

EPA-PC No.: 128810

There are 43 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Azoxystrobin has been selected as a systemic insecticide for control of Powdery Mildew in grape-vines.

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

The use of azoxystrobinis part of a Disease Management Plan for grape-vines, as outlined in Section 3

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

Azoxystrobin will be applied by knapsack, foot or power sprayers. Treatment will begin when shoots are 8 to 10 inches long. A wettable sulfur application at budbreak will be used first. Only one application per year will be recommended. Azoxystrobin will be alternated with fungicides with different modes of action to prevent resistance. It will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

Azoxystrobin was classified as Toxicity Category IV for acute oral toxicity and skin irritation (acute rat oral LD_{50}>5,000 mg/kg) and Category III for acute dermal, inhalation and eye irritation. Azoxystrobin was not a skin sensitizer in guinea pigs. The active ingredient was found to be a slight irritant in rabbits for both eyes and skin. There were no corneal effects.

No long term effects from chronic exposure to azoxystrobin have been observed in rats.

Azoxystrobin exhibited low ecological risks to birds, mammals and fish

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

Azoxystrobin is recommended for control of Powdery Mildew on grape-vines by UC Davis IPM programme.

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

Highly toxic to fish and invertebrates, practically non-toxic to birds and bees

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

Azoxystrobin will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south, subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographical regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

The incidence of Powdery Mildew can be reduced by the preventive use of sulphur, but if infection occurs, the use of a systemic fungicide is the only remedy. Fungicides with other modes of action, such as quinoxyfen, should be used in rotation to limit the development of resistance.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Quinoxyfen

a) USEPA's registration status of the requested pesticide

Quinoxyfen is a Quinoline fungicide

EPA-PC No.: 055459

There are 3products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Quinoxyfen has been selected as a systemic insecticide for control of Powdery Mildew in grape-vines

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

The use of quinoxyfenis part of a Disease Management Plan for grape-vines, as outlined in Section 3

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

Quinoxyfen will be applied by knapsack, foot or power sprayers. Treatment will begin when shoots are 8 to 10 inches long. A wettable sulfur application at budbreak will be used first. Only one application per year will be recommended. Quinoxyfen will be alternated with fungicides with different modes of action to prevent resistance. Quinoxyfen is not currently available commercially, but its introduction is recommended to increase the variety of fungicides available for this use. Agricultural retailers will offer PPE for sale. All retailers will receive training.

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

EPA Acute Toxicity is classed at III for Acute Oral and Acute Dermal exposure and at IV for

Acute inhalation, Primary eye irritation and Primary dermal irritation.The results from the chronic toxicity studies indicate a possible adverse health effect in the chronic dog study. A neurotoxicity study was not required.

Quinoxyfen is relatively non-toxic to rat, mallard and Bobwhite quail, but highly toxic to fish and extremely toxic to crustacean. It is relatively non-toxic to bees.

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

Quinoxyfen is recommended for control of Powdery Mildew on grape-vines by UC Davis IPM program

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

Quinoxyfen is relatively non-toxic to terrestrial wildlife, but highly toxic to freshwater fish and extremely toxic to aquatic invertebrates. However, toxic concentrations of Quinoxyfen are not expected to occur in aquatic environments due to its chemical properties and the proposed use pattern.

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

Quinoxyfen will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject, to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

The incidence of Powdery Mildew can be reduced by the preventive use of sulphur, but if infection occurs, the use of a systemic fungicide is the only remedy. Fungicides with other modes of action, such as azoxystrobin, should be used in rotation to limit the development of resistance.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Iprodione

a) USEPA's registration status of the requested pesticide

Iiprodione is a dicarboximide fungicide

EPA-PC No.:109801

There are 49 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Iprodione has been selected as a systemic insecticide for control of Powdery Mildew in grape-vines.

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

The use of iprodioneis part of a Disease Management Plan for grape-vines, as outlined in Section 3

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

Iprodione will be applied by knapsack, foot or power sprayers. Treatment will begin when shoots are 8 to 10 inches long. A wet able sulfur application at bud break will be used first. Only one application per year will be recommended. Iprodione will be alternated with fungicides with different modes of action to prevent resistance. It is not available commercially but should be introduced to increase the variety of fungicides available for this purpose. Agricultural retailers will offer PPE for sale. All retailers will receive training

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

Iprodione is a slightly toxic compound and carries the signal word CAUTION on the label.

Rats fed high doses of Iprodione (1,000 mg/kg) for a year and an half suffered no ill effects. Dogs fed even higher doses (2400 mg/kg) for the same period of time did not develop any adverse effects from the pesticide either (3). These results seem to contradict the results

found in other studies, therefore the risk of toxicity to humans from low level chronic exposure to the compound is impossible to evaluate.

Iprodione is only slightly toxic to wildfowl. Its LD50 in bobwhite quail is 930 mg/kg). Iprodione is moderately toxic to fish species, with LC50 values ranging from 2.25 mg/l in the sunfish to 6.7 mg/l in the rainbow trout. Iprodione is non-toxic to bees and thus should not pose a risk to them when used as directed.

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

Iprodione is recommended as an additional fungicide for the control of Powdery Mildew on grape-vines.

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

The use of iprodione in vineyards will not result in runoff into water bodies. Its use in rotation with other fungicides will not expose users to possible chronic effects.

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

Iprodione will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south, subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

The incidence of Powdery Mildew can be reduced by the preventive use of sulphur, but if infection occurs, the use of a systemic fungicide is the only remedy. Fungicides with other modes of action, such as quinoxyfen, should be used in rotation to limit the development of resistance.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into

effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Boscalid

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

Boscalid is an anilide fungicide

EPA-PC No. 128008

There are 9 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: No

b) *Basis for selection of the requested pesticide*

Boscalid has a broad spectrum of action against most fungal diseases affecting speciality crops. It is suitable for use in combination with other fungicides, and is formulated as Pristine, a mixture with pyraclostrobin. It is selected to provide an alternative to the strobins and other classes of fungicide.

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

The use of boscalid is part of a Disease management Plan for vegetables as outlined in Section 3.

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

Boscalid will be applied by knapsack sprayer in aqueous suspension. It will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

Boscalid is practically nontoxic to terrestrial animals and is moderately toxic to aquatic animals on an acute exposure basis.EPA Acute Toxicity is II & III, WHO Acute Toxicity Class: U. Mammalian LD_{50} is > 5000 mg/kg

EPA classified Boscalid (BAS 510 F) as, "suggestive evidence of carcinogenicity, but not sufficient to assess human carcinogenic potential", and, therefore, the quantification of human cancer risk is not recommended.

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

Boscalid, formulated as Pristine, is recommended by UC Davis for control of powdery mildew on vegetables and anthracnose on almonds.

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

Exposure to aquatic communities is expected to be limited due to the chemical's tendency to sorb to sediments. Boscalid is moderately toxic to aquatic animals; however based on estimated exposure concentrations, the proposed uses of boscalid are not likely to represent a threat to either acute or chronic ecological risk to freshwater fish and invertebrates.

Boscalid is categorized as practically nontoxic to birds n both an acute and sub acute exposure basis,

h) *Conditions under which the pesticide is to be used, including climate, flora, fauna, geography, hydrology and soils.*

Boscalid will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south, subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Prevention of fungal diseases depends on good management, especially sanitation and correct irrigation. However, fungicides are often a necessary measure to avoid serious loss.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Copper sulfate

a) USEPA's registration status of the requested pesticide

Copper sulfate is a Inorganic fungicide

EPA-PC No.008101

There are 73 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: No

b) Basis for selection of the requested pesticide

Copper sulphate has been selected to be used in Bordeaux Mixture as a preventive dormant season treatment against fungal diseases on fruit trees.

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

As outlined in Section 3, the use of Bordeaux Mixture is part of preventive Disease management Plans for stone and pome fruit. It may also be used preventatively on grape-vines.

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

Bordeaux mixture will be applied in aqueous solution as a dormant season treatment in orchards and vineyards by knapsack, foot or power sprayer.

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

Copper sulfate is only moderately toxic upon acute oral exposure. Vineyard sprayers experienced liver disease after 3 to 15 years of exposure to copper sulfate solution in Bordeaux Mixture. Chronic exposure to low levels of copper can lead to anemia.The biological or chemical manner by which excessive doses of copper sulfate work is not well understood.

Copper sulphate is very toxic to fish and toxic to aquatic invertebrates.

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

Bordeaux mixture has been used for many decades and in many countries for this purpose and is effective.

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

Dormant season spraying in February will cause minimum exposure of non-target organisms.

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

Bordeaux mixture will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south, subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

The alternative fungicides for the uses proposed are compounds with higher user hazard and eco-toxicity.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility ofMAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Copper hydroxide

a) USEPA's registration status of the requested pesticide

Copper hydroxide is an inorganic fungicide.

EPA 832401

Restricted Use Pesticide: no

There are 73 products containing this active ingredient registered by USEPA

b) Basis for selection of the requested pesticide

Copper hydroxide is recommended by UC Davis IPM program for the control of Downy Mildew on grapes.

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

The use of this pesticide is part of a Pesticide Management Plan for grapes as outlined in Section 3.

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

Copper hydroxide will be applied by knapsack sprayer either as a dilute or concentrate spray in combination with hydrated lime for the last 1 or 2 late-season applications following early-season application of another fungicide.

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

Copper hydroxide fungicide is considered moderately hazardous by WHO (WHO Acute Toxicity Class II) and slightly toxic by EPA (EPA Acute Toxicity Class III). Its mammalian LD_{50} is >489 mg/kg. It is a respiratory tract, skin and eye irritant. It is not carcinogenic, an acetyl cholinesterase inhibitor or neurotoxicity and does not cause reproductive or developmental abnormalities.

Copper hydroxide is moderately toxic to birds and highly toxic to fish, and aquatic invertebrates and algae. It is moderately toxic to honeybees and earthworms.

Operators will use PPE.

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

Copper hydroxide will complement the available range of fungicides and will help to prevent the development of resistance.

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

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

Copper hydroxide will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south, subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

The need for fungicides will be minimized by GAPs such as sanitation and canopy management. Other fungicides will also be used in rotation with Copper hydroxide.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Mancozeb

a) USEPA's registration status of the requested pesticide

Mancozeb is a dithiocarbamate + inorganic zinc fungicide

EPA-PC No.:014504

There are 65 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Mancozeb is recommended as a contact fungicide for Early Blight on potates and a range of fungal diseases of vegetables, including anthracnose, Botrytis Grey Mould, *Alternaria* and Downy Mildew.

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

The use of mancozeb is part of a Disease management Plan for vegetables as outlined in Section 3.

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

Mancozeb is widely available in Afghanistan as a wettable powder by itself, or as a mixture with metalazyl. It will be applied by knapsack sprayer in aqueous suspension. It will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

Mancozeb has a very low acute toxicity to mammals. No toxicological effects were observed in a long term study with rats fed doses of 5 mg/kg.

Mancozeb is comparable to another chemical, maneb, on which the following long-term studies have been conducted. A two-year feeding study on rats indicated that 6.25 mg/kg of maneb in the diet is the no observable effect level (NOEL) for rats. However, the next and highest level that was fed to rats in this two-year study did produce signs of poisoning. The ethylene bisdithiocarbamate pesticides (EBDCs), which include mancozeb, are generally considered to have low short-term mammalian toxicity. A major toxicological concern, however, is ethylenethiourea (ETU), an industrial contaminant and a breakdown product of mancozeb and other EBDC pesticides. In addition to having the potential to cause goiter, a condition in which the thyroid gland is enlarged, this metabolite has produced birth defects and cancer in experimental animals. ETU has been classified as a probable human carcinogen by the EPA. ETU can be produced when EBDCs are used on stored produce, and also when fruit or vegetables with residues of these fungicides are cooked

Mancozeb is slightly acutely toxic to birds and generally toxic to fish. It is highly poisonous to warm water fish and at least moderately toxic to coldwater fish. The EPA is currently reviewing data on the potential toxic effects of mancozeb on aquatic organisms

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

Mancozeb is widely used as a fungicide

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

Mancozeb is harmful to wildlife. It is slightly toxic to birds and generally toxic to fish but not hazardous to honey bees.

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

Mancozeb will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south, subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in

the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Prevention of fungal diseases depends on good management, especially sanitation and correct irrigation. However, fungicides are often a necessary measure to avoid serious loss.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Metalaxyl

a) USEPA's registration status of the requested pesticide

Metalaxyl is a phenylamide fungicide

EPA-PC No.: 113501

There are 97products containing this active ingredient registered by USEPA

Restricted Use Pesticide:

b) Basis for selection of the requested pesticide

Metalaxyl is a systemic, benzenoid fungicide used in mixtures as a foliar spray for tropical and subtropical crops, as a soil treatment for control of soil-borne pathogens, and as a seed treatment to control downy mildews. Treatment of seedlings in nurseries is important in preventing a range of soil-borne diseases. It is marketed in Afghanistan in a mixture with Mancozeb.

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

The use of Mancozeb/ metalaxyl mixture is part of a Disease management Plan for vegetables as outlined in Section 3.

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

Mancozeb/metalaxyl is available from agricultural retailers as a mixture, formulated as a wet able powder. It will be applied in aqueous suspension by knapsack sprayer. All users under USAID projects will receive training in safe and effective pesticide application.

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

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

Metalaxyl is widely used as fungicide against soil-borne pathogens

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

Metalaxyl is practically non-toxic to birds and freshwater fish. It is non-toxic to honeybees. The EPA has indicated that metalaxyl poses little threat to aquatic or terrestrial endangered species, whether plant or animal.

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

Mancozeb/metalaxyl mixture will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south, subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographical regions .USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

The use of synthetic fungicides is one of a number of methods, including soil sterilization and the choice of resistant varieties, of preventing soil-borne diseases of vegetables.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide program of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Tebuconazole

a) USEPA's registration status of the requested pesticide

Tebuconazole is a Azole fungicide

EPA-PC No.: 128997

There are 152 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Tebuconazole has been selected as a systemic insecticide for control of Powdery Mildew in grape-vines.

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

The use of Tebuconazole is part of a Disease Management Plan for grape-vines, as outlined in Section 3

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

Tebuconazole will be applied by knapsack, foot or power sprayers. Only one application per year will be recommended. It is not currently available commercially in Afghanistan, but its introduction should be considered in order to provide a greater variety of fungicides. Agricultural retailers will offer PPE and suitable sprayers for sale. All retailers will receive training.

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

Tebuconazole has moderate acute toxicity to mammals (LD_{50} = 1700), classified by WHO as III and EPA as II or III depending on formulation.

Slightly toxic to birds and moderately toxic to fish and freshwater invertebrates

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

Tebuconazole is recommended for control of Powdery Mildew on grape-vines by UC Davis IPM programme.

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

Tebuconazole is moderately toxic to mammals, birds, fish and honeybees.

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

Tebuconazole will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south, subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Cultural methods such as correct irrigation and canopy management are important methods of preventing Powdery Mildew. Preventive treatment with sulphur is also valuable. However, in

some conditions, infection may occur and the only remedy is the application of systemic fungicides. A variety of fungicides with different modes of action should be available to prevent resistance.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Carboxin

a) USEPA's registration status of the requested pesticide

Carboxin is a carboxamide fungicide

EPA-PC No.: 090201

There are 32 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Carboxin has been selected as a seed treatment in a mixture with thiram (Vitavax).

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

The use of carboxin, formulated in Vitavax, is part of a Disease Management Plan for wheat as outlined in Section 3

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

Carboxin will be applied to seed before sowing. Operators will wear gloves and dust masks. Vitavax will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

Carboxin is a slightly toxic compound. Symptoms of acute poisoning can include vomiting and headache. Recovery is very rapid if the exposed individual is treated quickly.

A 28-day study with rats fed doses up to 311 mg/kg showed some fluid accumulation in the liver even at low doses. Another rat study showed kidney changes at somewhat higher doses (1,000 mg/kg) fed for 90 days. A two-year rat study with levels of up to 30 mg/kg produced no compound-related effects in terms of physical appearance, behavior, blood chemistry, or urinalysis.

Carboxin is highly toxic to fish. It is practically non-toxic to freshwater invertebrates and non-toxic to bees.

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

Vitavax is widely used as a seed treatment against Karnal Bunt, Common Bunt, Dwarf Bunt and Black Point.

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

Carboxin has a very low toxicity to birds, but is highly toxic to fish. It is non-toxic to bees. Its use as a seed treatment is unlikely to pose a threat to the environment.

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

Vitavax will be used on rainfed and irrigated land, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in

the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Vitavax (a mixture of thiram and carboxin) and thiram powder are the only seed treatments against bunt available in Afghanistan. Seed treatment is the only preventive measure to protect wheat against bunt.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide program of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Copper oxychloride

a) USEPA's registration status of the requested pesticide

Copper oxychloride is a inorganic copper fungicide

EPA-PC No.: 023501

There are 25 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Copper oxychloride has been selected as a fungicide for prevention of anthracnose in grapes

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

The use of Copper oxychloride is part of a Disease Management Plan for grapes, as outlined in Section 3

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

Copper oxychloride is available commercially in Afghanistan as a 50% WP. It will applied in aqueous suspension by knapsack sprayer. Suitable sprayers and PPE are available from agricultural retailers.

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

Copper oxychloride has moderate acute mammalian toxicity (EPA Acute ToxicityI, II, III).

It is toxic to bees and birds and moderately toxic to fish

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

Copper oxychloride has been recommended for prevention of anthracnose on grapes in Afghanistan.

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

Copper oxychloride has low toxicity to mammals and moderate toxicity to birds and fish.

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

Copper oxychloride will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Cultural methods, including field sanitation, are important in preventing anthracnose in grapes, but, where there is a history of infection, the preventive use of fungicides is necessary.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

4. HERBICIDES

Bromoxynil

a) USEPA's registration status of the requested pesticide

Bromoxynil is a Hydroxybenzonitrile herbicide

EPA-PC No.: 035303

There is one product containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Bromoxymil has been chosen as a selective post-emergence herbicide against broad-leaved weeds as an alternative to 2, 4-D.

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

The use of bromoxynil is part of a Weed Management Plan for wheat, as outlined in Section 3.

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

Bromoxynil will be applied by knapsack sprayer, or boom-and-nozzle tractor-drawn sprayer. 2,4-D will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

Bromoxynil is a moderately toxic compound and carries the signal word WARNING on the label (EPA II.WHO II)

Dogs fed bromoxynil for 90 days at low doses showed unspecified adverse effects at and above 5 mg/kg. In one documented case of chronic exposure of humans, workers showed symptoms of weight loss, fever, vomiting, headache and urinary problems (3). Chronic exposure for these four individuals had lasted for about one year.

Bromoxynil is highly toxic to pheasants (LC50 of 50 mg/kg) and is moderately toxic to quail (LC50 of 100 mg/kg), and mallard ducks (LC50 of 200 mg/kg) (2). The compound is very highly toxic to moderately toxic to freshwater fish

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

Bromoxymil is recommended by UC Davis IPM programme for post-emergent control of broad-leaved weeds in small grains

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

Bromoxynil is not toxic to bees. It is is highly toxic to pheasants and moderately toxic to some other birds. It very highly toxic to moderately toxic to freshwater fish, In sandy soil, the half-life of bromoxynil is about ten days. During that time it is broken down to less toxic compounds. Degradation in clay was slower, with half of the bromoxynil degraded to its metabolites in about a two week period at 25 degrees C.

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

Bromoxynil will be used on irrigated and rainfed cereal crops. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean

in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions . USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Mechanical or hand weeding is an alternative to the use of herbicides. 2, 4-D is an alternative herbicide for use against broad-leaved weeds in cereals.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Glyphosate

a) USEPA's registration status of the requested pesticide

Glyphosate is a Phosphonoglycine herbicide

EPA-PC No.: 417300

There are 94 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Glyphosate has been selected as a broad spectrum herbicide to be used as a preparatory treatment on heavily infested fallow fields and also as part of a zero-tillage regime.

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

The use of glyphosate is part of a Weed Management Plan and Zero-Tillage Cultivation for cereals and oilseeds as outlined in Section 3.

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

Glyphosate will be applied by knapsack sprayer, or boom-and-nozzle tractor-drawn sprayer. 2, 4-D will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

Glyphosate is a moderately toxic herbicide and carries the signal word WARNING on the label. Even though the LD50 values show the compound to be relatively non-toxic it can cause significant eye irritation (EPA II, III.WHO U). There are no known chronic toxic effects.

Glyphosate is only slightly toxic to wild birds. Glyphosate is practically non-toxic to fish. However, an additive used in the Roundup formulation (modified tallow amine used as a surfactant) is apparently more toxic to fish than many common surfactants.

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

Glyphosate is very widely used as a broad-spectrum herbicide and known to be effective. Its use on IDEA-NEW training sites has given good results. It is recommended for application on fallow for control of weeds in small grains.

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

Glyphosate is only slightly toxic to wild birds. Glyphosate is practically non-toxic to fish. Glyphosate is highly adsorbed on most soils and is so strongly attracted to the soil that little is expected to leach from the applied area. Microbes are primarily responsible for the breakdown of the product. Because glyphosate is so tightly bound to the soil, little is transferred by rain or irrigation water

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

Glyphosate will be used on irrigated and rainfed cereal crops and as part of zero-tillage cultivation. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions .USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Pre-cultivation to kill weeds mechanically is alternative to the use of glyphosate. For zero-tillage cultivation, there is no available alternative.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Dicamba

a) USEPA's registration status of the requested pesticide

Dicamba is a benzoic acid herbicide

EPA-PC No.: 029801

There are 1036 products containing this active ingredient registered by USEPA

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

The use of dicamba is part of a Weed Management Plan for wheat, as outlined in Section 3.

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

Dicamba will be applied by knapsack sprayer, or boom-and-nozzle tractor-drawn sprayer. Dicamba will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

Dicamba is moderately toxic by ingestion and slightly toxic by inhalation or dermal exposure. Symptoms of poisoning with dicamba include loss of appetite (anorexia), vomiting, muscle weakness, slowed heart rate, shortness of breath, central nervous system effects (victim may become excited or depressed), benzoic acid in the urine, incontinence, cyanosis (bluing of the skin and gums), and exhaustion following repeated muscle spasms. In addition to these symptoms, inhalation can cause irritation of the linings of the nasal passages and the lungs, and loss of voice. Most individuals who have survived severe poisoning from dicamba have recovered within 2 to 3 days with no permanent effects.

Dicamba is very irritating and corrosive and can cause severe and permanent damage to the eyes. Running water should be flushed through the eyes for at least 15 minutes if any dicamba is splashed into them. The eyelids may swell and the cornea may be cloudy for a week after dicamba is splashed in the eyes.

In some individuals, dicamba is a skin sensitizer. It may cause skin burns. There is no evidence that dicamba is absorbed into the body through the skin

Dicamba is only slightly toxic to birds. The LD50 for technical dicamba in mallard ducks is 2,009 mg/kg. The 8-day dietary LC50 in mallards and in bobwhite quail is greater than 10,000 ppm. Dicamba is not toxic to bees. Dicamba is of low toxicity to fish.

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

Dicamba is widely used as a pre- and post-emergence selective herbicide against annual broad-leaved weeds in cereal crops.

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

When used according to the instructions, dicamba poses little threat to wildlife.

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

Dicamba will be used on irrigated and rainfed cereal crops. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographical regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Mechanical or hand weeding is an alternative to the use of herbicides. Dicamba is an alternative herbicide for use against broad-leaved weeds in cereals.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Clethodim

a) USEPA's registration status of the requested pesticide

Clethodim is a Cyclohexenone herbicide

EPA-PC No.: 121011

There are 58 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Clethodim has been chosen as a selective post-emergence herbicide against grass weeds in broad-leaved crops.

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

The use of clethodim is part of a Weed Management Plan for oilseeds and pulses as outlined in Section 3.

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

Clethodim will be applied by knapsack sprayer, or boom-and-nozzle tractor-drawn sprayer. It will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

Clethodim is moderately toxic by ingestion (EPA II, III.WHO none). The effects of acute exposure may include eye or skin irritation or central nervous system effects, e.g., salivation, decreased motor activity, un-coordination, unsteady gait and hyperactivity. These latter effects may be in large measure due to the aromatic constituents of the formulation, as they commonly occur upon exposure to such compounds

In a one-year feeding study of dogs, doses of 75 mg/kg/day resulted in increased relative and absolute liver weights, with anemia-like alterations in blood chemistry such as reduced hemoglobin, erythrocyte and hematocrit counts.

Clethodim is practically non-toxic to honeybees and birds. It is slightly toxic to fish and aquatic invertebrate species.

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

Clethodim is recommended for post-emergence control of grass weeds in broad-leaved crops by UC Davis IPM program.

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

EPA has stated that "available...wildlife data indicate that the proposed uses on cotton and soybeans will result in minimal hazard to nontarget and endangered beneficial insect, avian and freshwater fish and mammalian species". Clethodim is of low persistence in most soils with a reported half-life of approximately three days.

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

Clethodim will be used on irrigated and rain-fed annual. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Mechanical or hand weeding is an alternative to the use of herbicides.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide program of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Fenoxaprop-p-ethyl

a) USEPA's registration status of the requested pesticide

Fenoxa-prop-p-ethyl is a prop-ionic acid herbicide

EPA-PC No.: 129092

There are 15 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Fenoxaprop-p-ethyl has been chosen as a selective post-emergence herbicide against broad-leaved weeds in wheat.

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

The use of fenoxaprop-p-ethyl is part of a Weed Management Plan for wheat as outlined in Section 3.

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

Fenoxaprop-p-ethyl will be applied on irrigated and rainfed wheat post-emergence from the two-leaf stage. Application will be by knapsack or boom-and-nozzle sprayer. It will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

EPA Acute Toxicity Class II, III. WHO Acute Toxicity Class: none.

Mammalian LD_{50}=3150 mg/kg. There are no known chronic toxicity problems.

Fenoxaprop-p-ethyl is toxic to bees, non-toxic to birds and moderately toxic to fish.

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

Fenoxaprop-p-ethyl is recommended by UC Davis IPM program for post-emergent control of broad-leaved weeds in small grains

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

Fenoxaprop-p-ethyl is toxic to bees, non-toxic to birds and moderately toxic to fish.

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

Fenoxaprop-p-ethyl will be used on irrigated and rainfed land. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographical regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Mechanical or hand weeding is an alternative to the use of herbicides. An alternative herbicide for this use is 2, 4-D. It is desirable to rotate herbicide types to prevent resistance.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Sethoxydim

a) USEPA's registration status of the requested pesticide

Sethoxydim is a cyclohexadione herbicide.

EPA-PC No.: 121001

There are 20 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Sethoxydim has been chosen as a selective post-emergence herbicide against grass weeds in broad-leaved crops.

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

The use of sethoxydim is part of a Weed Management Plan for oilseeds and pulses as outlined in Section 3.

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

Sethoxydim will be applied by knapsack sprayer, or boom-and-nozzle tractor-drawn sprayer as a selective post-emergence herbicide against grass weeds in broad-leaved crops.. It will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

Sethoxydim is moderately toxic by ingestion, and not toxic by dermal absorption.(EPA III. WHO III) It causes skin and eye irritation. Inhalation of dusts or vapors can cause irritation of the throat and nose. Other symptoms of poisoning include uncoordination, sedation, tears, salivation, tremors; blood in the urine and diarrhea.Long-term contact with sethoxydim can cause redness and swelling of the eyes or skin

Sethoxydim is moderately toxic to trout and weakly toxic to carp

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

Sethoxydim is recommended for post-emergence control of grass weeds in broad-leaved crops by UC Davis IPM programme.

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

Sethoxydim is non-toxic to bees and of low toxicity to birds. It is moderately toxic to trout and weakly toxic to carp. Sethoxydim has low toxicity to wildlife.

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

Sethoxydim will be used on irrigated and rain-fed land. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in

the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographical regions .USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Mechanical or hand weeding is an alternative to the use of herbicides.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

2, 4-D

a) USEPA's registration status of the requested pesticide

2, 4-D is a chlorophenoxy acid herbicide

EPA-PC No.:030001

There are 906 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

2,4-D has been chosen as a selective herbicide against broad-leaved weeds of cereal crops.

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

The use of 2,4-D is part of a Weed Management Plan for wheat as outlined in Section 3.

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

2,4-D will be applied by knapsack sprayer, or boom-and-nozzle tractor-drawn sprayer. 2,4-D will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

While the LD50 of 2, 4-D suggests that it is only moderately toxic (EPA III. WHO II), the product carries the DANGER signal word on the label indicating that it is highly toxic. This is because 2,4-D has produced serious eye and skin irritation among agricultural workers. In humans, prolonged breathing of 2, 4-D causes coughing, burning, dizziness, and temporary loss of muscle coordination. Symptoms of poisoning can be fatigue and weakness with perhaps nausea. On rare occasions there can be inflammation of the nerve endings with muscular effects following high levels of exposure.

Rats given moderate amounts (50 mg/kg) of 2,4-D in the diet for two years had no adverse effects. Some dogs fed lower amounts of the compound in their food for two years died, probably because dogs do not excrete organic acids efficiently. A human given a total of 16.3 grams in 32 days as "desperation therapy" lapsed into a stupor, showed signs of un-coordination, weak reflexes, and urinary incontinence.

2, 4-D is slightly toxic to birds. Some formulations are highly toxic to fish while others are less so.

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

2,4-D has been used on training sites by IDEA-NEW for several years and given good results resulting in significant measurable increases in yields. It is recommended by UC Davis for post-emergent control of broad-leaved weeds in small grains.

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

2, 4-D is slightly toxic to birds. Some formulations are highly toxic to fish while others are less so. It is readily broken down in soil and aquatic habitats.

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

2,4-D will be used as a selective post-emergence herbicide against broad-leaved weeds on irrigated and rainfed cereal crops. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions . USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Mechanical weeding is an alternative to the use of herbicides. Bromoxynil is an alternative herbicide for use against broad-leaved weeds in cereals.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

5. INSECTICIDES/ACARICIDES

Spinosad

a) USEPA's registration status of the requested pesticide

Spinosad is a microbial insecticide/acaricide

EPA-PC No.: 110003

There are 76 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Spinosad is a relatively new, low toxicity, microbial derived insecticide. Spinosad has a broad-spectrum of activity against many vegetable pests including; the Colorado Beetle, diamondback moth, cabbage looper, corn earworm, hornworms, thrips, and leafminers. It has been used in Turkmenistan against Melon Fly.

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

The use of spinosad is part of a Pest Management Plan for potatoes and other vegetables as outlined in Section 3. It could also become part of IPM for melons if further research is carried out.

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

Spinosad will be applied by knapsack sprayer. Spinosad is not yet commercially available in Afghanistan, but if it is introduced by projects and a demand developes, it is expected that importers will supply it. Retailers will offer PPE for sale and will receive training.

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

EPA Acute Toxicity: III. WHO Acute Toxicity Class: U. No chronic toxicity reported.

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

Spinosad is highly effective against a wide range of pests. It has a novel mode of action helps prevent cross-resistance with organophosphates and carbamates.

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

Spinosad is listed by the Organic Materials Review Institute (OMRI) as acceptable for use during organic farming and gardening and any use where toxic chemicals are to be avoided. Spinosad loses its toxicity after 8 to 24 hours. It is toxic to bees when wet, but relatively safe for them once it dries. Therefore, it should be used when pollinators are not actively foraging.

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

Spinosad will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Spinosad is an alternative to other quick knock-down contact insecticides such as the pyrethroids and organo-phosphates. The alternatives to its use for the control of Colorado Beetle are the systemic imidacloprid, lambda-cyhalothrin and hand-picking.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

***Bacillus thuringiensis* (Bt)**

a) USEPA's registration status of the requested pesticide

Bacillus thuringiensis is a microbial insecticide/acaricide

EPA-PC No.: 006518

There are 54 products containing Bt registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Strains of Bt have been developed for a wide range of insect pests. Its low toxicity and environmental impact make it a desirable alternative to synthetic insecticides on vegetables, especially in greenhouses or on household plots. It is recommended for introduction on an experimental basis.

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

The use of Bt has the potential to enhance IPM for vegetables and other crops if research can be carried out in Afghanistan on its effectiveness and suitability for local conditions.

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

Bt will be applied by knapsack or hand sprayer as an aqueous suspension. Operators will wear goggles, gloves, masks and long-sleeved garments. BT will be introduced on an experimental basis and PPE will be provided by projects.

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

BT is Not Acutely Toxic (EPA III.WHO U).Data are not available from work-related exposures, accidental poisonings, or other human studies regarding the reproductive and developmental toxicity of B.t. Eighteen human volunteers ingested a Bt pesticide daily for 5 days. Five of the volunteers also inhaled the pesticide for 5 days. Scientists did not detect any adverse effects in the volunteers

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

Bt is widely recommended and used by organic growers as an acceptable and effective alternative to synthetic insecticides, especially against Lepidoptera. There are also strains effective against Colorado Beetle.

g) Compatibility of the proposed pesticide with target and non-targetecosystems.

Bt is a naturally-occurring soil bacterium that produces poisons which cause disease in insects. A number of insecticides are based on these toxins. Bt is considered ideal for pest management because of its specificity to pests and because of its lack of toxicity to humans

or the natural enemies of many crop pests. Bt has not been reported as having harmful effects in fish. Normal exposure rates do not cause harm to honey bees. Bt is, however, dangerous to all Lepidoptera and care must be taken to avoid habitats of rare or endangered butterflies.

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

Bt will be used in greenhouses, on vegetable plots and on grape-vines in irrigated cultivations, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Bt is an alternative to synthetic insecticides and complements other, non-chemical, methods of control.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide program of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Beauvaria bassiana

a) USEPA's registration status of the requested pesticide

Beauvaria bassiana is a microbial insecticide.

EPA-PC No.: 128815

Registered conditionally under FIFRA section 3(c)7

b) Basis for selection of the requested pesticide

Beauvaria bassiana has been developed by the University of Vermont, in collaboration with ICARDA, for control of the Sunn Pest *Eurygaster integricep*s.

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

The use of *B. bassiana* has the potential to enhance IPM for potatoes if research can be carried out in Afghanistan on its effectiveness and suitability for local conditions. It may also be valuable for preventive control of Sunn Pest.

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

B. bassiana will be applied as an emulsifiable suspension (ES) in water by knapsack sprayer. Operators will wear goggles, gloves and long-sleeved garments.

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

EPA found that the acute oral toxicity of four strains of *B. bassiana* to be category IV.

See g) below for details of ecotoxicology

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

The effectiveness of B. bassiana against *E. integriceps* has been proven by Univ. of Vermont. Further trials are needed to determine its effectiveness against *Dolycoris pennicillatus*.

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

B. Bassiana is a naturally occurring fungus which is pathogenic to insects. EPA factsheet states that tests show that the fungus is not toxic to mammals, birds or plants. There is a potential for the pesticide products to harm bees, so the products must not be applied near beehives or where bees are actively hunting for food. If the pesticide products are used as labeled, no harmful environmental effects are expected..

h) Conditions under which the pesticide is to be used, including climate, flora, fauna, geography, hydrology andsoils.

B. bassianae will be applied to overwintering Sunn Pest populations above 2000m altitude in the subalpine zone. No damage to this sensitive habitat will be caused by this product. It will also be applied on potatoes in irrigated cultivation.

The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes.

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

B. Bassiana will be an environmentally benign alternative to the use of synthetic insecticides for the control of Sunn Pest and Colorado Beetle. Mechanical control of overwintering Sunn Pest in the mountains involves the destruction of fragile plant communities.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide program of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Azadirachtin (Neem oil)

a) USEPA's registration status of the requested pesticide

Azadirachtin (Neem oil) is a Botanical insecticide/acaricide

EPA-PC No.: 121701

There are 42 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Azadirachtin is a natural plant extract used as an insecticide and feeding deterrent against insects. Its low vertebrate toxicity and low impact on non-target species, especially beneficial insects, make it a desirable alternative to synthetic insecticides on vegetables, especially in greenhouses or on household plots.

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

As outlined in Section 3, the use of azadirachtin as a feeding deterrent and mild insecticide has the possibility of enhancing the IPM for vegetables by reducing the need for synthetic insecticides.

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

Azadirachtin will be applied as an emulsion of neem oil by knapsack sprayer. Although it is of low toxicity, normal standards of pesticide application safety will be adhered to. PPE is available for sale through agricultural retailers.

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 acute oral toxicity in rats fed technical grade azadirachtin ranged from greater than 3,540 mg/kg to greater than 5,000 mg/kg, the highest dose tested when administered undiluted to albino rats. (EPA III. WHO none)

A 90-day oral toxicity study in rats fed levels of 500, 2500, and 10,000 ppm of azadirachtin showed no signs of overt systemic toxicity at any dose level after 90 days of feeding. Mean body weight was significantly decreased in the 10,000 ppm males and females at weeks 3 and 4, respectively. This persisted for the duration of the 90-day feeding period

Azadirachtin is relatively harmless to spiders, butterflies, and insects such as bees that pollinate crops and trees, ladybugs that consume aphids and wasps that act as parasites on various crop pests. This is because neem products must be ingested to be effective.No significant effects on other wildlife were reported

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

Azadirachtin is widely recommended and used by organic growers as an acceptable alternative to synthetic insecticides.

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

When used as directed on product labels, neither clarified hydrophobic extract of neem neither oil nor azadirachtin are expected to harm non-target organisms. The substances are found in the environment, where they degrade naturally. However, product labels direct users not to apply the products directly to water, not to contaminate water during cleaning or disposal activities, and not to apply when honeybees are actively foraging. (EPA Fact Sheet)

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

Azadirachtin will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content.

The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions.

USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Azadirachtin is one of a number of plant extracts, including chilli, garlic and assafoetida, traditionally used as feeding deterrents against insects as alternatives to synthetic insecticides.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide program of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Carbaryl

a) USEPA's registration status of the requested pesticide

Carbaryl is a Carbamate insecticide/acaricide

EPA-PC No.: 056801

There are 479 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Carbaryl is recommended by UC Davis IPM programme for control of cutworms.

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

Carbaryl is part of a Pest Management Plan for vegetables as outlined in Section 3.

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

Carbaryl will be used in powdered bait (5%) against cutworms. It will be sprinkled on the ground around the stems of the plants. It will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

Carbaryl is moderately to very toxic, and is labeled with a WARNING signal word. (EPA III. WHO II). It can produce adverse effects in humans by skin contact, inhalation or ingestion. The symptoms of acute toxicity are typical of the other carbonates. Direct contact of the skin or eyes with moderate levels of this pesticide can cause burns. Inhalation or ingestion of very large amounts can be toxic to the nervous and respiratory systems resulting in nausea,

stomach cramps diarrhea and excessive salivation. Other symptoms at high doses include sweating, blurring of vision, un-coordination, and convulsions

Although it may cause minor skin and eye irritation, carbonyl does not appear to be a significant chronic health risk at or below occupational levels

Carbaryl is lethal to many non-target insects. It is also moderately toxic to wild bird species

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

Carbaryl has been used for this purpose for many years and its effectiveness is well established.

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

Carbaryl is lethal to many non target insects. The pesticide is more active in insects than in mammals. The destruction of honeybee populations in sprayed areas is sometimes a problem. Carbaryl is moderately toxic to aquatic organisms, such as rainbow and lake trout, bluegill, and cutthroat. It is also moderately toxic to wild bird species. Carbaryl has a short residual life on treated crops. Insecticidal properties are retained for 3-10 days. Its use as bait against cutworms will not pose a threat to non-target species.

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

Carbaryl will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Cutworms are difficult pests to control and traditional methods include the use of deterrents such as ash, garlic extract and asafetida. Mechanical protection of stems with silver paper can be used in very small household plots but is prohibitively labor intensive for commercial growers.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Deltamethrin

a) USEPA's registration status of the requested pesticide

Deltamethrin is a parathyroid insecticide/acaricide

EPA-PC No.: 097805

There are 261 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: some

b) Basis for selection of the requested pesticide

Deltamethrin has been the preferred insecticide for locust control in Afghanistan and other countries for many years and has been used for this purpose by FAO. It has also been used against Sunn Pest and Melon Fly.

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

Deltamethrin will be mainly used for the emergency control of migratory pests such as locusts and Sunn Pest, as outlined in Section 3.

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

Deltamethrin will be applied in a 1.25% formulation by ULV or as an EC formulation by backpack sprayers. ULV application will take place under the supervision of PPQD staff, with applicators and PPE provided. Knapsack sprayers and PPE are available through project supported agricultural retailers.

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

EPA Acute Toxicity: II, III. WHO, Acute Toxicity Class: II.

Deltamethrin produces typical type II motor symptoms in mammals: a writhing syndrome in rodents, as well as copious salivation.

Acute exposure effects in humans include the following: ataxia, convulsions leading to muscle fibrillation and paralysis, dermatitis, edema, diarrhea, dyspnea, headache, hepatic microsomal enzyme induction, irritability, peripheral vascular collapse, rhinorrhea, serum alkaline phosphatase elevation, tinnitus, tremors, vomiting and death due to respiratory failure. Allergic reactions have included the following effects: anaphylaxis, bronchospasm, eosinophilia, fever, hypersensitivity pneumonia, pallor, pollinosis, sweating, sudden swelling of the face, eyelids, lips and mucous membranes, and tachycardia.

Studies have shown many cases of dermal deltamethrin poisoning after agricultural use with inadequate handling precautions, and many cases of accidental or suicidal poisoning by mouth at doses estimated to be 2- 250 mg/kg. Oral ingestion caused epigastric pain, nausea, vomiting and coarse muscular fasciculation. With doses of 100-250 mg/kg, coma was caused within 15-20 minutes.

Suspected chronic exposure effects in humans include the following: choreoathetosis, hypotension, prenatal damage and shock. Workers exposed to deltamethrin during its manufacture over 7-8 years experienced transient cutaneous and mucous membrane irritation, which could be prevented by use of gloves and face masks. No other ill effects were seen.

Deltamethrin is considered toxic to bees and is very toxic over long periods to the predatory mite *Typhodromum pyri*. It has a high toxicity to fish under laboratory conditions, but in field conditions under normal conditions of use, fish are not harmed

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

Deltamethrin has been extensively trialed against locusts and is used by MAIL in its control campaign. It has been used successfully against Sunn Pest in Afghanistan. Trials against Melon Fly in Afghanistan showed that, correctly applied, it could achieve effective control.

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

Deltamethrin is considered toxic to bees and is very toxic over long periods to the predatory mite *Typhodromum pyri*. It has a high toxicity to fish under laboratory conditions, but in field conditions under normal conditions of use, fish are not harmed.

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

Deltamethrin will be used on rainfed land, with little or no run-off into natural waterways. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Deltamethrin is a non-persisent; quick knock-down insecticide, which is a preferred alternative to the more toxic organo-phosphates such as chlorpyriphos. It is more powerful than cypermethrin and so is appropriate where there is less danger to non-target organisms, such as in locust control, or when cypermethrin is ineffective.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Cypermethrin

a) USEPA's registration status of the requested pesticide

Cypermethrin is a pyrethroid insecticide

EPA-PC No.: 109704

Cypermethrin was reregistered by EPA in 2012

Restricted Use Pesticide: some

b) Basis for selection of the requested pesticide

Cypermethrin has been selected as a non-persistent, quick knock-down insecticide for use against a range of pests when crop monitoring indicates damagingly high pest levels.

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

As outlined in Section 3, a number of crops may require the application of a quick knock-down insecticide should monitoring indicate dangerous levels of pest infestation.

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

Cypermethrin will be applied by knapsack sprayer in aqueous emulsion. It will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

EPA II, WHO II LD50 287 mg/kg

EPA registration review finds that cypermethrin is a moderately toxic material by dermal absorption or ingestion. It may cause irritation to the skin and eyes. Symptoms of dermal exposure include numbness, tingling, and itching, burning sensation, loss of bladder control, in coordination, seizures and possible death. Pyrethroids may adversely affect the central nervous system. Human volunteers given dermal doses of 130ug/cm^2 on the earlobe experienced local tingling and burning sensations. One man died after eating a meal cooked in a 10% cypermethrin concentrate that was mistakenly used for cooking oil. Shortly after the meal, the victim experienced nausea, prolonged vomiting, stomach pains, and diarrhea which progressed to convulsions, unconsciousness and coma. Other family members exhibited milder symptoms and survived after hospital treatment.

Cypermethrin exposure can present acute toxic risk to earthworms and to beneficial non-target insects, such as honey bees. For birds, all acute (dose-based and dietary-based) RQs are below the acute risk LOC (0.5) and the endangered species LOC (0.1) for all crop uses; chronic RQs are also below the LOC (1). EPS' screening level ecological risk assessment for endangered species results in the determination that cypermethrin will have no direct acute or chronic effect on threatened and endangered birds. It should not be used where there is danger of runoff into waterways.

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

Cypermethrin is used on a wide range of crops as a non-persistent insecticide.

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

Alpha Cypermethrin is practically non-toxic to birds but extremely toxic to fish and aquatic invertebrates. As a broad spectrum insecticide is harmful to many beneficial insects, but breaks down rapidly in the environment. It readily adheres to clay particles and so does not tend to run off into waterways.

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

Cypermethrin will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Cypermethrin is a non-persistent, quick knock-down insecticide, which is a preferred alternative to the more toxic organo-phosphates such as chlorpyriphos.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff

Lambda cyhalothrin

a) USEPA's registration status of the requested pesticide

Lambda cyhalothrin is a pyrethroid insecticide.

EPA-PC No.: 128897

There are 235 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: formulations containing more than 10% are RUP

b) Basis for selection of the requested pesticide

Lambda-cyhalothrin is a quick knock down contact insecticide that is appropriate for a variety of uses (see Section 3).

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

As outlined in Section 3, a number of crops may require the application of a quick knock-down insecticide should monitoring indicate dangerous levels of pest infestation.

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

This PERSUAP authorizes the use of formulations of lambda-cyhalothrin containing concentration of 10% or less a.i.

Lambda cyhalothrin will be applied by knapsack sprayer in aqueous emulsion. It will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

Lambda cyhalothrin is moderately toxic in the technical form, but may be highly toxic via some routes in formulation (e.g. as Karate). Available data indicate that lambda cyhalothrin is moderately toxic via the oral route in test animals.(EPA II, III. WHO II). In addition to the corrosive effects to skin and eyes, other acute effects due to exposure to lambda cyhalothrin, like those of other pyrethroids, will be mainly effects on the nervous system. These may result in: tingling, burning or numbness sensations (particularly at the point of skin contact); tremors, un-coordination of movement, paralysis or other disrupted motor function; and confusion or loss of consciousness.

The principal toxic effects noted in chronic studies were decreased body weight gain and decreased food consumption

For ecotoxicology, see g) below.

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

Lambda-cyhalothrin is a broad spectrum insecticide effective against a wide range of pests.

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

Lambda cyhalothrin's toxicity to birds ranges from slightly toxic to practically non-toxic. It is highly toxic to bees and very highly toxic to many fish and aquatic invertebrate species. However, lambda cyhalothrin is not expected to be appreciably mobile in most soils, although to a greater degree in those with high sand or very low organic matter content. There is little potential for groundwater contamination.

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

Lambda cyhalothrin will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Lambda-cyhalothrin is a non-persistent, quick knock-down insecticide, and is a preferred alternative to the more toxic organo-phosphates such as chlorpyriphos.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Diflubenzuron

a) USEPA's registration status of the requested pesticide

Diflubenzuron is a benzoyl urea (Insect Growth Regulator) insecticide.

EPA-PC No.: 108201

There are 43 products containing this active ingredient registered by USEPA.

Restricted Use Pesticide: some

b) Basis for selection of the requested pesticide

Diflubenzuron is a persistent stomach poison with low vertebrate toxicity and environmental impact. It can be used as a barrier spray against marching locust hoppers or on hatching egg-beds. It can also be used against lepidopterous fruit borers such as Codling Moth and Bollworm if applied before hatching.

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

Diflubenzuron will be mainly used outside crops for the preventive control of locusts. As outlined in Section 3, it has the potential to enhance the IPM of pome fruit and tomatoes by replacing the use of pyrethroids when monitoring indicates that an insecticide is necessary.

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

Diflubenzuron will be applied for locust control as a ULV formulation from hand-held or vehicle-mounted ULV applicators. This will be carried out under the supervision of PPQD staff. Equipment and PPE will be provided by PPQD. Diflubenzuron may also be used as an EC formulation in orchards and gardens and applied by knapsack or foot sprayer. PPE is available for sale through project-supported agricultural retailers.

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

Diflubenzuron is slightly toxic pesticide and carries the signal word CAUTION. No overt signs of toxicity were observed in any of the acute studies conducted. (EPA III. WHO III). No measurable pathological changes were observed at very low, long term exposure to diflurobenzuron.

For ecotoxicology, see g) below.

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

Diflubenzuron has been used with high effectiveness against locusts in Afghansiatn and is used against Codling Moth in Europe.

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

Diflubenzuron is practically non toxic to wild birds and to aquatic invertebrates and to fish. Insects and other arthropods are most susceptible in the pre- molting stage. Adult insects and insects that do not feed directly on the sprayed vegetation are unaffected.

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

The use of diflubenzuron for locust control will take place on open rangeland. It will also be used in irrigated orchards and gardens. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions . USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Diflubenzuron is mainly used in Afghanistan for locust control at the nymphal stage, where it is more effective than contact insecticides. The traditional mechanical methods of control, driving the hoppers into trenches, are quite ineffective. Diflubenzuron can also be used on lepidopterous pests of fruit, such as bollworm and Codling Moth, as an alternative to contact insecticides.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Malathion

a) USEPA's registration status of the requested pesticide

Malathion is a Organo-Phosphate insecticide.

EPA-PC No.: 857701

There are 1054 products containing this active ingredient registered by USEPA.

Restricted Use Pesticide: No

b) Basis for selection of the requested pesticide

Malathion is a relatively non-persistent quick knock-down insecticide for use against a range of pests when crop monitoring indicates damagingly high pest levels.

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

As outlined in Section 3, a number of crops may require the application of a quick knock-down insecticide should monitoring indicate dangerous levels of pest infestation.

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

Malathion will be applied by knapsack sprayer in aqueous emulsion. It will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

Malathion is classified as slightly toxic and carries the signal word CAUTION on the label. Malathion has been shown to have different toxicities in male and female rats and humans. For humans, the lowest dose at which lethal effects have been observed was nearly three times higher for males than for females. Acute symptoms in humans include nausea, headache, tightness in the chest, and other symptoms typical of acetyl- cholinesterase inhibition. Unconsciousness, convulsions, and a "prolonged worsening illness" are also typical of Malathion poisoning at high doses. There is one reported case of Malathion poisoning of an infant who exhibited severe signs of cholinesterase inhibition after exposure to an aerosol bomb containing 0.5% Malathion. Numerous other Malathion intoxication incidents have occurred among pesticide workers and with small children through accidental exposure. Human exposures can occur through ingestion, inhalation, and absorption through the skin. As with many other organophosphate insecticides, Malathion, at relatively high doses (near the LC50) can act to suppress the immune system in some animal species

Malathion is moderately toxic to birds and highly toxic to aquatic invertebrates, the aquatic stages of amphibians and to honey bees. Mallards have an LD50 of 1,485 mg/kg and chickens a LD50 of 948 mg/kg. Ninety percent of the dose to birds was metabolized and excreted in 24 hours via urine. Fish have a wide range of toxicities to Malathion, extending from very highly toxic for the walleye and slightly toxic for goldfish

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

Malathion is a broad spectrum contact insecticide effective against a wide range of insect pests.

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

Malathion is harmful to beneficial insects and care must be taken to avoid its use where foraging bees are active. It is also also harmful to aquatic life and contamination of waterways must be prevented. However, it breaks down quickly and is not persistent.

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

Malathion will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Malathion should only be applied when pheromone traps or other pest monitoring practices indicate a dangerous density of the target pest. The alternative quick knock-down insecticides are the pyrethroids. Diflubenzuron is a persistent, but low toxicity, IGR which can be applied at or immediately before oviposition to control chewing insects such as bollworm or Codling Moth.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Imidacloprid

a) USEPA's registration status of the requested pesticide

Imidacloprid is a chloro-nicotinyl insecticide.

EPA-PC No.: 129059

There are 696 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Imidacloprid is a systemic insecticide that is used against aphids and other sap-sucking insects, especially in dense crops in which contact insecticides are ineffective.

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

As outlined in Section 3, the use of imidacloprid is part of Pest Management plans for crops that are attacked by aphids at an early stage.

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

Imidapcloprid will either be applied as a seed dressing or as a foliar application using knapsack sprayers. It will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

Imidacloprid is moderately toxic. (EPA II, III. WHO II). Although no account of human poisoning was found in the literature, signs and symptoms of poisoning would be expected to be similar to nicotinic signs and symptoms, including fatigue, twitching, cramps, and muscle weakness including the muscles necessary for breathing.

For ecotoxicology, see g) below.

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

Imidacloprid is recommended for the control of aphids by UC Davis IPM programme.

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

Imidacloprid is toxic to upland game birds. In studies with red- winged blackbirds and brown-headed cowbirds, it was observed that birds learned to avoid imidacloprid treated seeds after experiencing transitory gastrointestinal distress (retching) and ataxia (loss of coordination). It was concluded that the risk of dietary exposure to birds via treated seeds was

minimal. Imidacloprid is highly toxic to bees if used as a foliar application, especially during flowering, but is not considered a hazard to bees when used as a seed treatment. There is some evidence that sub-lethal doses of imidacloprid are harmful to bee colonies. The toxicity of imidacloprid to fish is moderately low, but may be very toxic to aquatic invertebrates.

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

Imidacloprid will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Imidacloprid is an alternative systemic insecticide to the highly toxic organo-phosphate dimethoate. Aphids and other sap-sucking insects may be controlled by non-toxic methods such as insecticidal soap or mineral oil, but heavy infestations require chemical treatment.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Acetamiprid

a) USEPA's registration status of the requested pesticide

Acetamiprid is a chloro-nicotinyl insecticide.

EPA-PC No.: 099050

There are 65 products containing this active ingredient registered by USEPA.

Restricted Use Pesticide: Some formulations for domestic use

b) Basis for selection of the requested pesticide

Acetamiprid is a systemic insecticide that is used against aphids and other sap-sucking insects, especially in dense crops in which contact insecticides are ineffective.

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

As outlined in Section 3, the use of acetamiprid is part of Pest Management plans for crops that are attacked by aphids at an early stage.

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

Acetamiprid will be applied as a foliar application using knapsack sprayers. It will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

Acetamiprid is moderately toxic (WHO II, EPA no consensus across products). Two cases were reported in 2010 of acute poisoning with an insecticide formulation containing acetamiprid for suicidal purposes. Both cases experienced severe nausea and vomiting, muscle weakness, hypothermia, convulsions, and clinical manifestations including tachycardia, hypotension, electrocardiogram changes, hypoxia, and thirst in the case with the higher serum concentration of acetamiprid. The symptoms were partially similar to acute organophosphate intoxication. Supportive treatments for a variety of symptoms were sufficient for recovery, and both individuals were discharged without any complications 2 days after ingestion.

For ecotoxicology, see g) below.

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

Acetamiprid is recommended by UC Davis IPM programme for the control of a number of insect pests including Codling Moth and thrips.

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

EPA found that acetamiprid use would pose a minimal risk to fish and wildlife Toxicity of acetamiprid is selective to insects, but some uses may pose risk to certain non-target aquatic invertebrates. It is only moderately toxic to bees. Its use would generally pose low risk to threatened and endangered species Its use would pose minimal risk to non target plants Moderate risk to be mitigated by label restrictions and warning. However, there have recently been concerns that sublethal doses of neo-nicotinamides may be a factor in colony collapse disorder in honeybees. It should therefore not be used on flowering crops where bees are foraging.

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

Acetamiprid will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Acetamiprid is an alternative systemic insecticide to the highly toxic organo-phosphate dimethoate. Aphids and other sap-sucking insects may be controlled by non-toxic methods such as insecticidal soap or mineral oil, but heavy infestations require chemical treatment.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Insecticidal soap

a) USEPA's registration status of the requested pesticide

Insecticidal soap is a fatty acids insecticide/acaricide

EPA-PC No.: 079009

There are 24 products containing soap salts registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Insecticidal soap is a very low toxicity alternative to synthetic pesticide for the control of aphids and other soft-bodied insect pests. It is especially suitable for relatively light outbreaks in greenhouses and on household plots. It can also be used against Safflower Aphid.

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

The use of insecticidal soap is part of the Pest Management Plans for vegetables and Safflower, which are attacked by soft-bodied pests such as aphids and scale insects. This will reduce the need to resort to more toxic synthetic insecticides and reduce damage to natural enemies and other beneficial insects.

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

Insecticidal soap will be applied as an aqueous solution by knapsack or small pressure sprayer. Soap may cause eye irritation and so goggles should be worn

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

EPA has ruled that "All registered pesticide products containing the active ingredient soap salts are not likely to cause unreasonable adverse effects in people or the environment, and are eligible for re-registration."

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

If applied carefully, insecticidal soap is effective against soft-bodies insects, but very heavy infestations may require synthetic insecticides.

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

Insecticidal soap is practically non-toxic to vertebrates and to most hard-bodied insects such as bees and beetles. It may cause cause phytotoxicity in some plants. See EPA finding above.

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

Insecticidal soap will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Insecticidal soap is a non-toxic alternative to systemic insecticides such as imidacloprid or contact insecticides such as the pyrethroids for the control of soft-bodied insects such as aphids. Other non-toxic methods include mineral oil and plant extracts such as azadirachtin or garlic.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Mineral oil

a) USEPA's registration status of the requested pesticide

Mineral oil is a petroleum insecticide/acaricide

EPA-PC No.: 063502

There are 229 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Mineral oil (Winter Oil) is widely used as a dormant season preventive treatment against aphids and other insect pests on fruit trees. It may also be used as a direct control measure against Woolly Aphid and Black Bark Aphid.

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

The use of mineral oil as a dormant season preventive treatment against aphids and other insect pests is part of the Pest management plan for stone fruit, as outlined in Section 3. Its use against Woolly Aphid may also reduce the need for using more toxic insecticides on apple and so protect beneficial insects.

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

Mineral oil will be applied as an aqueous emulsion during the dormant season. Exceptionally it may be applied during the growing season against Woolly Aphid. It will be applied using knapsack sprayers or foot pumps. It will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

EPA Acute Toxicity: III. WHO Acute Toxicity Class: none.

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

Mineral oil is widely used as a low toxicity treatment against aphids and a wide range of sucking insects and mites. Its use has been shown to be highly effective in northern Afghanistan in the demonstrations set up in 2007 by HLP. Resistance is unlikely.

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

Mineral oil is a non-toxic material that kills insects by smothering them. It is applied in winter during the dormant period and so no adverse environmental impact is expected. Mineral oil may also be used during the growing season against Woolly Aphid. Other soft-bodied insects such as the larvae of coccinelids and syrphids may be affected by the treatment, but no environmental contamination is expected.

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

Mineral oil will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

There is no non-toxic alternative to dormant season of fruit trees treatment with mineral oil. The only other method of control of aphids and other sap-sucking pests is the application of synthetic insecticides during the growing season.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Abamectin (Avermectin)

a) USEPA's registration status of the requested pesticide

Abamectin (Avermectin) is a microbial insecticide/acaricide

EPA-PC No.: 122804

There are 120 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: formulations containing more than 1.9%

b) Basis for selection of the requested pesticide

Abamectin has been selected for control of spider mites on almonds, an important crop in Afghanistan. It is recommended by UC Davis for IPM of web-spinning spider mites on almonds, with low impact on predators. It is a natural product with low environmental impact.

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

As outlined in Section 3, IPM of almonds may require the application of an acaricide against outbreaks of spider-mite. Abamectin is the preferred chemical for this as its impact on beneficial insects is low.

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

This PERSUAP authorises the use of formulations of abamectin containing 1.9% a.i. or less.

Abamectin will be applied as an emulsion in water by knapsack, foot or power sprayer. All users under USAID projects will receive training in safe and effective pesticide application. Abamectin will be supplied through retailers who will offer PPE for sale. All retailers will receive training.

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

Abamectin is a highly toxic material; however, most formulated products containing abamectin are of low toxicity to mammals. Emulsifiable concentrate formulations may cause moderate eye irritation and mild skin irritation. Symptoms of poisoning observed in laboratory animals include pupil dilation, vomiting, convulsions and/or tremors, and coma. (EPAII, III.WHO none)

When mice were fed 8 mg/kg/day, the highest dose tested, for 94 weeks, the males developed dermatitis and changes in blood formation in the spleen, while females exhibited tremors and weight loss

Abamectin is highly toxic to fish and aquatic invertebrates.See g) below for ecotoxicology.

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

Abamectin is recommended for this specific use by UC Davis IPM Guidelines for Almonds.

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

Abamectin is highly toxic to insects. Its use will not be recommended at flowering and so its use will not affect pollinators. It is practically non-toxic to birds, but is highly toxic to fish. Its use in irrigated land with no runoff into natural waterways will not constitute a hazard.

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

Abamectin will be used in irrigated gardens and orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

The principal method of minimising damage by mites is by implementing an IPM program that avoids the misuse of other insecticides that kill the natural predators. However, external conditions, such as dust or high temperature may occasionally result in mite levels that exceed the economic threshold and require chemical control. Alternative acaricides are judged to present a higher risk to users and the environment, i.e. they have a higher user hazard and eco-toxicity

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

(E, E)-8, 10-Dodecadien-1-ol

a) USEPA's registration status of the requested pesticide

A formulation of this substance in a waxy matrix, **SPLAT-Cydia,** is registered by USEPA (EPA Reg. No. 80286-3) for control of Codling Moth by mating disruption

Restricted Use Pesticide: No

Arthropod pheromones are exempt from requirements of tolerance in or on raw agricultural commodities when applied to growing crops at a rate not exceeding 150g a.i./acre/year.

b) Basis for selection of the requested pesticide

SPLAT-Cydia has been selected as a mating disrutant for control of Codling Moth as an alternative to insecticides.

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

As outlined in Section 3, the use of mating disruption for control of Codling Moth can remove the major need to apply insecticides to pome fruit.

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

SPLAT-Cydia will be applied as a It is formulation in an amorphous polymer matrix and applied through a metered caulking gun onto the bark of the trees. SPLAT is an eye irritant and normal safety procedures for pesticide application will be used. PPE is available for sale through agricultural retailers. SPLAT-Cydia is not at present available commercially in Afghanistan, but its introduction on a trial and demonstration basis should be encouraged.

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

There are no acute or long-term toxicological hazards to humans or the environment associated with this product. The mixture of wax, emulsifiers and carriers used in the formulation are all listed by EPA as exempt from the requirement of tolerance

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

Independent field studies have shown SPLAT Cydia to be an effective mating disruption product.

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

SPLAT-Cydia is a synthetic analogue of the naturally occurring pheromone of the Codling Moth formulated in a biologically inert matrix. As such it has not effect on any other organisms than Codling Moth.

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

SPLAT-Cydia will be used in irrigated orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

The alternatives to the use of SPLAT-Cydia are the application of synthetic insecticides such as lambda-cyhalothrin and diflubenzuron. Pheromone traps may also be used for control. Mechanical methods such as the use of cardboard traps on the bole of the tree for the pupating larvae may achieve some success.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide program of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

(Z, E)-7, 9, 11-Dodecatrienyl formate:

a) USEPA's registration status of the requested pesticide

Registration of a formulation of this substance in a waxy matrix, **SPLAT-EC,** is pending with USEPA (EPA Reg. No. 80286-XX), for use as a mating disruptant.

Arthropod pheromones are exempt from requirements of tolerance in or on raw agricultural commodities when applied to growing crops at a rate not exceeding 150g a.i./acre/year.

b) Basis for selection of the requested pesticide

SPLAT-EC has been selected as a mating disruptant for control of Carob Moth as an alternative to insecticides.

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

The use of a mating disruptant to control carob Moth would remove the major need to use insecticides in pomegranate orchards. Pomegranate is often grown in mixed orchard with other fruit trees and so insecticides may have harmful effects on other beneficial insects.

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

SPLAT-EC will be applied as formulation in an an amorphous polymer matrix and applied through a metered caulking gun onto the bark of the trees. SPLAT is an eye irritant and normal safety procedures for pesticide application will be used. PPE is available for sale through agricultural retailers. SPLAT-EC is not at present available commercially in Afghanistan, but its introduction on a trial and demonstration basis should be encouraged.

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

There are no acute or long-term toxicological hazards to humans or the environment associated with this product. The mixture of wax, emulsifiers and carriers used in the formulation are all listed by EPA as exempt from the requirement of tolerance

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

Field trial conducted by UC Riverside CA demonstrated that SPLAT-EC is a viable alternative to insecticides for control of Carob Moth on dates. Trials conducted by IDEA-NEW in Balkh province demonstrated significant reductions in losses to pomegranates from Carob Moth.

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

SPLAT-EC is a synthetic analogue of the naturally occurring pheromone of the Carob Moth formulated in a biologically inert matrix. As such it has not effect on any other organisms than Carob Moth.

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

SPLAT-EC will be used in irrigated orchards, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographically regions. USAID will always seek to minimize environmental impacts in the use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Apart from the application of synthetic insecticides, Carob Moth on pomegranate may be managed by bagging the fruit at an early stage. A traditional method is to close the calyx end of the fruit with a mud plug (often augmented with BHC dust). These are both labour-intensive and expensive procedures.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

6. MOLLUSCICIDE

Metaldehyde

a) USEPA's registration status of the requested pesticide

Metaldehyde is an aldehyde molluscicide.

EPA-PC No.: 053001

There are 81 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: yes

b) Basis for selection of the requested pesticide

Metaldehyde has been selected as a molluscicide for control of snails on leafy vegetables.

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

The ability to control mollusc pests is a necessary part of IPM for leafy vegetable crops.

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

Metaldehyde will be applied as a 2% or 4% bait, Care must be taken to prevent domestic and other non-target animals from ingesting it.

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

Metaldehyde is highly toxic by inhalation, moderately toxic by ingestion and slightly toxic by dermal absorption. EPA Acute Toxicity: II, III.WHO Acute Toxicity Class: II.

Ingestion causes irritation of the stomach and intestines. It can also cause kidney and liver damage. One to three hours after ingestion, the following symptoms may appear: severe abdominal pain, nausea, vomiting, diarrhea, fever, convulsions, and coma. Other symptoms of acute exposure include increased heart rate, panting, asthma attack, depression, drowsiness, high blood pressure, inability to control the release of urine and feces, uncoordination, muscle tremors, sweating, excessive salivation, tearing, cyanosis, acidosis, stupor, and unconsciousness. Kidney injury and liver cell death ('necrosis') may also occur. Mental deficiencies and memory loss from ingestion poisoning may persist for one year or more. Death may occur due to kidney or lung failure. Convulsions and eventual death within two hours of administration were seen in mice that were given an oral dose of 1,000 mg/kg of metaldehyde.

Dosages which are not toxic when given singly do not cause illness when repeated. Long-term, repeated skin exposure to metaldehyde can result in dermatitis. Prolonged eye exposure can cause conjunctivitis.

For ecotoxicology, see g) below.

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

Metaldehyde is recommended for this purpose by UC Davis IPM programme

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

Birds may be killed if they feed in metaldehyde-treated areas. Metaldehyde is toxic to wildlife and dogs.

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

Metaldehyde will be used in irrigated gardens, with little or no run-off into natural waterways. Most of the soils are alluvial with high clay content. The climate varies across the country, being essentially Mediterranean in the north and sub-tropical in the south subject to quite extreme temperatures on account of the continental location. The fauna and flora comprise elements of the Irano-Turanian, the Sahara-Sindian, the Himalayan and the Indian biogeographical regions. USAID will always seek to minimize environmental impacts in the

use of chemicals for agricultural purposes. No project will use pesticides in sensitive habitats or protected areas.

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

Mechanical methods are an alternative to the use of a molluscicide. Snails can be trapped beneath boards or flower pots positioned throughout the garden and landscape. Inverted melon rinds also make good traps. Traditional herbal deterrents are used.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

7. RODENTICIDES

Zinc phosphide

a) USEPA's registration status of the requested pesticide

Zinc phosphide is an inorganic rodenticide

EPA-PC No.: 088601

There are 156 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: Formulations containing more than 2% a.i. are RUP.

b) Basis for selection of the requested pesticide

Zinc phosphide has been selected as a rodenticide to be used in food commodity stores and warehouses.

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

This pesticide will not be used in crops.

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

This PERSUAP authorises the use of formulations of Zinc phosphide containing 2% or less a.i.

Zinc phosphide will be applied a bait to prevent rodent damage to commodities in storage. It will be applied in secure bait stations to prevent accidental poisoning of non-target animals and humans. It is readily available in agricultural retail stores.

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

EPA Acute Toxicity: I, II, III.WHO Acute Toxicity Class: Ib.Symptoms of acute zinc phosphide poisoning includes nausea, shock, weak heart beat and low blood pressure, loss of consciousness. Other symptoms include vomiting, diarrhea, cyanosis, rales, restlessness and fever. There are documented cases of adults dying from massive doses of the pesticide (4,000 to 5,000 mg) although others have survived acute exposure of as high as 25,000 mg to 100,000 mg of zinc phosphide if vomiting occurred early and absorption was limited. The inhalation of zinc phosphide or its breakdown product phosphine gas may result in acute toxicity.

There have been no observed symptoms of chronic poisoning due to zinc phosphide exposure in humans. However it has been noted that chronic exposure to sublethal concentrations for extended periods of time may produce toxic symptoms. No specific note was made of the toxic symptoms or the doses required producing them. No definitive conclusions can be drawn to the chronic toxic potential of zinc phosphide.

For ecotoxicology, see g) below.

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

Zinc phosphide has been used for many years as a rodenticide.

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

Zinc phosphide is highly toxic to wild birds and freshwater fish. It is also toxic to non-target mammals. Its controlled use on industrial premises will not allow its release into the environment.

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

Zinc phosphide will be applied in secure buildings.

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

The alternatives to zinc phosphide are coumarin rodenticides, such as warfarin, mechanical traps and cats.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Warfarin

a) USEPA's registration status of the requested pesticide

Warfarin is a coumarin rodenticide

EPA-PC No.: 086002

There are 57 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: no

b) Basis for selection of the requested pesticide

Warfarin has been selected as a rodenticide to be used in food commodity stores and warehouses.

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

This pesticide will not be used in crops.

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

Warfarin will be applied a bait to prevent rodent damage to commodities in storage. It will be applied in secure bait stations to prevent accidental poisoning of non-target animals and humans.

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

Average or large doses of warfarin in humans may cause hemorrhage. Warfarin is not known to be an eye irritant. It has produced hemorrhages in the retina, however, through its systemic toxicity. The compound is considered highly toxic by inhalation and ingestion and moderately toxic by dermal absorption. A dose of Warfarin at 200 mg/m3 is considered highly toxic and immediately dangerous to life or health.

A farmer whose hands were intermittently wetted with a 0.5% solution of Warfarin over a period of 24 days developed gross hematuria two days after the last contact with the solution; the following day, spontaneous hematomas appeared on the arms and legs. Within four days, there were also epistaxes, punctuate hemorrhages of the palate and mouth, and bleeding from the lower lip. Four days later, after treatment for two days with phytonadione, the patient recovered.

For ecotoxicology, see g) below.

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

Warfarin and similar coumarin rodenticides are the favoured method of rodent control in many parts of the World. However, resistance may develop and so it should be used in conjunction or rotation with other methods.

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

The use of warfarin as a hand-placed bait limits the potential for any secondary exposure of nontarget mammals. However, because of its high degree of mammalian toxicity and its use patterns, warfarin could adversely affect endangered or threatened species if improperly used. The acute avian toxicity of warfarin indicates that it is practically non-toxic to birds. Warfarin used as prepared bait (0.13%) is considered non-toxic to bees when used as prescribed.

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

Warfarin will be applied in secure buildings.

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

The alternatives to warfarin are zinc phosphide, mechanical traps and cats.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions. At present, warfarin is on a list of banned imports. There is no obvious reason for this and it may be reversed in future.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide programme of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Brodifacoum

a) USEPA's registration status of the requested pesticide

Brodifacoum is a coumarin rodenticide.

EPA-PC No.: 112701

There are 49 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: No

b) Basis for selection of the requested pesticide

Brodifacoum has been selected as a rodenticide to be used in food commodity stores and warehouses.

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

This pesticide will not be used in crops.

d) Proposed methods of application, including availability of appropriateapplication and safety equipment.

Brodifacoum will be applied as bait to prevent rodent damage to commodities in storage. It will be applied in secure bait stations to prevent accidental poisoning of non-target animals and humans.

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

Severely toxic effects may result from the accidental ingestion of coumarins; animal experiments indicate that ingestion of less than 5gram may be fatal or may produce serious damage to the health of the individual. This class of compounds blocks blood clotting and causes death by internal bleeding. They are safe in normal use but with high doses or prolonged use, they can cause bleeding accidents. Symptoms of poisoning include nausea and vomiting; effects may be delayed for days. Other symptoms include bleeding gums, easy bruising, blood in the urine and excessive bleeding from minor wounds. Severe poisonings can cause shock, coma and death. Skin contact with the material may produce severely toxic effects; systemic effects may result following absorption and these may be fatal.

There is some evidence that human exposure to the material may result in developmental toxicity. Several cases of foetal abnormalities have been described in mothers who took large doses of bromides during pregnancy.

Repeated exposure to some coumarin derivatives may cause nosebleed, bleeding gut and pharynx, dark red bleeding spots, wide spread bruising, blood swelling, blood in the phlegm, vomitus, urine or stools. Bleeding into the organs, digestive tract, joints, abdomen can cause localized pain. Exposure at work can cause anemia with weakness, pallor and shock. Many coumarins cause mutations and cancer. Coumarins also inhibit tumor production by carcinogens and inhibit metastasis. Depression, hallucinosis, and schizophreniform psychosis can be seen in the absence of other signs of intoxication. Bromides may also induce sedation, irritability, agitation, delirium, memory loss, confusion, disorientation, forgetfulness

(aphasias), dysarthria, weakness, fatigue, vertigo, stupor, coma, decreased appetite, nausea and vomiting, diarrhoea, hallucinations, an acne like rash on the face, legs and trunk, known as bronchoderma (seen in 25-30% of case involving bromide ion), and a profuse discharge from the nostrils (coryza), and generalized hyperreflexia have also been observed.

Due to low bait concentrations (usually 10 – 50mg/kg bait, i.e. 0.001 — 0.005%) and slow onset of symptoms, and the existence of a highly effective antidote (appropriately dosed vitamin K1), brodifacoum is considered to be of relatively low hazard to humans. A caveat is that the poisoning must be identified specifically, so that vitamin K supplementation and monitoring may be maintained for periods that range up to months.

Laboratory studies demonstrated that this class of pesticide is acutely and chronically toxic to a wide variety of organisms, including birds, mammals, fish and aquatic invertebrates. In addition, they are a cause of secondary toxicity to predator/scavenger birds and mammals.

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

Brodifacoum and similar coumarin rodenticides are the favoured method of rodent control in many parts of the World. However, resistance may develop and so it should be used in conjunction or rotation with other methods.

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

The use of Brodifacoum as a hand-placed bait limits the potential for any secondary exposure of non target mammals. However, because of its high degree of mammalian toxicity and its use patterns, Brodifacoum could adversely affect endangered or threatened species if improperly used. The acute avian toxicity of Brodifacoum indicates that it is moderately to very highly toxic to birds. Secondary poisoning of predatory birds and animals may occur due to the extreme persistence of the pesticide within both target and non-target species. It may also be dispersed by insects that feed on poisoned bait without harm and retain the pesticide within their bodies.

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

Warfarin will be applied in secure buildings.

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

The alternatives to coumarins are zinc phosphide, mechanical traps and cats.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions. At present, warfarin is on a list of banned imports. There is no obvious reason for this and it may be reversed in future.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide program of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' management program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

Bromadiolone

a) USEPA's registration status of the requested pesticide

Bromadioloneis a coumarin rodenticide

EPA-PC No.: 214600

There are 145 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: No

b) Basis for selection of the requested pesticide

Bromadiolone has been selected as a rodenticide to be used in food commodity stores and warehouses.

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

This pesticide will not be used in crops.

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

Bromadiolone will be applied as bait to prevent rodent damage to commodities in storage. It will be applied in secure bait stations to prevent accidental poisoning of non-target animals and humans.

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

Severely toxic effects may result from the accidental ingestion of coumarins; animal experiments indicate that ingestion of less than 5gram may be fatal or may produce serious damage to the health of the individual. This class of compounds blocks blood clotting and causes death by internal bleeding. They are safe in normal use but with high doses or prolonged use, they can cause bleeding accidents. Symptoms of poisoning include nausea and vomiting; effects may be delayed for days. Other symptoms include bleeding gums, easy bruising, blood in the urine and excessive bleeding from minor wounds. Severe poisonings can cause shock, coma and death. Skin contact with the material may produce severely toxic effects; systemic effects may result following absorption and these may be fatal.

There is some evidence that human exposure to the material may result in developmental toxicity. Several cases of foetal abnormalities have been described in mothers who took large doses of bromides during pregnancy.

Repeated exposure to some coumarin derivatives may cause nosebleed, bleeding gut and pharynx, dark red bleeding spots, wides pread bruising, blood swelling, blood in the phlegm, vomitus, urine or stools. Bleeding into the organs, digestive tract, joints, abdomen can cause localized pain. Exposure at work can cause anemia with weakness, pallor and shock. Many coumarins cause mutations and cancer. Coumarins also inhibit tumor production by carcinogens and inhibit metastasis. Depression, hallucinosis, and schizophreniform psychosis can be seen in the absence of other signs of intoxication. Bromides may also induce sedation, irritability, agitation, delirium, memory loss, confusion, disorientation, forgetfulness (aphasias), dysarthria, weakness, fatigue, vertigo, stupor, coma, decreased appetite, nausea and vomiting, diarrhoea, hallucinations, an acne like rash on the face, legs and trunk, known as bronchoderma (seen in 25-30% of case involving bromide ion), and a profuse discharge from the nostrils (coryza), and generalized hyperreflexia have also been observed.

Due to low bait concentrations (usually 10 – 50mg/kg bait, i.e. 0.001 — 0.005%) and slow onset of symptoms, and the existence of a highly effective antidote (appropriately dosed vitamin K1), brodifacoum is considered to be of relatively low hazard to humans. A caveat is that the poisoning must be identified specifically, so that vitamin K supplementation and monitoring may be maintained for periods that range up to months.

Laboratory studies demonstrated that this class of pesticide is acutely and chronically toxic to a wide variety of organisms, includingbirds, mammals, fish and aquatic invertebrates. In addition, they are a cause of secondary toxicity to predator/scavenger birds and mammals.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions. At present, warfarin is on a list of banned imports. There is no obvious reason for this and it may be reversed in future.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide program of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively.

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

The use of this product will be monitored as part of the projects' management program. Any incidents reported by program staff or farmers will be followed up on by M&E staff.

8. FUMIGANTS

Aluminium phosphide

a) USEPA's registration status of the requested pesticide

Aluminium phosphide is an inorganic fumigant.

EPA-PC No.: 06501

There are 37 products containing this active ingredient registered by USEPA

Restricted Use Pesticide: yes

b) Basis for selection of the requested pesticide

Aluminum phosphate has been selected as a fumigant for food commodities in storage or transit.

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

Aluminum phosphate will be used on industrial and transport premises and not be used in crops. It will not therefore be part of an IPM scheme.

d) Proposed methods of application, including availability of appropriateapplication and safety equipment.

Aluminum phosphate is highly toxic and should only be applied by specially trained personnel with full PPE. Ideally it should be applied in specifically designed fumigation structures, but it may be used in containers and railway wagons or under tarpaulins. Fumigation should normally be carried out only by professional PPQD staff, but facilities requiring regular fumigation may train and equip their own staff to the required standard.

Where fumigation requires workers to enter the fumigated space to apply the fumigant or to aerate it, there must be at least two workers under the direct control of a supervisor trained to the standard of a Certified Applicator. Workers should wear a long-sleeved shirt, long trousers, socks, and shoes. All items should be clean, dry, and free of holes and tears. Shirts and trousers should be loosely woven because tight-fitting garments can trap fumigants next to the skin. Coveralls worn over normal work clothes are suitable, provided they fit loosely over the body. When handling aluminum phosphate prepacs, no gloves are needed. But when handling aluminum phosphate tablets or pellets, dry cotton gloves must be worn.

Workers exposed to concentrations of phosphine between 0.3 and 15 ppm must be equipped with full-face canister gas mask with approved canister for phosphine or self-contained breathing apparatus (SCBA) or supplied air-line respirator (SALR) and SCBA combination. Where concentrations exceed 15ppm or when gas concentrations are not measured or are unknown, workers must wear either a SCBA or a SALR-SCBA combination.

All access to the fumigated space must be clearly placarded in the appropriate languages and with ideograms. The fumigated space must be checked for leaks and sealed as necessary. Measures must be taken to ensure that workers in nearby spaces are not exposed to concentrations exceeding 0.3ppm and those procedures and facilities are in place to deal with leakages, spillages or other emergencies, including fire.

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

Aluminum phosphate has a high acute toxicity with a mammalian LD_{50} of 8.7mg/kg (EPA Acute Toxicity I). In contact with water, it breaks down to release the toxic gas phosphine. Acute effects are reversible. Used with proper equipment, Aluminum phosphate is deemed to pose an acceptable risk to workers.

The environmental effects of Aluminum phosphate result from its acute toxicity causing accidental poisoning of non-target species. Used as a fumigant on industrial premises, it should have no adverse environmental effects.

Fumigants are necessarily dangerous chemicals. With appropriate equipment and training they can be used safely.

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

Aluminum phosphate is widely used for this purpose

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

Aluminum phosphate breaks down in the presence of water to phosphine gas, which disperses naturally. Though, highly toxic to most organisms, the danger is mainly in confined spaces where the concentration of phosphine gas may reach hazardous levels.

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

Aluminum phosphate will be used on industrial and transport premises and not be used in crops. It will not therefore be part of an IPM scheme.

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

International phytosanitary requirements offer no alternative to fumigation for certain commodities. Methyl bromide is an alternative fumigant, but is not permitted under this PERSUAP as it is listed under the Montreal protocol.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency. Specific regulation of pesticides is the responsibility of MAIL. A new pesticide law, establishing a system of registration and regulation, is currently with Parliament. Until this comes into effect, the powers of MAIL are limited to blocking the importation of products covered by the Stockholm and Rotterdam Conventions.

k) Provisions made for training of users and applicators.

Section 4 describes in detail the arrangements for a Mission-wide program of training to ensure that all beneficiaries are able to use the recommended pesticides safely and effectively. Fumigation with aluminum phosphates will require specific training.

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

The use of this product will be monitored as part of the projects' crop management extension program. Any incidents reported by program staff or farmers will be followed up on by M&E staff

9. MICROBICIDES

Chloroxylenol (4-chloro-3,5-dimethylphenol)

a) USEPA's registration status of the requested pesticide

EPA-PC No. 886801

There 12 registered products carrying labels with "Caution" and "Danger"

b) Basis for selection of the requested pesticide

Chloroxylenol is the main activre ingredient of Dettol, a widely used antiseptic and disinfectant. It is an antimicrobial chemical compound used to control bacteria, algae, and fungi in adhesives, emulsions, paints, and wash tanks.[2] It is also commonly used in antibacterial soaps and household antiseptics.

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

Not applicable.

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

Chloroxylenol, formulated as Dettol, will be used in aqueous solution as a clinical antiseptic and disinfectant.

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

Chloroxylenol is not significantly toxic to humans and other mammals, is practically non-toxic to birds, moderately toxic to freshwater invertebrates and highly toxic to fish. It is a mild skin irritant and may trigger allergic reactions in some individuals.

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

Chloroxylenol is effective against a wide range of Gram-positive bacteria. It is less effective against staphylococci and Gram-negative bacteria; it is often ineffective against *Pseudomonas* spp. and it is inactive against spores.

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

Dettol will be used in hospitals and clinics.

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

Dettol will be used in hospitals and clinics

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

A range of other disinfectants are available as well as sterilization by heat.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency.

k) Provisions made for training of users and applicators.

The use of Dettol will be under the supervision of trained clinicians.

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

The use of this product will be monitored as part of the projects' management program. Any incidents reported by program staff will be followed up on by M&E staff

Chlorhexidine

a) USEPA's registration status of the requested pesticide

EPA-PC No.: 217100

Chlorhexidine is not registered with USEPA.

b) Basis for selection of the requested pesticide

Chlorhexidine is a representative disinfectant and antiseptic.

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

Not applicable

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

Chlorhexidine will be used in aqueous solution as wipes and washes.

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

Chlorhexidine is harmful in high concentrations, but is used safely in low concentrations in many products, such as mouthwash and contact lens solutions. However, numerous scientific papers have reported complications with low level exposure too.

In the UK, the Medicines and Healthcare Products Regulatory Agency (MHRA) has issued a patient safety alert on the risk of anaphylactic reactions from the use of medical devices and medicinal products containing chlorhexidine.

Chlorhexidine will be used in hospitals and clinics under the supervision of medical staff.

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

Chlorhexidine is recommended by WHO as a mild antiseptic.

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

Chlorhexidine will not enter the natural environment.

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

Chlorhexidine will be used in hospitals and clinics.

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

Various agents can serve as alternatives.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency.

k) Provisions made for training of users and applicators.

Chlorhexidine will be used by the staff of hospitals and clinics under trained supervision.

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

The use of this product will be monitored as part of the projects' management program. Any incidents reported by program staff will be followed up on by M&E staff

Sodium Hypochlorite

a) USEPA's registration status of the requested pesticide

EPA-PC No.: 914703

There are 2909 registered products containing Sodium Hypochlorite

b) Basis for selection of the requested pesticide

Sodium Hypochlorite releases chlorine on breakdown and is a powerful microbicide with many uses from water purification. It is commonly known as bleach.

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

Not applicable

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

Sodium Hypochlorite will be used in dilute aqueous solution.

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

Sodium hypochlorite is a strong oxidizer. Oxidation reactions are corrosive, solutions burn skin and cause eye damage, in particular, when used in concentrated forms. However, as recognized by the NFPA, only solutions containing more than 40% sodium hypochlorite by weight are considered hazardous oxidizers. Solutions less than 40% are classified as a moderate oxidizing hazard (NFPA 430, 2000).

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

A 1-in-5 dilution of household bleach with water (1 part bleach to 4 parts water) is effective against many bacteria and some viruses, and is often the disinfectant of choice in cleaning surfaces in hospitals (primarily in the United States).

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

Sodium hypochlorite will not enter the natural environment.

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

Sodium hypochlorite will be used in hospitals and clinics.

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

Other micro biocides are available but the choice of their use is a matter for professional clinical judgment.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency.

k) Provisions made for training of users and applicators.

Sodium hypochlorite will be used by the staff of hospitals and clinics under trained supervision.

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

The use of this product will be monitored as part of the projects' management program. Any incidents reported by program staff will be followed up on by M&E staff

Sodium Hydroxide

a) USEPA's registration status of the requested pesticide

EPA-PC No.:075603

There are three registered products containing Sodium Hydroxide.

RUP: No

b) Basis for selection of the requested pesticide

Sodium hydroxide is an effective cleaning agent and disinfectant widely used in domestic, clinical and industrial environments on sinks, work surfaces and sanitary ware.

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

Not applicable

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

Sodium hydroxide will be used in dilute aqueous solution of less than 0.5%.

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

At the concentrations used for this purpose, Sodium hydroxide is a mild skin and eye irritant. It may be harmful if swallowed. Instillation into the eyes may result in transient superficial effects similar to those produced by mild toilet soaps and detergents. Ingestion may result in

transient nervous system effects (ataxia and muscle weakness) and/or gastrointestinal irritation with nausea, vomiting or diarrhea. Use on irritated or extremely dry skin may aggravate the existing conditions. Water spray should be used to dilute and/or wash away spills. Small (household) quantities may be disposed of via sewer.

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

Sodium hydroxide is effective against gram-negative bacteria such as *Salmonella* and *Escherichia*.

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

Sodium hydroxidewill not enter the natural environment.

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

Sodium hydroxide will be used in hospitals and clinics.

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

Other micro biocides are available but the choice of their use is a matter for professional clinical judgment.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency.

k) Provisions made for training of users and applicators.

Sodium hydroxide will be used by the staff of hospitals and clinics under trained supervision.

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

The use of this product will be monitored as part of the projects' management program. Any incidents reported by program staff will be followed up on by M&E staff

Phenol

a) USEPA's registration status of the requested pesticide

EPA-PC No. 064212

Phenol is not registered with USEPA

b) Basis for selection of the requested pesticide

Phenol is used by hospitals and clinics as a micro biocide to achieve asepsis.

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

Not applicable.

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

Phenol will be used as a disinfectant in aqueous solution.

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

Phenol and its vapors are corrosive to the eyes, the skin, and the respiratory tract. Repeated or prolonged skin contact with phenol may cause dermatitis, or even second and third-degree burns. Inhalation of phenol vapor may cause lung edema. The substance may cause harmful effects on the central nervous system and heart, resulting in dysrhythmia, seizures, and coma. The kidneys may be affected as well. Long-term or repeated exposure of the substance may have harmful effects on the liver and kidneys." There is no evidence that phenol causes cancer in humans. Besides its hydrophobic effects, another mechanism for the toxicity of phenol may be the formation of phenoxylradicals.

Chemical burns from skin exposures can be decontaminated by washing with polyethylene glycol, isopropyl alcohol, or perhaps even copious amounts of water. Removal of contaminated clothing is required, as well as immediate hospital treatment for large splashes.

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

Phenol is a powerful micro biocide.

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

Phenol will not enter the natural environment.

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

Phenol will be used in hospitals and clinics.

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

Other micro biocides are available but the choice of their use is a matter for professional clinical judgment.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency.

k) Provisions made for training of users and applicators.

Phenol will be used by the staff of hospitals and clinics under trained supervision.

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

The use of this product will be monitored as part of the projects' management program. Any incidents reported by program staff will be followed up on by M&E staff

Ethanol

a) USEPA's registration status of the requested pesticide

EPA-PC No. 001501

There are 4143 products containing ethanol registered with USEPA

b) Basis for selection of the requested pesticide

Ethanol has bactericidal activity and is used to disinfect skin prior to injection, venepuncture or surgical procedures. It is also used to disinfect hands and toclean surfaces..

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

Not applicable.

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

Ethanol is used in medical wipes and in most common antibacterial hand sanitizer gels at a concentration of about 62% v/v as an antiseptic.

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

Pure ethanol will irritate the skin and eyes.[86] Nausea, vomiting and intoxication are symptoms of ingestion. Long-term use by ingestion can result in serious liver damage.

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

Ethanol kills organisms by denaturing their proteins and dissolving their lipids and is effective against most bacteria and fungi, and many viruses, but is ineffective against bacterial spores

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

Ethanol will not enter the natural environment.

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

Ethanol will be used in hospitals and clinics.

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

Other micro biocides are available but the choice of their use is a matter for professional clinical judgment.

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

Overall regulation of environmental matters is governed by the Environment Law which gives overarching authority to the National Environment Protection Agency.

k) Provisions made for training of users and applicators.

Ethanol products will be used by the staff of hospitals and clinics under trained supervision.

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

The use of this product will be monitored as part of the projects' management program. Any incidents reported by program staff will be followed up on by M&E staff

Table 9: Status of selected pesticides in PERSUAPs for Uzbekistan, Pakistan, Tajikistan and Zimbabwe

Active Ingredient	**Uzbekistan**	**Pakistan**	**Tajikistan**	**Zimbabwe**
fungicides				
Copper sulfate		permitted	permitted	
sulfur	permitted	permitted	permitted	permitted
thiram (TMTD)		permitted		permitted
Copper hydroxide		permitted	permitted	

carboxin				
Mancozeb		permitted	permitted	permitted
Quinoxyfen			permitted	
Boscalid			permitted	
Kresoxim-methyl		permitted	permitted	permitted
Copper oxychloride		permitted		permitted
Tebuconazole		permitted	permitted	permitted
metalaxyl		permitted	permitted	
iprodione		permitted	permitted	permitted
azoxystrobin	permitted	permitted	permitted	permitted
herbicides				
bromoxynil		permitted	permitted	permitted
2,4-D				
Phenoxaprop-p-ethyl				
sethoxydim			permitted	
glyphosate	permitted	permitted	permitted	permitted
clethodim		permitted	permitted	permitted
fenoxaprop-p-ethyl				permitted
insecticides/acaricides				
cypermethrin			not permitted	
Imidacloprid	restricted	permitted	permitted	permitted
acetamiprid	permitted	permitted	permitted	permitted
Abamectin (Avermectin)	restricted	permitted	permitted	permitted
azadirachtin (neem oil)	pending registration	permitted	permitted	permitted
azadirachtin (neem oil)			permitted	
Bacillus thuringiensis-BT		permitted	permitted	
Beauvaria bassiana		permitted	permitted	
Carbaryl		permitted	permitted	permitted

cypermethrin (alpha)				
Diflubenzuron		permitted	permitted	
insecticidal soap			permitted	
lambda cyhalothrin	restricted	permitted	permitted except as formulation Karate	permitted
mineral oil	permitted	permitted	permitted	permitted
Spinosad	pending registration	permitted	permitted	
Deltamethrin		permitted	permitted except on cotton	permitted
mating disruptant				
SPLAT-Ectomyoform				
SPLAT-Cydia				
Metaldehyde			not permitted	permitted
fumigant				
aluminium phosphide		permitted	not permitted	
rodenticide				
Bromadiolone				
Brodifacoum				permitted
zinc phosphide				
warfarin				
disinfectant				
Ethanol				
Soap				
Sodium hypochlorite		permitted	permitted	
phenol				
Chlorhexidine				
Chloroxylenol				

VII. PESTICIDE SAFE USE ACTION PLAN (SUAP) FOR AFGHANISTAN USAID ASSISTANCE PROJECTS

This section specifies those measures by projects to ensure that pesticides procured, recommended or financed by USAID project in Afghanistan or used safely and effectively and comply with the laws of Afghanistan and international standards. It should be read and understood by reference to the relevant previous sections.

The scale of the USAID program in Afghanistan and the present state of agriculture and pesticide use mean that USAID projects will have a determining effect on the way pesticides are used in general in the country in the foreseeable future. This is both a responsibility and an opportunity.

1. SELECTION OF PESTICIDES

Section 5 lists those pesticides and their acceptable uses that are permitted by this PERSUAP.

Projects providing pesticides as inputs to farmers will select only those pesticides included in the list.

Projects carrying out crop demonstrations and trials will use only pesticides included in the list, except where the purpose of the trial is evaluate a new pesticide not on the list, in which case a waiver will be obtained for that pesticide from the MEO.

Projects providing finance that may be used for the purchase of pesticides will ensure that beneficiaries receive information (see Training below) concerning permitted pesticides and their safe and effective use.

Many of the pesticides approved are not currently available commercially in Afghanistan, but projects should promote and recommend them when they are the preferred solution to a plant protection problem. Afghanistan has a flexible and enterprising commercial sector and if a demand is created, it will most likely be supplied.

2. PROMOTION OF IPM AND GAPS

Except, where inapplicable for example in the case of clinical disinfectants, pest control in industrial premises and emergency preventive control of migratory pests, USAID projects will apply IPM principles. Section 3 outlines Pest Management Plans for the major crops, but this should not be regarded as prescriptive and projects should exercise their own professional judgment in developing IPM and GAP programs for their own work. It is strongly recommended that pheromone traps, where available, should be used to monitor pest levels and that, if possible, UC Davis online models or other techniques should be used to time application of pesticides (http://www.ipm.ucdavis.edu/WEATHER/index.html).

3. Support to Retailers

Most project beneficiaries will obtain their pesticides from local retailers. They will probably also seek advice on their use from the same source, especially as many farmers are illiterate. The safe and effective use of pesticides provided by USAID resources is likely to depend on the standards of the agricultural retailers providing them.

It is strongly recommended that, where USAID activities in a district are expected to lead to the use of pesticides, support should be given to improve the standards of the local retailers. This should take the form of training and certification and, if necessary, the upgrading of premises to at least a minimum acceptable level (see Annex I).

Retailers should be provided with informational material such as posters and leaflets to be available in their shops.

4. Training Program

By far the most important mitigating measure for pesticides is to ensure that those who use them understand them and are competent in handling and using them. It is essential that training to a uniform high standard is available across the program. The Mission will therefore ensure that a dedicated team, trained in participatory training methods, will be available to carry out courses based on Annex I, as outlined in Section 4. It is recommended that this team be part of RADP-Central and that the provision of this facility be included in this project's SoW. No other training involving pesticides will be permitted unless the syllabus and trainers are approved by the MEO.

All project beneficiaries who are expected to use USAID resources for pesticides will receive training. Information materials, such as leaflets and posters, in Dari and Pashtu, will be prepared and made available for those projects, such as those providing finance, who lack the relevant technical capacity.

Pesticide training should be provided to project and MAIL staff conducting crop trials and demonstrations.

Training and certification should be provided to retailers in districts where USAID agricultural projects are active. District PPQD staff should be included in such training.

If finance is provided to credit unions to enable them to provide loans to farmers for inputs, then the members of those credit unions should receive a training course on pesticides and informational material be made available to them.

If loans are provided to enterprises dealing in pesticides, then staff will receive pesticide training and the premises will be inspected to ensure that they conform to acceptable standards for the storage; handling, transport and sale of pesticides (see Annex I).

If loans are provided to processing enterprises using pesticides or preservatives, staff will receive pesticide training and the premises will be inspected.

Introduction of Better Products

The list of pesticides approved by this PERSUAP is a compromise based on the activities of previous and current projects and the expected activities of upcoming projects.

It is expected that this PERSAP will be reviewed annually. It is hoped that projects will constantly review their requirement for pesticides and suggest safer and more effective products for use within their IPM and other programs.

Research

There are many opportunities for the introduction of safer and more effective pesticides to Afghanistan. These include the use of microbial insect pathogens such as *Bacillus thuringiensis* and *Beauvaria bassiana*. Trials of these and others should be included within the research element of the USAID program.

ANNEX I: PESTICIDE RETAILER HANDBOOK

Pesticide Retailer

Handbook

Prepared by:

Incentives Driving Economic Alternatives for the North

August 2010

IDEA-NEW

New ideas for agriculture

TABLE OF CONTENT

1 Introduction 195
2 Dealing with Farmers 198
2.1 Good Service = Good Business 198
2.2 The Elements of Good Service 199
2.3 The Elements of Bad Service 199
3 Crop Management and Pest Management 199
3.1 Pests, Diseases and Weeds 200
3.2 Crop Management and Pest Management 200
3.3 Methods of Pest Management 202
3.4 Economic Principles of Pest Management 204
3.5 The Place of Pesticides in Pest Management 204
3.6 Causes of Failure of Pesticide Applications 205
4 Pesticide Laws and Regulations 206
4.1 International Laws and Agreements 206
4.2 National Legislation 207
4.3 'Private' Rules and Regulations 207
5 Pesticides and Formulations 208
5.1 Pesticide Names 208
5.2 Pesticide Classification 209
5.3 Pesticide Formulations 211
5.4 Adjuvants 216
6 The Container Label 217
6.1 Parts of the Label 217
6.2 Toxicity 218
6.3 Pictograms 218
7 Pesticide Application and Mixing 220
7.1 Objectives of Pesticide Application 220
7.2 Plant Coverage, Droplet Size, and Volume of Water 221
7.3 Effectiveness of Spray Applications 221
7.4 Nozzles 222
7.5 Sprayer Calibration and Maintenance 223
7.6 Comparisons of Sprayer Types 223
7.7 Mixing 225
8 Transport, Disposal and Spills 226
8.1 Transport 226
8.2 Disposal 226
8.3 Spills 227
9 Shop Organisation and Sales 228
9.1 Storage Hazards 228
9.2 Basic Principles for Storage and Display of Pesticides 228
9.3 Location and Construction of Buildings 229
9.4 Record Keeping and Stock Control 229
10 Risk, Health and Safety 230
10.1 How Pesticides Enter the Body 231
10.2 Common Ways of Pesticide Exposure 231
10.3 Harmful Effects of Pesticides 232
10.4 General Symptoms and Signs of Acute Pesticide Poisoning 233
10.5 First Aid 233

10.6 Protective Clothing 235
11 Environmental Aspects 236
11.1 Sources of Environmental Contamination 237
11.2 Pesticide Movement in the Environment 237
11.3 Sensitive Areas 237
11.4 Residues on Food Crops 238
Appendix I: Crop Management Practices for Crops in Northern Afghanistan 238
Appendix II: Container Labels – Layout Examples 247

INTRODUCTION

Pesticides are an important input for agricultural crop production. However, pesticides cost the farmer money to use, and are not the only means by which pests can be controlled. Farmers need to know how to use pesticides effectively and economically within an overall crop and pest management programme. Pesticide retailers can play an important role in providing farmers with this information, and by doing so will also improve their levels of service to farmers and the strength of their business.

In addition, pesticides are dangerous chemicals which need to be transported, stored, handled, and used with care so as to protect the user, bystanders, the food that we eat, and the environment.

Pesticide retailers thus need to know all the characteristics of the pesticide products that they are selling, how to handle and use them safely, the basic procedures in case of accidents, the different aspects of crop and pest management, and how pesticides fit into the overall crop production and protection programme.

A training scheme for pesticide retailers is being introduced to address these considerations. The objectives of the training scheme are to:

- Improve the standards of retailer knowledge and skills.
- Enable certified retailers to give better service to their customers (farmers and others).
- Assist certified retailers to be more competitive through a more satisfied customer base than non-certified retailers.
- Improve the government's perception of retailers, so that they are treated as responsible people.
- Assist in ensuring that pesticides are transported, stored, handled, sold, and used safely, effectively, and economically.

A retailer will become certified if he passes the standard test at the end of the training course to prove that he has the required knowledge about pesticides. This Handbook is intended to support the course contents, and contains all the necessary information to pass the test.

Note:
Additional information on various technical aspects is included in the Handbook in shaded boxes like this one. The contents of these boxes provide more detailed background material, but will not be included in the certification test.

Certain pesticides and pesticide products are mentioned in this Handbook.
These are for example purposes only, and are not a recommendation for the particular pesticide or pesticide product mentioned.

DEALING WITH FARMERS

Any business depends on its customers for success. The more customers that a business can attract, the more successful the business will be. Customers expect service when they come into a shop – if they receive good service they will use that shop instead of other shops.

GOOD SERVICE = GOOD BUSINESS

Information is given in the next section on how to help farmers reduce the amount of pesticides they use. As a retailer you may be asking yourself "Why should I help a farmer reduce the amount of pesticide he uses? It means I will sell less, and so make less profit - I should be trying to sell as much pesticide as possible."

Obviously, as a retailer, you want to have a successful business, which means selling pesticides and making a profit. But there are two ways of looking at this aspect of making a profit. One is to sell as much pesticide as possible to a small number of farmers, whether they need it or not. The other way is to attract as many farmers to the shop as possible, selling each one a smaller amount of pesticide, but actually selling a greater amount when combined over the larger number of farmer customers. Although the first way may be profitable in the short term, the second way will be much more profitable in the long term. The retailer should thus be looking at the second way, in order for his business to prosper and have a long term future.

So how do you attract farmers to your shop? Currently, farmers consider that pesticides sold by retailers are of poor quality, that advice on the selection and use of pesticides is not always given, and that the retailer just wants to take their money. In other words, farmers generally consider that retailers provide a poor level of service. To attract farmers to your shop, therefore, you must provide a better service than your competitors.

This means selling high quality pesticides at a reasonable price, selecting the right pesticide for the pest in question, and providing accurate and practical information on how to use and apply the pesticide.

Furthermore, although pesticides are an important input for agricultural crop production, they cost the farmer money to use and are not the only means by which pests can be controlled. Pesticides must be considered as one possible tool in an overall crop and pest management programme. If you can also provide the farmer with practical information on good crop management and how to reduce pest losses with minimum pesticide use and cost, then you will be giving him the service he needs.

Once farmers discover a retailer who provides good service, they will use that retailer rather than competitors who do not provide the same high level of service. They will also tell their friends which is the best retailer to use. It is up to you to provide the service that the farmer

wants, and to help him use pesticides effectively and economically. If you can do this, you will attract farmers to your shop, and have a successful and profitable business.

The Elements of Good Service

- Constant availability of good quality products at reasonable prices.
- Good quality, practical advice on pesticide selection and use, which is easily understood and remembered by the farmer.
- Knowledge of the farmers' problems, and appropriate solutions.
- The ability to ask questions to identify the problem.
- A well lit, clean, tidy shop, with products and posters attractively displayed so that the farmer can see what is available.
- Treating the farmer as a friend, and not as a source of money.
- Honesty in all dealings with the farmer.

THE ELEMENTS OF BAD SERVICE

The elements of bad service are the opposite of those of good service:

- Selling poor quality, out-of-date, or adulterated pesticides.
- Selling any pesticide, regardless of its suitability or the problem, because the farmer asks for the cheapest product, or because the retailer makes the most profit on that product.
- Providing no advice or help to the farmer in the selection of an appropriate solution or product for his problem.
- A dark, dirty, cluttered shop, with products badly displayed, and with leaking or damaged containers, or with no labels.
- Treating the farmer as ignorant, and as someone to just take money from.
- Dishonesty.

Crop Management and Pest Management

"Pests" can occur in many situations – for example in crops, where they cause damage and loss to produce; in houses and buildings, where they cause damage and loss to food, structures and fabrics; in public health, where they spread disease; and as general nuisance organisms.

Often, the first reaction to a pest situation is to use a pesticide. However, pesticides are only one solution to a pest problem. There are many other methods available, some of which have been used for hundreds of years – before modern pesticides became available. These other methods concentrate on producing a healthy crop, or on producing an environment which is unfavourable for pest populations. These methods can be implemented at little or no extra cost to the farmer, as they are often part of normal crop production practices

This section outlines these other methods of pest management, describes the place of pesticides in the overall pest management strategy, and gives the principles for effective and economic pesticide use. Although many of the examples given refer to crop protection, the

underlying principles apply in almost any pest situation, be that in the field, a house, or wherever.

Pests, Diseases and Weeds

First of all, we must understand what is meant by a pest. An insect pest, a disease or a weed is any organism that:

- Competes in any manner with humans, domestic animals or useful plants.
- Injures humans, domestic animals, useful plants, structures or possessions.
- Spreads disease to humans, animals or plants.
- Annoys humans or animals.

Put simply, a pest can be defined as: **'Any organism which affects man, his crops, his livestock, or anything he considers to be of value.'**

From this, we can see no organism is inherently a "pest". To call something a pest is subjective, and depends on the situation in which the organism is found. For example, bees are useful insects as they pollinate flowering plants and produce honey. However, if bees build a nest in a house, then in that situation they would be considered to be a pest.

The types of pests include:

Insects	Aphids, beetles, caterpillars, mosquitoes, cockroaches, etc
Insect-like organisms	Mites, spiders, ticks, etc
Weeds	Any plant growing where it is not wanted
Molluscs	Slugs, snails, etc
Vertebrates	Rats, birds, etc
Microbial organisms	Bacteria, fungi, nematodes, viruses (which cause plant diseases)

In this Handbook, 'pest' is often used as a general term to include insect pests, weeds and diseases

CROP MANAGEMENT AND PEST MANAGEMENT

The potential yield of a crop depends on the genetic makeup of the seed. High quality seeds have higher yield potential. The final yield of a crop depends on this genetic potential and how well subsequent crop and pest management practices are implemented.

Crop management includes all the operations, activities and practices that are implemented to grow a crop and produce a yield. These include:

- Selection of a suitable site and soil type for the crop to be grown.
- Use of crop rotations to maintain soil fertility and structure.
- Appropriate land preparation for the crop to be grown.
- Use of certified, clean seed, seedlings or root stocks that are suitable for local production, climatic, and market conditions.
- Where appropriate, transplanting at the correct time.
- Planting at the correct time.
- Using the correct plant spacing.
- Where appropriate, thinning at the correct growth stage.
- Keeping the field free of weeds or maintaining a cover crop, as appropriate.
- Using organic manures to maintain or increase soil organic matter.
- Using the correct amounts of artificial fertiliser at the correct times to meet crop needs and allow for nutrients removed from the field in produce or as crop residues.
- Using the correct amounts of irrigation water at the correct times.
- Minimising losses and damage caused by insect pests, diseases and weeds.
- Pruning of vines and orchards to stimulate production, and improve aeration and sun penetration.
- Trellising of suitable crops to stimulate production, and improve aeration and sun penetration.

To produce a strong and healthy crop with a yield as close as possible to the potential yield, all crop management practices must be implemented in an optimal manner. If any of the practices are implemented below optimum levels, then crop vigour and final yield are reduced.

Minimising losses caused by insect pests, diseases and weeds is also a part of crop management, but is only one element of many. In addition, one factor of pest management that is often misunderstood is that:

Pest management does not increase the yield potential of a crop,

It only protects the crop against loss or damage

A fundamental of good pest management is thus to produce a strong healthy crop by optimising all crop management practices.

Crop management and pest management are thus inter-linked, and each has an effect on the other. As an example, if plants are grown too close together, there is not only competition between them so that yields are reduced, but also the close spacing both provides an environment which encourages insect pests and diseases, and in addition makes spray penetration difficult so that pesticide applications are less effective.

METHODS OF PEST MANAGEMENT

Cultural control includes those practices which optimise plant growing conditions, or produce unfavourable conditions for pests. Optimal growing conditions provide a healthy crop which is more able to resist pest attack.

- **Time of planting.** Planting at the correct time promotes healthy plant growth and avoids periods of attack by major pests, such as early planting of cotton to avoid late season bollworm attack.

- **Timing and amount of fertiliser.** Wrongly timed or excess fertiliser can promote vegetative and dense plant growth which encourages pests such as aphids and whitefly.

- **Timing and amount of irrigation.** Similarly to fertiliser, wrongly timed or excess irrigation can promote vegetative plant growth which encourages pests and diseases such as aphids and whitefly in cotton, and blight in tomatoes.

- **Plant spacing and density.** Plants sown too close together are weaker and more susceptible to pest attack. Too close spacing also provides suitable micro-climate conditions within the crop for the build-up of pests and diseases, such as aphids and whitefly in cotton, and blight in tomatoes

- **Pruning of tree and vine crops.** Allows more air and light, and lowers humidity so that diseases and pests are discouraged.

- **Crop rotation.** Helps to minimise the build-up of soil pests, weeds and diseases, such as nematodes, orabanche, fusarium, and root rots.

- **Thinning of seedlings.** When seedlings are thinned too late, the plants are weaker and more susceptible to pest attack.

- **Trap crops.** Can attract pests away from the main crop, and provide sources of beneficial insects.

Sanitation helps to prevent and suppress pests by removing or preventing access to sources of food and shelter. Practices include:

- Ploughing-in or burning of crop residues and fallen leaves, fruit and branches.
- Removal of food sources such as seed and grain (after both planting and harvesting); cleanliness in the store, house or kitchen; good management of animal manure, etc.
- Using clean certified seed, which has no weed seeds.
- Using nets, screens, rodent proof grain stores, etc.

Resistant crop varieties have in-built resistance or tolerance to attack by certain pests. The degree of resistance can vary from slight to almost complete. A resistant variety is resistant to some pests, but not all pests. Resistance mechanisms work in three main ways:

- Chemicals in the plant repel the pest, or prevent it from completing its life cycle.
- The plant is more vigorous or tolerant than other varieties, and thus suffers less damage from pest attack.
- The plant has physical characteristics that make it more difficult for the pest to attack it.

Examples are varieties of tomatoes tolerant to virus diseases and fusarium wilt.

Mechanical control is sometimes called physical control, and involves the use of machines or other tools.

- Soil cultivation and tillage, which physically kills some pests, buries them, or exposes them to drying conditions on the soil surface or as food for birds or other predators.
- Soil cultivation also kills weed seedlings, and buries potential food sources for insect pests.
- Traps, such as rat traps and sticky insect traps.

Biological control involves the use of natural enemies of pests – predators and parasites (also called beneficial insects) – and encouraging their development. Some pests must always be available to provide a food supply, and there is a time lag between the increase of a pest population and the increase of natural enemies. Biological control also includes methods by which the pest is biologically changed.

- Predators (ladybirds, spiders, lacewings, birds etc) are the most commonly observed natural enemies, but parasites (parasitic wasps, flies etc) often have the greater control effect.
- Natural enemies can be encouraged by using pesticides only when necessary, particularly early in a crop season, and leaving “refuge habitats” around fields where natural enemies can shelter and find food.
- Natural enemies are often common in fields which have not been sprayed with a pesticide. They will often reduce a pest population on their own, without the need for pesticides.
- Diseases of pests caused by viruses, bacteria, fungi and nematodes also control pest populations.
- Pests can be biologically changed by the use of Insect Growth Regulators, which prevent the pest from developing from one stage to another, and by pheromone mating disruption, which prevents the adults’ pests from finding one another to mate.

Chemical control is the use of pesticides, which kill pests, control their activity, or prevent them from causing damage.

- The advantage of pesticides is that they provide the quickest and most effective solution to an existing pest problem, with a result that is easily seen by the farmer.

- The disadvantages of pesticides are that they provide only a temporary solution, are costly, involve a hazard in use, kill natural enemies of pests, and can cause pest resurgence. In addition, excessive use can result in pests developing resistance to pesticides.
- All the other methods of pest control should first be utilised to keep pest populations as low as possible, and pesticides used only when these methods have not been completely successful.

Following a pesticide application, pest numbers may be reduced for short periods but then rapidly increase to much higher levels than were present before the application. This is known as **pest resurgence**, and is due to the pesticide killing the natural enemies of the pest, as well as most, but not all, the pests. The removal of the natural control allows the pests to multiply too much higher levels than before.

In addition, pests may be present which problems are not normally as their numbers are kept low by natural enemies. With the use of pesticides, this control is removed and they can develop from **secondary pests** to become a major pest problem.

ECONOMIC PRINCIPLES OF PEST MANAGEMENT

A farmer grows a crop as a food supply or to make money. In either case, he wants to maximise his yield or profit, and needs to consider both in economic terms.

- Pesticides are an input in crop production, and cost the farmer money. The more he spends on inputs, including pesticides, the less profit he makes.
- Profit = Value of harvested crop – Cost of production.
- Inputs, including pesticides, need to be used effectively and economically. In other words, the farmer should only use inputs when they will give an economic benefit. As an example from another aspect of crop production, a crop needs water but irrigating every day, or more often than is necessary, does not increase yields. Similarly spraying every day, or more often than is necessary, will not provide increased levels of crop protection.
- Pesticides should thus only be used when pests reach a level where the value of the crop that will be lost is greater than the cost of the pesticide application. The use of a pesticide in this case will give a RETURN on the farmers investment in pesticide use.
- If pests are at a low level, where the value of the crop that will be lost is less than the cost of a pesticide application, the farmer will LOSE money by using a pesticide.

THE PLACE OF PESTICIDES IN PEST MANAGEMENT

Efficient, effective and safe pest management is not a case of “See a pest - spray a pesticide”. It is a case of using all available techniques, all of which play a part in keeping pests at levels below those which cause economic damage or loss. Pesticides are an integral part of pest management, but they are the last, not the first, line of defence against pests. The first line of defence against pests is all the other crop and pest management practices that can be used.

Many crop management practices can reduce the numbers or effects of pests, and involve no extra expense for the farmer. In addition, the use of a range of tactics causes the least disruption to the eco-system, which enables the organisms in the system (plants, beneficial insects, pests) to maintain a balance. It is when this balance is upset, and pest numbers increase to economically damaging levels, that pesticides may have to be used.

The advantages of pesticides are that they provide an effective and quick reduction of pests when numbers reach economically damaging levels, they can control several pests at the same time, and they are easy to use.

The disadvantages of pesticides are that they provide only a temporary solution, are costly, involve a hazard in use and to the environment, kill natural enemies of pests, kill pollinators such as bees, can cause pest resurgence, and excessive use can result in pest resistance.

For economic and effective pest management, therefore, pesticides are used only when necessary - and only when pests are causing economic loss or damage. Crop monitoring and application thresholds are used to determine pest numbers and to time applications at the most vulnerable pest stage. If a pesticide is used, it should be selective, of low persistence and of low toxicity.

No attempt should ever be made to eradicate a pest with pesticides, as this is almost impossible to achieve. In addition, small numbers of pests are required to provide a food source for natural enemies.

Causes of Failure of Pesticide Applications Sometimes a pesticide application fails to reduce the level of a pest. In Afghanistan at present this may be due to low quality, fraudulent, or adulterated pesticides. Retailers have a responsibility to their farmer customers to sell only recognised products of high quality when a high quality pesticide is used and fails to reduce the levels of a pest, the common causes are:

INCORRECT PESTICIDE FOR THE PEST

The pest has been correctly identified, but a pesticide has been selected and used which has no effect on the pest. This may be due to the farmer wanting to use a cheap pesticide, or having been given poor advice. Alternatively, the pest has been not been correctly identified, and, although the correct pesticide has been selected and used for the identified pest, the pesticide has no effect on the actual pest which is present.

- **Incorrect timing of the application**. The pest population is not at a susceptible stage. For example, late stage caterpillars are much harder, or impossible, to kill with the recommended pesticide dose.

- **Incorrect dose rate**. A dose rate has been used which is too low to kill the pests. This may occur if the farmer is trying to save money by using less pesticide than recommended, or because of poor application.

- **Incorrect application**. The pesticide has not been applied correctly, so that the pesticide is not applied to the right place where the pest is present (for example, whitefly under the leaves and most of the pesticide applied to the top of the leaves), or has not been applied evenly over the crop, so that there are areas of over- and under-dosing. Other possibilities are poorly calibrated or badly maintained spray equipment which apply an incorrect dose rate.

An additional possible cause of failure with systemic pesticides (see Section 0) is that the plants are under stress so that there is little absorption or movement of the pesticide in the plant. This can apply to insecticides, herbicides and fungicides.

PESTICIDE LAWS AND REGULATIONS

Pesticides are hazardous materials. They are controlled through laws and regulations in order to ensure safe manufacture, transport, storage and use, and to minimise the risks to handlers, users, bystanders, consumers of agricultural products, and the environment.

Laws and regulations also ensure the quality and effectiveness of pesticides available on the market.

INTERNATIONAL LAWS AND AGREEMENTS

There are many international laws, agreements, and conventions which either directly or indirectly affect the distribution and use of pesticides. Some are legally binding on a country as it has signed the agreement to indicate that it will implement the contents.

Examples are:

- The Rotterdam Convention of the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (FAO and UNEP). Includes 29 banned or severely restricted pesticides, 2 of which are sold by retailers in Afghanistan. A legally binding Convention. Afghanistan is not a signatory.

- The International Code of Conduct on the Distribution and Use of Pesticides (FAO). For both governments and industry (including retailers). Not legally binding.

NATIONAL LEGISLATION

The majority of countries have their own national legislation which regulates all aspects of pesticide manufacture, distribution, sale and use. Examples of these aspects are given in the list below. Afghanistan is in the process of developing such legislation, and will probably include similar aspects.

- International trade in pesticides
- Roles and responsibilities of regulating authorities
- Requirements for manufacturing and storage facilities, and licensing procedures for such premises
- Requirements for the registration of a pesticide
- Requirements for container labelling and materials
- Control of pesticides imported and sold based on the above criteria
- Licensing and certification of retailers
- Requirements for pesticide retail premises and licensing procedures
- Establishment of Maximum Residue Levels (MRLs) on agricultural produce for consumption and use.
- Record keeping
- Training of handlers, retailers, applicators, users
- Control of pesticide advertising and effectiveness claims
- Offences and penalties for breaking the laws and regulations

National legislation usually also includes the maximum residue levels (MRL) which are allowed on agricultural produce of the pesticides registered in that country. These MRLs also apply to produce which is imported into the country; this has impacts on exporting countries as their produce must meet the requirements of the importing country. The consignment will be rejected if pesticide residues exceed the specified limits or if residues of non-registered pesticides are present.

In Europe and America these requirements are strict. In the Gulf countries and Asia the requirements are becoming more comprehensive and stricter.

'PRIVATE' RULES AND REGULATIONS

Major supermarket chains have their own requirements for produce quality because of consumer concerns about pesticide residues. These requirements are even stricter than national requirements, and also usually require that producers are certified under such programmes as GlobalGAP.

GlobalGAP is a pre-farmgate standard, covering <u>all</u> aspects of production from inputs such as seed or animal feed, together with all production activities until the produce leaves the farm. It also requires extensive documentation to be completed during the production process. Producers are certified by external inspectors, either as individuals or as groups.

These national and 'private' rules and regulations must be taken into consideration when developing Afghanistan export crops. Pesticide retailers can help farmers, and the Afghan economy, by providing only reputable pesticides of high quality, together with advice on the actual need for a pesticide to be applied, the correct pesticide to use for each crop and pest, the correct dose rate, and the interval required between a pesticide application and harvest.

Pesticides and Formulations

We can define a pesticide as any substance which is used to either directly control a pest population, or to prevent or reduce damage or loss caused by pests. Not all pesticides directly kill the pest; some may inhibit its growth or repel it.

Pesticide Names

A pesticide may be referred to by several different names, which can cause confusion.

Active Ingredient Only a certain component of a pesticide product has activity against pests. This component is called the active ingredient. There may be more than one active ingredient in a formulation.

Chemical name each active ingredient is given a chemical name which describes the actual chemical composition. This name is often long and complicated. It may appear on the label in brackets.

Common name each active ingredient is given an internationally recognised common chemical name that is much easier to use and remember than the chemical name. A specific common name always refers to the same active ingredient, regardless of the manufacturer of the product. Common names are always given on the label.

Product or Trade name Manufacturers give their own name to their products containing a particular active ingredient. It is the product name which appears in large print on the label.

Examples of pesticide names are:

Chemical Name: alpha-cyano-3-phenoxybenzyl-3-(2-chloro-3, 3, 3-trifluoroprop-1-enyl)-2, 2-dimethylcyclopropanecarboxylate

Common Name: Lambda Cyhalothrin

Product Name: Lambda Cyhalothrin, Icon, Super Top

Common Name: Malathion

Product Name: Denadoul, Dimethione, Fifanoun, Killer, Malathion, Super Malathion, Super Sure, Super Dithio

Pesticide manufacturers often use only slightly different names for products containing different active ingredients. For example, products beginning with "Sumi-" are manufactured by Sumitomo (Japan). Also, different formulations of the same active ingredient may be registered for use on different crops. For example, an emulsifiable concentrate formulation may be phytotoxic to a crop while the wettable powder formulation is not.

Pesticide Classification

Pesticides may be classified in several ways, each way having its own special purpose. Examples of classification are:

Type of pest controlled

Insecticides	Control insects.
Fungicides	Control fungi.
Herbicides	Control weeds.
Acaricides	Control mites.
Rodenticides	Control rodents (rats, mice).
Molluscicides	Control snails.
Nematicides	Control nematodes.

Chemical group

Insecticides:

Inorganic Pesticides which do not contain carbon, they commonly contain arsenic, copper, mercury, sulphur, tin or zinc. Many of these compounds are now banned or have severely limited uses.

Examples are Kumulus-DF (sulphur)

Organic Pesticides which contain carbon, some are derived directly from plants and other living material, but most are synthetic in that they have been developed by man. They are the most commonly used pesticides.

- Organophosphates Examples are Chlorpyrifos and Dimethoate
- Carbamates Examples are Carbaryl.
- Pyrethroids Examples are Deltamethrin and Lambda-Cyhalothrin.

Biological / Contain bacteria, fungi, protozoa or viruses, such as *Bacillus thuringiensis*

Microbial and Abamectin

Botanical Obtained from plant extracts, such as rotenone, neem, and pyrethrum.

Herbicides

Herbicides have many different chemical groups, the most common of which include triazines, substituted ureas, and sulfonylureas.

Fungicides

As with herbicides, fungicides have many different chemical groups. Common groups are inorganic and dithiocarbamates.

- Inorganic Examples are wettable sulphur.

- Dithiocarbamates Examples are Thiram

Toxicity

Toxicity is the measure of how poisonous the pesticide is to man. High toxicity to man does not necessarily mean that the pesticide is highly toxic to the pest. Formulations are usually less toxic than the pure active ingredient, although with some formulations one or more of the inert ingredients (for example, oil-based solvents) can be more toxic than the active ingredient. The World Health Organisation (WHO) classification is most commonly used, but there are other classifications, such as national systems.

WHO Classification

Class Ia	"Extremely Hazardous"
Class Ib	"Highly Hazardous"
Class II	"Moderately Hazardous"
Class III	"Slightly Hazardous"
[no class]	"Unlikely to Present Acute Hazard in Normal Use"

The toxicity warning on the product label normally refers to the formulation, not the active ingredient.

Mode of action

Contact

The target pest is killed when it comes into direct contact with the pesticide. The pesticide is usually applied to a surface, such as leaves, but may be applied as aerial droplets, for example for flying mosquito or locust control. For a given volume of spray, the more drops per square

centimetre of treated surface, the better the effectiveness of the pesticide. Most insecticides are contact pesticides. Good under leaf cover is essential for the control of insect pests such as aphids, whiteflies and spider mites, while good overall plant cover is essential for control of weeds and diseases.

Stomach

Insect pests must eat the pesticide to be killed. Most insect contact pesticides are also stomach poisons.

Systemic

A pesticide that is absorbed and moved within a plant, applied to leaf surfaces or to the soil. Within a leaf, movement is mainly from the upper to lower leaf surface. There is very little movement down the plant, so overall plant coverage is essential for pests in the lower parts of the crop. Absorption by the plant is reduced if the plants are under stress. Insect pests are killed when they feed on the plant. Herbicides are largely systemic pesticides, which kill the weed when they are absorbed.

Vapour action

A pesticide in vapour or gas form in the air which the pest breathes in. Used as space treatments in enclosed areas such as greenhouses, houses etc.

Selectivity

Selective

Selective pesticides control only a limited range of pests, but have little or no activity on other or similar species. While this classification can refer to all pesticides, it is most commonly used for herbicides to identify those which kill the weed species while leaving the crop plants unharmed. Selective insecticides kill the target pest but leave beneficial insects unharmed.

Selectivity can be lost if too high a dose rate is used, particularly with herbicides, resulting in damage to crop plants.

Broad Spectrum

Broad spectrum pesticides control a wide range of pests, but also many non-pest species. Broad spectrum pesticides kill beneficial insects as well as pests, while broad spectrum herbicides kill crop plants as well as weeds.

Pesticide Formulations

Active ingredients are rarely applied in a pure form. Instead, the manufacturer mixes the active ingredient with various other components to make a pesticide formulation. This is done in order to dilute the active ingredient, and to make the product safer and more effective, or

easier to measure, mix and apply, or to improve storage. The other components are referred to as inert ingredients, as they have no effect on pests.

Some inert ingredients, such as petroleum based solvents, may be more toxic to humans and crop plants than the active ingredient. More recent formulations, such as suspension concentrates (SC), water dispersible granules (WG), and microgranules (MG), have no hazardous inert ingredients, and also posses improved stability properties.

The properties of a formulation, including effectiveness and safety, depend on the use of high quality ingredients and closely controlled manufacturing processes. In Afghanistan many of the products in the market are sub-standard, counterfeit or fraudulent, with low quality ingredients and manufacturing processes.

Problems associated with sub-standard formulations include:

Poor quality active ingredient which has reduced effectiveness,

A lower concentration of active ingredient than that indicated on the label.

No active ingredient in the product.

Excessive, often highly toxic, by-products of the active ingredient manufacturing process in the formulation break down of the formulation in the container during storage. In Afghanistan, this is made worse by the high temperatures prevailing for much of the year.

Separation out of the spray mix of emulsifiable concentrate formulations saettling out of the spray mix of powder formulations, damage or total loss of crops by the product not being effective or phytotoxic,

For effective pest management and safety in use, only high quality formulations from reputable manufacturers should be used.

The same active ingredient may be available in several different formulations. One formulation may be safer to handle or more suitable for a given situation than another formulation of the same active ingredient. Also, different formulations of the same active ingredient may be registered for use on different crops. For example, an emulsifiable concentrate formulation may be phytotoxic to a certain crop while the wettable powder formulation is not.

The common types of formulations are:

Emulsifiable Concentrate (EC)

Liquid formulations where the active ingredient is dissolved in a petroleum solvent. The formulation is diluted with water to form an emulsion for application. Usually contain 25 to 75 percent of active ingredient. ECs are among the most common pesticide formulations.

Advantages	**Disadvantages**
Easy to handle, transport and store Can be used with most types of application equipment Little agitation needed in spray tank, does not settle out Not abrasive to nozzles and pumps Do not block filters or nozzles	Usually high concentration in the formulation Mixers need more protective clothing than applicators Easy to over- or under-dose due to mixing and calibration errors May cause phytotoxicity to crops Easily absorbed through the skin Solvents may attack rubber, plastic, hoses, gaskets etc Flammable
Wettable Powder (WP) Dry formulations of fine, insoluble powders. The active ingredient is combined with an inert carrier such as clay or talc, together with wetting and/or dispersing agents. The formulation is diluted with water to form a suspension for application. Usually contain more than 50 percent active ingredient. WPs are among the most common pesticide formulations.	
Advantages	**Disadvantages**
Easy to handle, transport and store Can be used with most types of application equipment Easily measured and mixed Usually less phytotoxic than ECs Absorbed less readily through the skin than ECs	Mixers need more protective clothing than applicators Require constant agitation in the spray tank, or they quickly settle out Abrasive to nozzles and pumps Can clog filters and nozzles Risk of inhaling powder during mixing Inert carriers may leave a deposit on crops, which has to be removed before marketing
Suspension Concentrate (SC) Used for active ingredients those are not soluble in the more common solvents. They are	

mixed on a carrier, such as clay, and formulated with a liquid to form a thick, paste-like suspension. The formulation is diluted with water to form a suspension for application. They combine the advantages and disadvantages of both ECs and WPs.	
Advantages Easy to handle, transport and store Can be used with most types of application equipment Easily measured and mixed Usually less phytotoxic than ECs Absorbed less readily through the skin than ECs	**Disadvantages** Mixers need more protective clothing than applicators Container must be shaken before use to remix formulation More difficult to accurately measure when mixing than ECs Require moderate agitation in the spray tank, or they settle out May be abrasive to nozzles and pumps May clog filters and nozzles Inert carriers may leave a deposit on crops, which has to be removed before marketing
Seed Dressings (DS, ES, FS, LS, PS, SS, WS) Dry or liquid formulations for application to seeds prior to planting. Dry formulations usually require no further dilution (SS formulations require dilution with water), liquid formulations usually, but not always, require dilution with water. PS formulations are pre-dressed seed.	
Advantages Depending on formulation, similar to EC, WP, SC formulations. Can be applied to seed on-farm with simple equipment. Help to avoid early season foliar sprays, and so protect beneficial insects.	**Disadvantages** Depending on formulation, similar to EC, WP, SC formulations. Bulk treatment of seed requires specialist treatment equipment. Treated seed may be eaten by humans, domestic animals, wildlife.

Granule (G)	
Granule formulations are similar to dusts, except that the particles are larger and heavier. The active ingredient may be coated on the outside or absorbed into the particles. They are applied without any further dilution, and usually contain 1 to 15 percent of active ingredient. They are most commonly used for soil application to control weeds, nematodes and soil living insects.	
Advantages	**Disadvantages**
Ready to use, no mixing needed Slow release of pesticide gives extended protection Low risk of drift Little hazard in use to applicator Require only simple application equipment	Do not stick to foliage or other non-level surfaces May need to be incorporated in soil Can be difficult to obtain even distribution over the target area Slow release of pesticide results in long persistence May be hazardous to non-target animals such as chickens and other birds who mistake granules for food grain
Bait (B)	
An active ingredient mixed with food or other attractant material. The bait may be sold pre-mixed, or the pesticide and bait material mixed by the user. Pests are killed by eating the pesticide contained in the bait, either in a single dose, or over time. The concentration of active material is low, usually less than 5 percent. Commonly used in indoor situations, but may be used in agriculture, such as for control of cutworm.	
Advantages	**Disadvantages**
May be ready to use Little pesticide needed – bait applied only where pests are present and pests are attracted to the pesticide	Can be attractive to non-target organisms (domestic animals, children etc) Pests may prefer other food or crop to the bait

Fumigant (F)	
Pesticides that form poisonous gases. May be a liquid under high pressure that changes to a gas when released, or a volatile liquid, or a solid that releases a gas under high humidity. Used for structural pest control, food and grain storage, soil sterilization, and greenhouses.	
Advantages Toxic to a wide range of pests. Can penetrate cracks, wood, soil and grain. Single treatment will usually kill most pests in the treated area	**Disadvantages** Target site must be covered and airtight to prevent the gas from escaping. Highly toxic to humans and all other living organisms. Need specialised protective clothing, including respirators. Need specialised application equipment

Soluble	A substance that will dissolve in a *solvent* to form a *solution*. For example, sugar is soluble in water or tea.
Emulsion	A mixture of two liquids in which particles of one liquid are suspended evenly throughout the other. For example, the butter fat in milk.
Suspension	Fine particles of a solid suspended in a liquid. For example, mud in a river.

When a spray mix is prepared emulsifiable concentrates will quickly separate into the constituent liquids and wettable powders will quickly settle out of suspension if sub-standard ingredients and/or manufacturing processes have been used in the production of the pesticide formulation.

Adjuvants

Adjuvants are chemicals incorporated in a pesticide formulation, or added to the tank mix, to increase effectiveness and safety. They generally have no pesticidal effect.

Emulsifiers	Help emulsifiable concentrates to mix better with water
Wetting agents	Help wettable powders to mix better with water, and help formulations spread on water repellent surfaces
Spreaders	Help the pesticide to spread evenly over the sprayed surface
Stickers	Help the pesticide to stick to the sprayed surface

THE CONTAINER LABEL

Most pesticides in Afghanistan do not have adequate labels. Such labels are indicative of low quality pesticides. As noted in Section 0, Afghanistan is in process of developing a pesticide Law and Regulations, which will include adequate labelling.

The label on a high quality pesticide from a reputable manufacturer is the primary source of information about a product. Such a label has all the basic information that is needed – the trade name, the active ingredient, the concentration of active ingredient, the crops and pests for which the product is registered, the dose rates, the toxicity, the safety precautions, the pre-harvest intervals, the expiry date, the name of the manufacturer and importer.

When selling a pesticide, the retailer is responsible for giving advice on safe and effective use according to the product label. If a farmer is asking questions or you are giving advice, do not rely on memory. It is too easy to make a mistake. Read the label every time to make sure that the advice you give is correct.

PARTS OF THE LABEL

The lay-out of the pesticide label varies between countries. There may be one, two, or three panels, sometimes separated by boxes or lines, with each panel having a different type of information. Example layouts are given in Appendix II.

Regardless of the type of layout, every label on a pesticide container from a reputable manufacturer or source will have the following information:

- Product name of the pesticide.
- Name of the active ingredient(s) in the product.
- Percentage concentration of active ingredient in the product.
- Percentage concentration of inert materials in the product.
- Toxicity of the product.
- Crops and pests for which the product is registered for use.
- Dose or application rates to use.
- Safety precautions to follow when mixing and applying.

- First aid measures and antidotes.
- Pre-harvest interval.
- Date of manufacture, batch number, and expiry date.
- Product registration number
- Name of the manufacturer or importer and contact details.

Also along the bottom of the label should be pictograms, which give information in a graphical format about the precautions to be taken when using the product, and which complement the statements in the label text.

Many pesticides in Afghanistan do not have labels which meet these criteria, which is indicative of a low quality or fraudulent pesticide.

TOXICITY

The FAO Guidelines on Good Labelling Practice for Pesticides include a hazard statement, a symbol, and often a band colour for labels based on the WHO classification system. This system is followed in many countries, although some countries have their own system.

WHO Class (1)		**Label**		
		Hazard statement	**Symbol**	**Band Colour** (2)
Ia	Extremely Hazardous	Very Toxic		Red
Ib	Highly Hazardous	Toxic		Red
II	Moderately Hazardous	Harmful		Yellow
III	Slightly Hazardous	Caution	None	Blue
	Products unlikely to present a hazard in normal use	Caution	None	Green

(1) The hazard warning on the label refers to the formulation, not the active ingredient.
(2) This is the most commonly used colour scheme, but may differ in some countries.

PICTOGRAMS

The pictograms on the label are intended to provide graphical advice and warnings concerning the product. They should be in a band across the bottom of the label, one section of the band being concerned with mixing, one with application, and one with general warnings and information.

The meanings of the most common pictograms are as follows:

Storage			
Keep locked away and out of reach of children			
Activity			
Handling liquid concentrate	Handling dry concentrate	Application	
Advice			
Wear gloves	Wear boots	Wear eye protection	Wear face shield
Wear mask	Wear respirator	Wear overalls	Wear Apron
Wash after use			
Warning			
Dangerous to animals	Dangerous to fish and water		

Examples of colour bands and possible pictograms for some WHO toxicity classifications are given in Appendix II.

PESTICIDE APPLICATION AND MIXING

The effectiveness of a pesticide in controlling a pest depends on:

- Using the right pesticide for the target pest (Selection)
- Applying the pesticide at the right time (Pest Scouting / Monitoring)
- Applying the pesticide in the right amount (Mixing / Application)
- Applying the pesticide to the right place (Application)

If any of these factors is wrong, the effectiveness of the pesticide application will be reduced, control of the pest will be poor, costs will be increased, and additional (probably also incorrect) applications will be applied. Farmers may often complain that a pesticide did not work, blaming the pesticide itself, when one of the above factors was wrong.

Two of the factors are concerned with application, emphasising the need of correct application for a pesticide to be fully effective.

OBJECTIVES OF PESTICIDE APPLICATION

The objectives of applying a pesticide are to:

- Protect the crop from economic damage or loss
- To do this in the most effective and economic way. Pesticides cost money – they must be used effectively to give the farmer a return on his investment.

The final target for a pesticide is the pest. An intermediate target is often the plant surface. The pesticide must thus be taken from the container in which it was purchased and transmitted to the pest. This can be done in various ways, but the most common method in crops is by spray application.

Spay application involves:

- Mixing the pesticide with a carrier to dilute it and carry it to the target. The carrier is commonly water, or a mixture of water and air.
- Putting the spray mix into a sprayer.
- Using the sprayer to break the spray mix into droplets, usually by passing it through a nozzle.
- Using the energy of the droplets themselves, or natural or artificial air movement, to carry the droplets to the target.

For the pesticide to be most effective there must be sufficient numbers of droplets containing the pesticide applied evenly over each plant in the target area or field. This gives the greatest opportunity for a mobile pest, such as leafworm, to come into contact with the pesticide, for the pesticide to directly contact immobile pests such as aphid, or, in the case of systemic pesticides, to be translocated throughout the plant.

If the pesticide is not applied evenly:

- Areas on the plant and in the field will be under-dosed so that many of the pests are not killed. Crop losses will not be prevented, and costs of control are increased.
- Areas on the plant and in the field will be over-dosed so that excess pesticide is wasted. Costs of control are increased.
- Particularly with underleaf pests (aphid, whitefly, some diseases, etc) there must be good coverage of the lower leaf surface for contact pesticides to be effective.
- If the target area is limited, for example aphids only in parts of the field or application to young seedlings, then spot- and band-spraying can save pesticide, water, and time.

PLANT COVERAGE, DROPLET SIZE, AND VOLUME OF WATER

The objective of spray application is to get the pesticide to the target pest, not to drown the pest with water. It is not necessary to use large volumes of water to evenly cover the plants and field, as "washing" the plants results in large amounts of pesticide running off to the ground, where it is wasted, is money thrown away, and causes environmental contamination.

The spray mix is broken into droplets by the sprayer. It is not the volume of water or spray mix that is important, <u>but the number of droplets which are deposited per unit area on the plant</u>. Providing there are sufficient droplets on the plant, each one of which contains pesticide, then effective plant coverage will be obtained and the pesticide will be effective in controlling the pest. If droplet size is halved, then eight times as many droplets will be produced from the same volume of spray mix.

Droplets can be large or small in size.

- If large droplets are produced by the sprayer, to achieve the required number on the plant a large volume of water is needed.
- If small droplets are produced by the sprayer, to achieve the required number on the plant only a small volume of water is needed.

The smaller the droplet, the further it will drift. Very small droplets are thus used for control of locusts and sunn pest using drift spraying with ULV sprayers and formulations. Large droplets are used with herbicides as drift must be avoided because of the risk to adjacent crops.

In general, large droplets are used for the application of herbicides, so as to minimise drift, while small droplets are used for the application of insecticides, fungicides and acaricides to optimise crop penetration and underleaf cover.

EFFECTIVENESS OF SPRAY APPLICATIONS

Effective spray application is essential for the pesticide to have the greatest effect and to minimise costs.

To illustrate this, on average less than 1 per cent of the pesticide applied actually reaches the pest population.

- If, through poor application, only 0.5 per cent of the pesticide reaches the pest population, the effectiveness of the pesticide is halved, twice the amount is needed to obtain effective control, and the costs are doubled.
- If this can be increased to 2 per cent by more effective spray application, the effectiveness of the pesticide is doubled, only half the amount will be needed, and the costs are halved.

Small changes in the proportion of pesticide applied which actually reaches the pest population thus result in huge changes in effectiveness and costs.

NOZZLES

Different types of nozzles are used for different purposes. The size of the droplets produced depends on the size of the hole in the nozzle and the spray pressure. For any type of nozzle, the larger the hole and the lower the pressure, the larger the size of the droplets produced. Nozzles are generally described by the shape of the spray pattern produced. The most common types are:

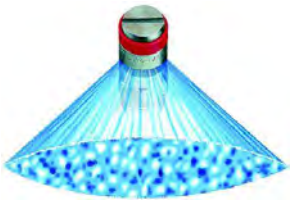
Full Cone /
Hollow cone

- Produce a cone shaped spray pattern. With a full cone nozzle, the full area of the cone has spray droplets, with a hollow cone the droplets are only on the outside of the cone.
- Full cone nozzles are usually fitted only to air-blast sprayers, hollow cone nozzles are used with hand operated knapsack equipment.
- Droplet size tends to be small, and there is a risk of spray drift.
- Used at higher pressures than flat fan or deflector nozzles.
- Most commonly used for application of insecticides, acaricides and fungicides.

Flat fan /
Even spray flat fan

- Produce a fan shaped spray pattern.
- Droplet size tends to be large, with a low risk of spray drift.
- Flat fan nozzles deposit most spray directly under the nozzle tip. They are thus used on tractor mounted boom sprayers, where several nozzles can overlap, producing an even spray pattern. Not suitable for single use with hand operated equipment.
- “Even spray” flat fan nozzles produce an even deposit of spray across the fan, and are thus suitable for hand operated equipment.
- Most commonly used for the application of herbicides.
- May reduce the efficacy of insecticide, acaricide and fungicide application.

Deflector



- Also known as “flooding” or “anvil” nozzles.
- Produce a fan shaped spray pattern.
- Droplet size tends to be large, with a low risk of spray drift.
- Give a relatively even deposit of spray across the fan.
- Most commonly used for the application of herbicides.
- May reduce the efficacy of insecticide, acaricide and fungicide application.

SPRAYER CALIBRATION AND MAINTENANCE

Accurate calibration of a sprayer is essential to ensure that the correct amount of pesticide is applied to the target area. A sprayer which is not regularly calibrated will apply either too much or too little pesticide, resulting in waste or poor control of pests.

Calibration involves measuring the output of the sprayer, the width of the spray pattern produced, and the speed at which the spray operator is walking or the tractor is moving. Once these factors are known, the amount of spray mix applied to the target area can be calculated. If necessary, adjustments can then be made to one or more of the controlling factors, or to the mixing rate of the pesticide in the water (or to the pressure), to ensure that the correct amount of pesticide is applied.

Regular sprayer maintenance is also essential to ensure that the sprayer is working correctly, and for safety by ensuring there are no leaks. Nozzles should be regularly replaced, at least at the beginning of the season, more often if the sprayer is used frequently or if abrasive formulations such as wettable powders are applied. Calibration of the sprayer with new nozzles fitted will give a base from which to determine when new nozzles should be fitted, as the output will gradually increase as the nozzles become worn.

Leaking sprayers are dangerous, and leaks should be repaired immediately. Seals should be inspected on a regular basis and replaced as necessary. A small toolkit (screwdriver, spanner) should be available in the field to effect immediate repairs. These tools, and some spare parts, may be provided with the sprayer on purchase.

COMPARISONS OF SPRAYER TYPES

Four types of hand held ground sprayers are commonly used by farmers - pressure sprayers, knapsack sprayers, motorised knapsack mistblowers, and ULV / CDA sprayers.

PRESSURE (COMPRESSION) SPRAYERS

In this type of sprayer, the spray liquid is pressurised by pumping air into the spray tank. Although very cheap, these sprayers are not recommended for agricultural use as the pressure rapidly drops as soon as spraying starts, with subsequent reduction in output and increase in

droplet size. However, they are widely used in public health programmes, such as for mosquito control.

MANUAL KNAPSACK SPRAYERS

Manual knapsack sprayers are continually pumped by hand to maintain spray pressure. A regular rate of pumping should be maintained. The cost of these sprayers ranges from cheap to moderately expensive. The cheaper versions should be avoided as they have a very short working life, and are very prone to breakdowns and leaks.

Knapsack sprayers are widely used in field and vegetable crops. The most effective method of use of the hand lance provided with the sprayer is to spray sideways into the foliage, or "up and under" the leaf surfaces. For spot spraying in tall orchard trees, an extension can be fitted to the hand lance.

MOTORISED KNAPSACK MISTBLOWERS

Mistblowers are petrol motor driven knapsack sprayers that produces droplets by air force. The droplets are carried to the crop by a combination of the air forces produced by the sprayer and by natural wind forces. These sprayers are expensive to purchase and run, but they have a greater work output than manual knapsack sprayers.

The drift spraying technique must be used as the natural wind forces are much stronger than those of the sprayer. The spray should be directed downwind over the top of the crop, and allowed to penetrate and settle by natural air movements. The spray should <u>not</u> be directed directly into the crop, as this gives massive overdosing on the plants closest to the sprayer, with very poor penetration into the crop and uneven spray coverage

Misblowers are widely used in field, vegetable and tree crops. However, they are not suitable for treating tall field or orchard crops, unless an additional pump is fitted to pump spray mix to the nozzle.

ULV and CDA Sprayers

Ultra Low Volume (ULV) and Controlled Droplet Application (CDA) sprayers use spinning discs to produce small sized droplets of similar size. The discs are driven by a battery powered motor. Pesticides may be applied undiluted or mixed with a small amount of water. Different sprayers are needed for the application of insecticides and fungicides, and for herbicides.

For insecticides and fungicides, the drift spraying technique is used, the small droplets being carried into the crop by natural wind forces. Examples are for control of locust and sunn pest. Understanding how to use this technique is essential for good crop coverage and to avoid unwanted drift out of the target area/crop. With drift spraying, work rates are higher than with manual knapsack sprayers. CDA sprayers for applying herbicides produce larger droplets which fall under the influence of gravity, and drift is less of a problem.

MIXING

"Mixing" in this context means the preparation of a pesticide formulation for application, such as when a pesticide is "mixed" with water ready for spraying. It does **NOT** mean the mixing of two pesticide formulations to be applied together. This practice is not recommended and should be avoided because of potential adverse effects to the crop or to the spray mix.

Mixing is the most hazardous operation when handling pesticides as the product is in a concentrated form. Precautions are thus essential to protect the handler and the environment.

- Protective clothing should be worn, as indicated on the label. The minimum is gloves, boots, overalls, and goggles (or a face shield for liquids only).
- Take care when opening containers. Plastic and paper bags should be cut with a knife, not ripped open.
- All containers should be placed on a level surface so that they do not tip over and spill pesticide.
- The container should be closed or the cap replaced immediately after the pesticide has been poured out.

- Identify any measures used by local farmers. The quantities of liquid and powders these hold should be calculated so that where necessary the conversion can be made in giving recommendations to farmers.
- Local measures include such things as spoons, matchboxes, cut-down plastic bottles. These measures should be washed after use, and never used for any other purpose.

- When mixing liquid formulations, the liquid can be added directly to the spay tank.
- When mixing powder formulations, the powder should be creamed first with a small quantity of water in a separate container, and then added to the spray tank.

TO MIX THE PESTICIDE IN THE SPRAY TANK OF SMALL SPRAYERS:

- Read the label.
- Half fill the tank with water, with the filter in the tank opening in place.
- Remove the filter and add the correct amount of pesticide to the tank.
- Rinse the measure with water and add the washings to the tank. Repeat twice more.
- Replace the filter and lid, and shake the sprayer.
- Fill the tank with the remainder of the water, with the filter in the tank opening in place.
- Replace the lid and shake the sprayer again.
- When the filter is removed from the sprayer, place it on a clean surface so that it does not become contaminated with dirt, which can cause wear to the sprayer pump and the nozzles or block filters and nozzles.

TO MIX THE PESTICIDE FOR LARGE SPRAYERS:

- Read the label.
- Half fill the tank with water.
- Mix up the pesticide with some water in a small container. Stir with a clean stick, or similar, NOT the hand.
- Add the pesticide mix to the tank.
- Rinse the mixing container with water and add the washings to the tank. Repeat twice more.
- Fill the tank with the remainder of the water.

TRANSPORT, DISPOSAL AND SPILLS

TRANSPORT

Pesticides are in their most concentrated and dangerous form when being transported to or from the shop, warehouse, or farm. Accidents can result in broken containers, spills, environmental contamination, and poisoning to you or others. Care and attention to safety are thus needed.

When transporting pesticides:
Pesticides should never be transported by passenger carrying vehicles such as a bus or taxi.

DISPOSAL

Disposal is concerned with both empty pesticide containers, and of unused spray mix.

EMPTY PESTICIDE CONTAINERS:

- When paper containers are empty, cut them open and shake all the remaining pesticide formulation into the spray tank.
- When plastic or metal containers are empty, drain the container into the spray tank, fill one quarter full with water, replace the cap, shake for 30 seconds, and drain the water into the spray tank. Repeat this rinsing and adding to the spray tank twice more. This procedure is known as triple rinsing.
- The containers can then be disposed.

- Paper and plastic containers can be burnt in a hot fire. Be careful not to burn the containers close to buildings, and ensure that there are no people or animals downwind of the fire who could breathe in the smoke.
- Metal containers should be punctured, crushed and buried in a hole at least one meter deep. Do not bury the containers close to water sources (canals etc), or close to buildings.
- The hole should be fenced off and a warning sign erected.

Empty pesticide containers must NEVER be used for another purpose, such as holding water or food. It is impossible to remove all the pesticide, even with triple rinsing.

UNUSED SPRAY MIX:

- The golden rule with spray mix is not to have any left over at the end of the spraying operation.
- Only the correct amount of spray mix should be prepared for the area to be sprayed. This requires knowledge of the actual area, the application rate of the pesticide, the amount of water required, and correctly calibrated sprayers.
- With practice, farmers should know the correct amount of spray mix to prepare for the area or crop to be sprayed.
- If there is spray mix left in the tank at the end of the spraying operation, it should be sprayed on the field, walking much faster than for the normal spray operation so that the amount of pesticide in the twice treated areas is not too high.

Unused spray mix should NEVER be poured into canals or onto the ground.

SPILLS

Spills of pesticide formulation can occur during transport, storage and mixing. There are three stages to dealing with spills – Control, Contain and Clean-Up.

CONTROL

- Put on the necessary protective clothing.
- Stop the source of the spill if at all possible. If a container has fallen over, put it the right way up; if a small container is leaking, put it in a larger empty container. If a large drum is leaking or has fallen over, you may not be able to quickly stop the source.
- Keep other people away from the spill. Have someone stay at the site at all times to warn other people to keep away.

CONTAIN

- Confine the spill to stop it spreading. Surround the spill with soil or sand as a dam to contain the spill.
- Absorb liquids by covering them with sand, soil, sawdust, newspaper.
- Stop dry pesticide from blowing away by covering with a plastic sheet, or spraying a light mist of water. Do not use too much water as this will make clean-up harder.

CLEAN-UP

- For liquid spills, sweep up the absorbent material with the pesticide, and place it in a heavy duty drum or bag.

- For dry spill, sweep up and place in a heavy duty drum or bag.
- If the spill area is non-porous, such as concrete or tiles, wash down the affected area with soap or detergent and water. Do not use too much water, as this will spread the contamination. Soak up the water with absorbent material and place in the drum or bag.
- Wash all equipment and clothing used during the containment and clean up.
- Wash yourself thoroughly.

SHOP ORGANISATION AND SALES

Pesticides retailers are directly involved with the storage and sale of pesticides, and it is essential that they know and understand the principles and procedures involved. This is for their own safety and the safety of their staff and customers, to give the best service to their customers, and to operate a successful business.

STORAGE HAZARDS

The main hazards involved with pesticide storage, whether in a warehouse or shop, are those of fire and environmental contamination. Many pesticides can easily catch fire or the vapours can explode, particularly oil based formulations. If a fire does occur, pesticides will release toxic smoke and fumes, which present severe risks to firefighters and bystanders. Environmental contamination can occur in case of spills, or from the run-off of water used in firefighting.

BASIC PRINCIPLES FOR STORAGE AND DISPLAY OF PESTICIDES

- Pesticides must be stored and displayed separately. They must never be kept in the same area as food, drink, or medicines (including veterinary medicines) for human or animal consumption. They must also not be kept in the same area as any material that might become contaminated, such as seed, fertiliser, or clothing.
- Pesticides must be kept out of direct sunlight, temperature extremes, water and moisture.
- If stored on shelves, dry pesticides should be placed above liquid pesticides.
- Herbicides should be on the lowest shelves.
- Containers should be inspected regularly to ensure that there are no leakages.
- Shelves should not be over-stocked, as this makes correct stock rotation and the detection of leaking containers more difficult, and increases the risk of shelves breaking due to the weight.
- Materials must be available for cleaning up spills – sawdust/sand, bucket, broom, shovel, drums/strong plastic bags for sweepings, overalls, gloves, boots, face mask.
- Firefighting equipment must be available – fire extinguisher (foam or dry powder), bucket of sand.
- Washing facilities must be available – water, soap, towel.
- There must be no smoking, eating or drinking in the pesticide area.
- No unauthorised access must be allowed into the pesticide area.
- Warning notices should be displayed – 'No smoking', and 'Danger – Pesticides'.

Location and Construction of Buildings

GENERAL:

- Walls, roof and shelving should be constructed of non-combustible material (concrete, steel).
- For stores and warehouses, the roof should be of light-weight material that will collapse in the event of a fire.
- Walls and floors should be of non-permeable material, such as concrete or tiles, smooth and without cracks or crevices, so as to allow easy cleaning.
- Shelves should be of non-permeable material, such as metal or plastic, and without cracks or crevices, so as to allow easy cleaning.
- There must be adequate natural or artificial lighting, sufficient to read all parts of the pesticide label.
- The store should be well ventilated. For bulk stores this means upper and lower wall vents, in addition to opposing doors.

Shops:

- Shops should be located away from stores selling food, clothing and other materials, and pharmacies.
- An area separate from the main part of the shop should be available for storing stock not on display.
- If physically separated from the shop, the store must meet all the necessary requirements for pesticide storage.
- Stock received last should be kept in this store, with older stock on the display shelves so as to facilitate first-in, first-out stock rotation.

STORES AND WAREHOUSES:

- Stores and warehouses should be located away from schools, hospitals, markets, human and animal food stores, water sources, open water, or where there is a high water table or possible flooding.
- The store or warehouse should be surrounded by a containment bund, and drains and a sump should be provided into which spills and washings can flow. There should be no drainage access to public drains.
- Access for emergency vehicles should preferably be from two sides, but must be at least from one long side.

RECORD KEEPING AND STOCK CONTROL

Record keeping is good business practice. It enables only the quantities needed to be purchased at the right times of the year, existing stock can be taken into consideration when ordering new stock, it facilitates first-in, first-out stock management, and sales records can help in diagnosing the cause if a pesticide failed to work.

Records should be kept of all pesticides received into stock and sold. Record details should include:

- Date of purchase
- Name and address of supplier
- Product name
- Expiry date
- Quantity
- Pack size
- Date of sale
- Details of the purchaser
- Balance left in stock

Expired (out-of-date) stock must never be sold. If a pesticide is approaching its expiry date, consider selling the remainder of the stock quickly by offering a discount. This may involve some financial loss, but it will avoid the problems and potential total financial loss of expired pesticide.

Accumulation of expired stock indicates poor business procedures and stock control.

The solution to the problem is to avoid expired stock in the first place:

- Only the quantities of pesticide that are needed should be purchased.
- **Never purchase more of a pesticide than you can sell in one year.**
- The amount of existing stock should be taken into consideration when ordering new stock.
- The expiry date should be checked when the pesticide is received. Pesticides should not be accepted if they have less than one year until expiry.
- Stock should be sold on a **first-in, first-out** basis. Old stock should be at the front of shelves, and new stock at the back or in a separate store.

- The shelf life of a pesticide is normally two to three years.
- Any period longer than this on the label (dates of manufacture and expiry) are indicative of a poor quality or fraudulent product.
- Organophosphate pesticides have a shorter shelf life than other types. For example, dimethoate has a shelf life of 18 months to two years.

RISK, HEALTH AND SAFETY

Pesticides are poisons that are used to kill pests. Human beings have certain body systems similar to those of pests, and so pesticides can also kill people. Some pesticides are extremely toxic to humans and can cause severe adverse effects. Others are less toxic, but too much exposure can also cause adverse effects. The following formula will help determine the potential risks of handling or using a pesticide.

Risk = Hazard x Exposure

Hazard is the inherent property of a substance to cause adverse effects. **Exposure** is the amount of time a person is in contact with the substance, or how much they get in or on their body. The combination of these two factors gives the **Risk**.

Every time a pesticide is handled or used, there is an associated **Risk**. The amount of risk depends upon the level of hazard of the pesticide combined with the level of exposure during the conditions under which the pesticide is used. For example, applying a pesticide in windy conditions gives a greater chance of drift onto the operator, or to adjacent crops, livestock, or open water. Under these circumstances, the exposure is increased and so is the risk of adverse effects to the operator or in these adjacent areas.

A pesticide formulation has an inherent hazard. The primary consideration when using a pesticide is to avoid exposure and so reduce the risk.

HOW PESTICIDES ENTER THE BODY

Pesticides enter the body in three main ways or routes:

Dermal exposure - Getting a pesticide on the skin, or in the eyes
Inhalation exposure - Breathing a pesticide into the lungs through the nose and mouth
Oral exposure - Swallowing a pesticide through the mouth

In most pesticide handling situations, the skin is most likely to be exposed. The amount of pesticide absorbed through the skin (and eyes) depends on:

- The pesticide itself and the dilution material. Oil based formulations (emulsifiable concentrates) are absorbed easily. Water based pesticides and dilutions (wettable powders) are absorbed less readily.
- Dry formulations (dusts, granules) are not absorbed as readily as liquid formulations and dilutions.
- The part of the body that is exposed. The scalp, forehead and ears are highly absorptive.
- The condition of the skin. Cuts, abrasions and skin rashes allow the pesticide to penetrate more easily. Hot and sweaty skin absorbs pesticide more readily than cool, dry skin.

COMMON WAYS OF PESTICIDE EXPOSURE

Dermal	**Eyes**	**Inhalation**	**Oral**
Not washing hands after handling pesticides or containers	Rubbing eyes or forehead with contaminated gloves or hands	Handling pesticides in confined or poorly ventilated areas	Not washing hands before eating, drinking or smoking
Splashing or spilling pesticide on the skin	Splashing pesticide in the eyes	Handling dusts or powders	Splashing pesticide into the mouth

Wearing contaminated clothing	Pouring dry formulations without wearing goggles	Using an inadequate or poorly fitting respirator	Storing pesticide in drink bottles
Being exposed to pesticide drift	Being exposed to pesticide drift	Being exposed to pesticide drift	Accidentally applying pesticide to food
Applying pesticides in windy weather	Applying pesticides in windy weather	Applying pesticides in windy weather	
Touching treated plants, livestock or soil		Not washing hands before smoking	

The primary safety consideration is to avoid exposure to pesticides. Exposure can be avoided by using pesticides only when necessary, taking the necessary safety precautions, mixing and applying the correct dose, wearing suitable protective clothing, washing often when handling or using pesticides, and observing re-entry and pre-harvest intervals.

HARMFUL EFFECTS OF PESTICIDES

Pesticides can cause three types of harmful effects – Acute, Delayed and Allergic.

Acute effects are those that occur immediately after the exposure, within minutes or hours. As well as the poisoning effects covered below, there can be physical effects on the body. The mouth, throat and stomach can be burned, making it difficult to eat and drink. The lungs can be burned, making it difficult to breath. The skin can itch, blister, or crack. The eyes can be burned, causing temporary or permanent blindness.

Delayed effects are illnesses or injuries that do not appear immediately and may take years to become apparent. They are caused by repeated exposure to a pesticide, pesticide group, or combination of pesticides over a long period of time, or by a single exposure to a pesticide which causes a harmful reaction that does not become apparent until much later. Delayed effects include the development of cancer or tumours, sterility, defects in unborn children, and injury to the body systems (blood, liver, kidneys, brain, lungs etc)

With certain pesticides, a large single exposure will cause an acute effect, while repeated smaller exposures will cause a delayed effect. For example, organophosphate and carbamate insecticides inhibit a chemical, called cholinesterase, in the nervous system of humans. A large single exposure causes immediate acute illness. On the other hand, if someone is spraying frequently, the small repeated exposures can gradually reduce the amount of cholinesterase in the body, although with no obvious symptoms of illness. This process is

reversible, and the body can replace the cholinesterase when it is no longer exposed to the pesticide. However, if the cholinesterase level in the body becomes too low, even a small additional exposure may cause immediate severe illness.

Allergic effects are reactions that some people, but not all, develop after exposure to pesticides. Allergic effects usually require several exposures before they become apparent. Typical reactions are asthma (difficulty in breathing), skin irritation (rashes, blisters, open sores), or eye and nose irritation (itchy, watery eyes and sneezing).

GENERAL SYMPTOMS AND SIGNS OF ACUTE PESTICIDE POISONING

Pesticide poisoning occurs when a pesticide enters the body and interferes with the essential systems of the body. Many of the signs and symptoms of acute pesticide poisoning are similar to those of other illnesses, such as flu. Anyone who has been handling or using pesticides and then develops suspicious signs and symptoms should immediately see a doctor, taking the pesticide label or container with them.

Depending on the type of pesticide and degree of exposure, only some of the symptoms may be apparent, and individual symptoms may appear at different times after the exposure. Symptoms can start anything from ½ hour to 24 hours after exposure. The typical symptoms and signs of pesticide poisoning are:

Initial:
- Nausea, vomiting
- Headache, dizziness
- General weakness or tiredness
- Tightness in chest

Later:
- Excessive sweating, salivation
- Vomiting, diarrhoea
- Stomach cramps
- Muscle twitches, cramps, aches
- Blurred vision
- Confusion
- Fits or unconsciousness

FIRST AID

This section on First Aid is not included in the Retailer training course due to time constraints. It is given here for information only, and will not be included in the Certification test.

First aid is the initial treatment of a person suffering from a pesticide exposure, before seeking proper medical attention.

In all cases of pesticide poisoning: Follow the product label instructions if they are available.

The **first action** is to remove the person from the source of the exposure by removing pesticide from the skin, removing contaminated clothing, or getting the person to fresh air. While doing this, be careful to avoid contaminating yourself.

PESTICIDE ON THE SKIN:

- Drench skin and clothing with plenty of water.
- Remove contaminated clothing.
- Wash hair and skin with soap and water. If available, a shower is the best way to thoroughly wash and rinse the whole body.
- Dry the victim, and wrap in a blanket or any clean clothing. Do not allow the victim to become chilled or overheated.
- If the skin is burned, or otherwise injured, cover immediately with a loose, clean, dry, soft cloth or bandage.
- Do not apply ointments, greases or powders to burns or injured skin.

PESTICIDE IN THE EYE:

- Wash the eye(s) quickly but gently.
- Hold the eyelid open and wash with a gentle drip of water flowing across the eye rather than directly onto it. If a tap is not available, a tea pot, or similar, can be used.
- Rinse for 10 minutes or more.
- Do not use chemicals in the rinse water.

PESTICIDE INHALED:

- Get the victim to fresh air immediately.
- Warn other people in the area of the danger.
- Loosen tight clothing that would restrict breathing.

PESTICIDE IN MOUTH OR SWALLOWED:

- Repeatedly rinse mouth with plenty of water.
- Never induce vomiting if the victim is unconscious or having convulsions.
- Never induce vomiting if the victim has swallowed a corrosive poison, as it will burn the throat and mouth as severely coming up as it did going down. It may also get into the lungs and cause burning there.
- Never induce vomiting if an emulsifiable or oil solution has been swallowed, as these can cause death if inhaled during vomiting.

Apply artificial respiration if breathing has stopped or if the victim's skin is blue. If pesticide is on the victim's mouth or face, avoid direct contact during artificial respiration.

Following the first aid, the victim must be taken to a doctor as quickly as possible, with the pesticide container or label so that the doctor can identify the active ingredient.

PROTECTIVE CLOTHING

Protective clothing consists of clothing and devices that are worn to minimise exposure to pesticides and to keep pesticides away from the body. The minimum amount to wear for a specific pesticide formulation and activity is given on the label of a high quality pesticide, either in the text or the pictograms.

Protective clothing only protects if the pesticide remains on the outside and does not come into contact with the body. Protective clothing must be worn in the correct way to prevent this happening. Also, torn, damaged or broken protective clothing should not be used as pesticide can enter and be trapped next to the skin. Contaminated clothing should be removed immediately.

All protective clothing should be washed after every use.

Alternatives to dedicated protective clothing are indicated in the following sections. However, these alternatives give only limited protection, and should only be used if the correct protective clothing is not available.

BODY PROTECTION:

- Any time pesticides are handled, the minimum to wear is overalls. The collar should be fastened to protect the lower part of the neck.
- An alternative to overalls is a long sleeved shirt and long legged trousers. The shirt collar should be fastened to protect the lower part of the neck.
- A wide brimmed cotton or canvas hat can be worn during spraying to protect the head.
- All work clothes, including hats, should be washed after every days use.

HAND AND FOOT PROTECTION:

- Rubber gloves and rubber boots should be worn when handling pesticide concentrates. They should be unlined, as fabric liners can trap pesticide and are impossible to clean adequately.
- Trousers should be worn outside the boots, not tucked in.
- Gloves should be washed with soap and water before removal, turned inside out and the inside washed. Boots should also be washed inside and out after use.
- Do not use gloves with holes or tears, as the pesticide will get inside and be held next to the skin.

- An alternative to rubber gloves is a plastic bag.
- For spraying operations only, an alternative to rubber boots is canvas shoes. They should be thoroughly washed with soap and water after each days use.

EYE AND FACE PROTECTION:

- Non-fogging eyewear such as safety glasses and goggles should be worn when there is a chance of mists or dusts, for example during spraying or mixing dry formulations.
- Face shields should be worn when there is a risk of being splashed with insecticide, such as when mixing liquid formulations.
- An alternative is to use ordinary glasses or sunglasses. However, these give only minimal protection to the eyes.

INHALATION PROTECTION:

- Dust/mist masks are usually shaped filters that cover the nose and mouth to filter out dusts, mists and particles.
- Masks must be disposed of after each days use.
- For spraying operations only, an alternative is a cloth tied over the nose and mouth. This should be washed after every spraying operation.
- Respirators remove contaminants in the air by filtering dusts or mists, or by removing gases and vapours.
- Respirators are usually only needed in specialised operations, or when mixing or applying more toxic products.

ENVIRONMENTAL ASPECTS

The environment is everything around us. It includes not only the "natural" elements such as soil, water and air, but also people, plants, animals, indoors/outdoors, fields, gardens, houses, offices, etc. It is important to remember that we depend on the environment for our survival.

Pesticides are poisons that are designed to kill pests, but because they are poisons they can also affect the environment in which we live. They can kill beneficial insects, birds, fish and domestic animals, they can poison sources of drinking and washing water, and they can poison our food and living and working areas. These environmental effects are why many people throughout the world are concerned about, or even against, the use of pesticides.

It is the responsibility of everyone concerned with the handling or use of pesticides to use them correctly and to follow practices which minimise environmental contamination.

SOURCES OF ENVIRONMENTAL CONTAMINATION

Pesticides get into the environment by several ways:

- Use at the site of application. Even a correct application puts a pesticide into the environment.
- Excess application leading to run-off from the plants or other treated surfaces.
- Drift during application or application during windy weather.
- Spills during storage, transport and use which are not cleaned up.
- Water used for personal washing and cleaning equipment and clothing.
- Improper disposal of excess spray mix and pesticide containers.

PESTICIDE MOVEMENT IN THE ENVIRONMENT

Once in the environment, pesticides can move to other places:

- Volatilisation from treated surfaces.
- Drift during application.
- Washing from the treated surface to the ground or soil by dew, rain or irrigation.
- Incorporation into the soil with treated crop residues.
- Removal from the field as residues on treated crop surfaces, such as vegetables, fodder and fuel.
- Removal from the field on contaminated mixing and application equipment, clothing and containers.
- Carried across the field in surface irrigation water.
- Leached through the soil into ground water.

The **persistence** of a pesticide is a measure of how long it remains active before being degraded or broken down. A pesticide with long persistence will remain in the environment for a longer period and have more chance to move from the site where it was applied than a pesticide with short persistence.

SENSITIVE AREAS

Some areas of the environment are more sensitive than others, as people or other living organisms are more likely to be injured by a pesticide.

INDOORS:

- Places where people – especially children, pregnant women, the elderly and the sick - live, work or are cared for.
- Places where food is processed, stored, prepared, or eaten.
- Places where domestic animals are kept, live and eat.

OUTDOORS:

- Areas near open or surface water, or where the ground water is close to the surface.
- Areas near schools, playgrounds, hospitals, gardens, or where food or fodder is processed.
- Areas where honey bees are active.
- Areas near food or fodder crops.

RESIDUES ON FOOD CROPS

Pesticides are applied to food crops to protect them from pest damage or loss, but leave residues that may be eaten by people or animals. For this reason, a **pre-harvest interval** is needed between the time of the pesticide application and harvesting in order to allow time for the pesticide to degrade and for the crop to be safe to eat.

Pre-harvest intervals are given on the pesticide label as the number of days needed between the pesticide application and harvest. The length of the interval depends on the toxicity of the pesticide and its rate of degradation. Pre-harvest intervals are longer for pesticides of high toxicity or slow rates of degradation.

When a food crop is close to harvest, the pre-harvest interval must always be considered when deciding if a pesticide spray is to be applied. If the crop will be harvested within the pre-harvest interval, either the spray should not be applied, a non-toxic (biological) pesticide should be used, or harvesting of the crop must be delayed until the relevant number of days has elapsed after the pesticide application.

Re-entry intervals are also indicated on the product label. These give the number of days which must elapse before a treated field can be safely entered.

APPENDIX I: CROP MANAGEMENT PRACTICES FOR CROPS IN NORTHERN AFGHANISTAN

The following are examples of crop management practices and non-pesticide methods of pest management that could possibly be used in the Northern Region of Afghanistan.

Practice	**Insect Pest, Disease, Weed Affected**
All Crops	
Implement optimum crop management practices to produce healthy and strong plants	Plants are more resistant / tolerant to insect pests, diseases and weeds.
Avoid planting seeds or seedlings too deeply, or into cold, wet soil	Seedling diseases (Damping off, Root rot, etc)
Crop rotation	Many insect pests and diseases

Use correct plant spacing	Provides aeration, avoids micro-climate favourable to insect pests and diseases
Avoid excess nitrogen	Makes plants attractive to insect pests, and susceptible to diseases
Avoid excess irrigation	Makes plants attractive to insect pests, and susceptible to diseases
Avoid water stress	Makes plants more susceptible to attack by insect pests and diseases.
Maintain refuge habitats, minimise pesticide use	Preserves and encourages beneficial insects
Remove and burn all crop residues and debris	Removes overwintering sites of insect pests and diseases
Wheat / Rye / Barley	
Resistant varieties	Smuts, Rusts
Clean, certified seed	All weeds and diseases
Maintain refuge habitats for beneficial insects	Sunn pest, aphid
Maize	
Resistant varieties	Smut, damping off, bacterial wilt, diplodia stalk rot
Avoid potassium deficiency	Diplodia stalk rot
Vegetables general	
Site selection - Use land without a history of disease or weed pressure.	All diseases and weeds.
Crop rotation - 3 year crop rotation best for vegetables. At least one cereal crop before cultivating the same vegetable crop, or fallow for several months.	Nematodes, all diseases
Use certified seed	Disease free, weed seed free
Seedlings - Produce in greenhouse or tunnel	Helps avoid insect and disease infestations.

Ventilate tunnels to reduce humidity	Diseases and insect pests.
Keep field free of weeds or cover crops for at least 10 days (3 weeks is best) before planting	Cutworm
Ensure balanced fertiliser	Diseases and insect pests
Avoid excessive nitrogen	Excess encourages insect pests and diseases
Optimal potassium	Increases tolerance to diseases, and essential for fruit formation.
Ensure balanced irrigation	Diseases
Remove and burn infested plants	All diseases
Remove and burn crop residues	All diseases
Clean all equipment and feet before leaving field to avoid spreading pests and diseases	Nematodes, *Verticillium wilt*, *Fusarium* wilt, many diseases, Red spider mite
Clean and disinfect all equipment at the end of the season	Avoids carry-over to the following season. *Verticillium* wilt, *Fusarium* wilt, many diseases
Water Melon / Melon / Cantaloupe	
Crop rotation	Nematodes
Resistant varieties	Watermelon mosaic virus, nematodes
Early planting	Avoids main attack of melon fly
Bagging of fruits	Melon fly
Onion	
Resistant varieties	Black mould
Plant clean bulbs	Onion maggot, onion bulb fly, onion smut
Remove and burn infested plants	Onion maggot, onion bulb fly, onion smut
Avoid irrigation prior to harvesting	Black mould

Tomatoes	
Crop rotation. Do not grow tomatoes on the same land for at least 3 years. Rotate with wheat, barley, maize, rice, chillies.	Nematodes, *Fusarium* wilt, *Verticillium* wilt, Early blight, *Sclerotinia*
Resistant / tolerant varieties	Nematodes, *Fusarium* wilt, *Verticillium* wilt, virus diseases, Early blight, Late blight, *Sclerotinia*, Bacterial canker, Blossom end rot, Fruit cracking.
Seedbed sterilisation / solarisation	Nematodes, all bacterial and fungal diseases
Establish seedbeds in light soil	Seedling wilt
Ensure seedbeds are free of nematodes and diseases to avoid transplanting infected plants into the field	All nematodes and diseases
Ensure good seedbed ventilation	All bacterial and fungal diseases
Avoid excessive seedbed irrigation	Seedling wilt, Damping off, Root rot
Keep field free of weeds or cover crops for at least 10 days (3 weeks is best) before planting	Cutworm
Deep ploughing of field	Cutworm
Heavy irrigation / flooding of field prior to sowing	Nematodes, Cutworm, *Sclerotinia*
Avoid damaging plants when transplanting	All diseases
Use correct plant spacing	Provides aerations, avoids micro climate which encourages bacterial and fungal diseases, aphids, whitefly
Immediately gapfill cut seedlings after transplanting	Cutworm
Ensure balanced fertilisation	Diseases and insect pests
Avoid excessive nitrogen	Excess encourages Blossom end rot, Blight, Powdery mildew, Aphids, Whitefly (which transmits virus diseases, cause delay in maturity and reduced yield).

Optimal potassium	Increases tolerance to diseases, essential for fruit formation
Increase organic matter of soil	Nematodes
Sterilise manure / compost	*Orabanche*, other weeds, Nematodes, fungal and bacterial diseases.
Avoid insufficient or irregular irrigation	Fruit cracking, Blossom end rot
Avoid excessive irrigation	*Orabanche, Phytophthera* root rot (late blight), *Sclerotinia*
Control weeds	Virus diseases, Fruit worm
Plough crop residues under as soon as harvesting completed	Late blight
Remove and burn crop residues	All diseases
Clean all equipment and feet before leaving field to avoid spreading pests and diseases	Nematodes, *Verticillium* wilt, *Fusarium* wilt, many diseases
Cotton	
Rotation with cereals	*Fusarium* wilt, Bacterial blight, seedling diseases.
Rotation with soyabean	Bacterial blight, Root knot nematode.
Avoid growing cotton close to wheat, melon, cucumber, pumpkins, onion.	Aphid, Thrips, Whitefly
Resistant varieties	Jassid, Mites, Bollworm, Aphid, Whitefly, Bacterial blight, *Fusarium* wilt
Certified, acid delinted seed	Bacterial blight free, weed seed free
Deep ploughing	Kills and exposes pests such as cutworm
Keep field free of weeds or cover crops for at least 10 days (3 weeks is best) before planting	Cutworm.
Fine seedbed – allows plants to germinate and grow strongly	Increased tolerance to diseases, insect pests and weeds

Early planting so that plants mature earlier	Avoids late season attack of bollworm, aphid, whitefly
Use correct plant spacing	Provides aeration, avoids plants growing too tall, and avoids micro-climate which encourages aphids and whitefly.
Early thinning	Allows plants to grow strongly, increasing tolerance to pest attack.
Avoid excess nitrogen	Excess makes plants attractive to Aphid, Jassid, Whitefly, Bollworm, and encourages *Fusarium* wilt.
Avoid excess irrigation	Excess gives an environment around the plants which encourages aphids and whitefly.
Keep field free of weeds	Seedlings are very susceptible to weed competition. Weeds in the crop encourage Aphid, Whitefly, and Spider mite.
Avoid plant stress (water, fertiliser, weeds)	Spider mites and other sucking pests
Remove and burn crop residues	Pink bollworm, Cotton stainer, Stem weevil, Whitefly, all diseases
Plough after harvest	Bollworm
Potato	
Hand collection early in the season	Colorado beetle
Orchards in General	
Use certified planting material	Disease and virus free.
Keep low cover of lucerne, alfalfa or grass between trees. Do not over-irrigate cover crops.	Prevents dusty conditions, which encourages spider mites. Excess irrigation encourages cankers, root rots and gummosis in trees.
Keep vegetation between trees cut short	Rodents
Circle trunk with soil	Avoids infection and spread of *Phytophthora*.
Remove and burn infested branches, leaves,	Prevents spread of many insect pests and

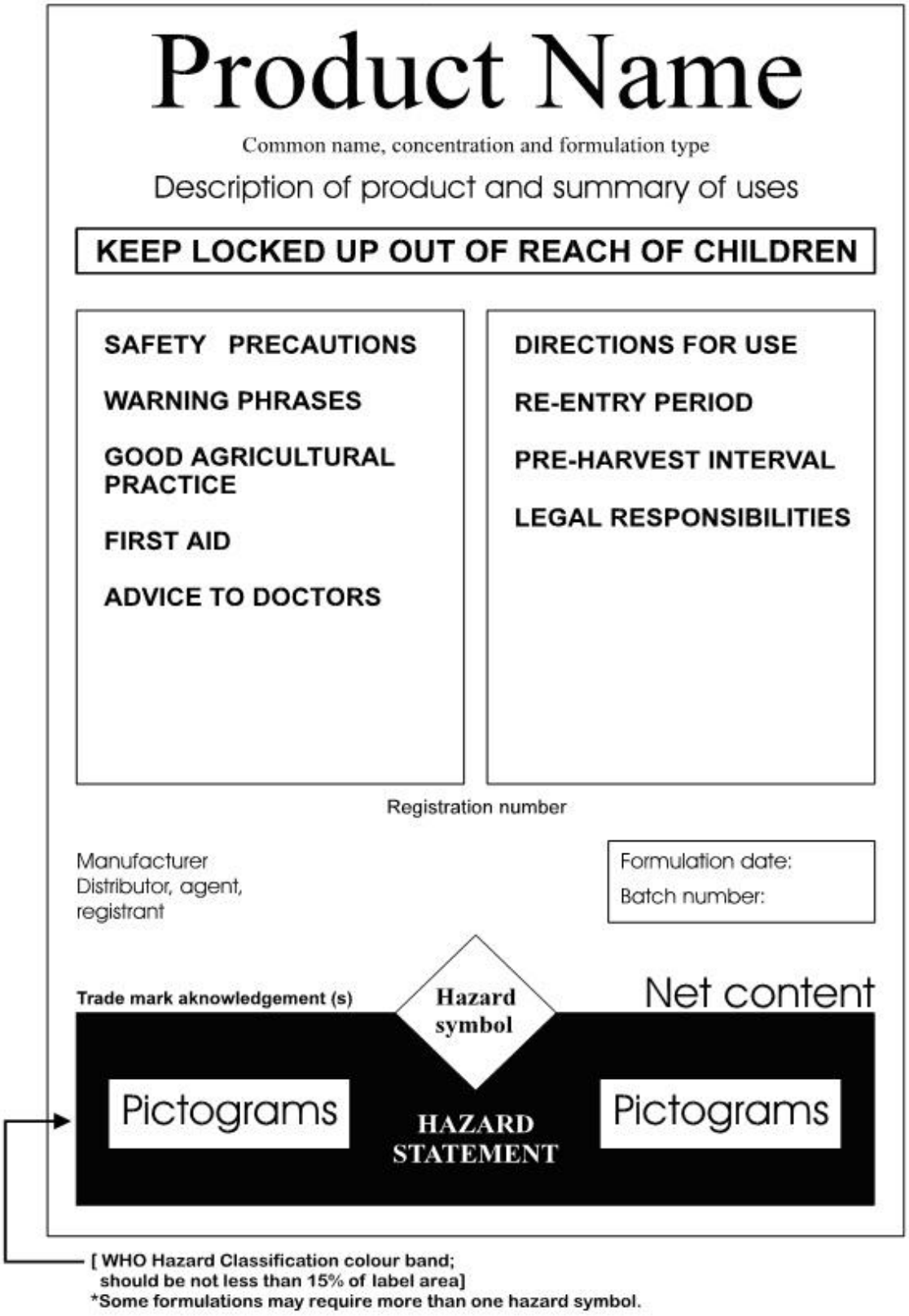
fruits during the season	diseases
Remove and burn fallen branches, leaves, fruits after harvesting to remove overwintering sites	Many insect pests and diseases
Grapes	
Keep low cover of lucerne, alfalfa or grass between vines to prevent dusty conditions.	Prevents dusty conditions, which encourages spider mites.
Pruning to improve aeration and lower humidity	Powdery mildew
Remove and burn infested branches and fruits	All diseases, scales
Collect and burn all fallen leaves, debris and weeds after harvesting to remove ovewintering sites	Spider mites
Apricot	
Resistant variety	Shot hole disease
Do not intercrop with cereals, vegetables or forage crops	Irrigation of these crops results in over-watering of trees with consequent increase in cankers, root rots, and gummosis
Remove and burn nests of tent caterpillars during winter / early spring	Tent caterpillars
Remove infected and fallen fruit, burn or feed to animals	Shot hole disease
Almond	
Do not intercrop with cereals, vegetables or forage crops	Irrigation of these crops results in over-watering of trees with consequent increase in cankers, root rots, and gummosis
Remove and burn nests of tent caterpillars during winter / early spring	Tent caterpillars
Remove and burn infested branches	San Jose scale
Early harvesting	Carob moth – Only infests almonds once

	hulls have split
Collect and burn fallen fruit at end of season	Carob moth – Overwinters within fruit
Pomegranate	
Orchard sanitation	Carob moth
Pheromone mating disruption	Carob moth
Remove and burn all infected fruit	Carob moth (Pomegranate fruit borer)
Bagging of fruit on formation	Carob moth (Pomegranate fruit borer)
Apple	
Improve soil tilth and drainage	Nematodes
Do not plant apple orchards within 2km of cedar trees	Cedar apple rust
Do not plant apple with pear	Fire blight
Avoid close spacing of trees when establishing orchard, so as to ensure adequate ventilation and light	Aphids, Mites, Apple scab, Branch wilt, Fire blight, Powdery mildew
Resistant varieties	Woolly apple aphid, apple scab, cedar apple rust, fire blight, Powdery mildew
Certified, virus-free seedlings	Apple leaf spot virus, Apple mosaic virus
Balanced fertilisation	Nematodes
Avoid excess nitrogen	Aphids, Fire blight
Ensure balanced irrigation	Red spider mite, Nematodes, Branch wilt
Avoid over-irrigation	Fire blight
Pruning in late winter / early spring to improve ventilation	Aphids, Apple scab, Powdery mildew
Remove infested, dead, diseased wood, cankers, mummified fruits	Stemborer, Woolly apple aphid, Apple scab, Fire blight, Powdery mildew
Summer pruning of water sprouts	Green apple aphid

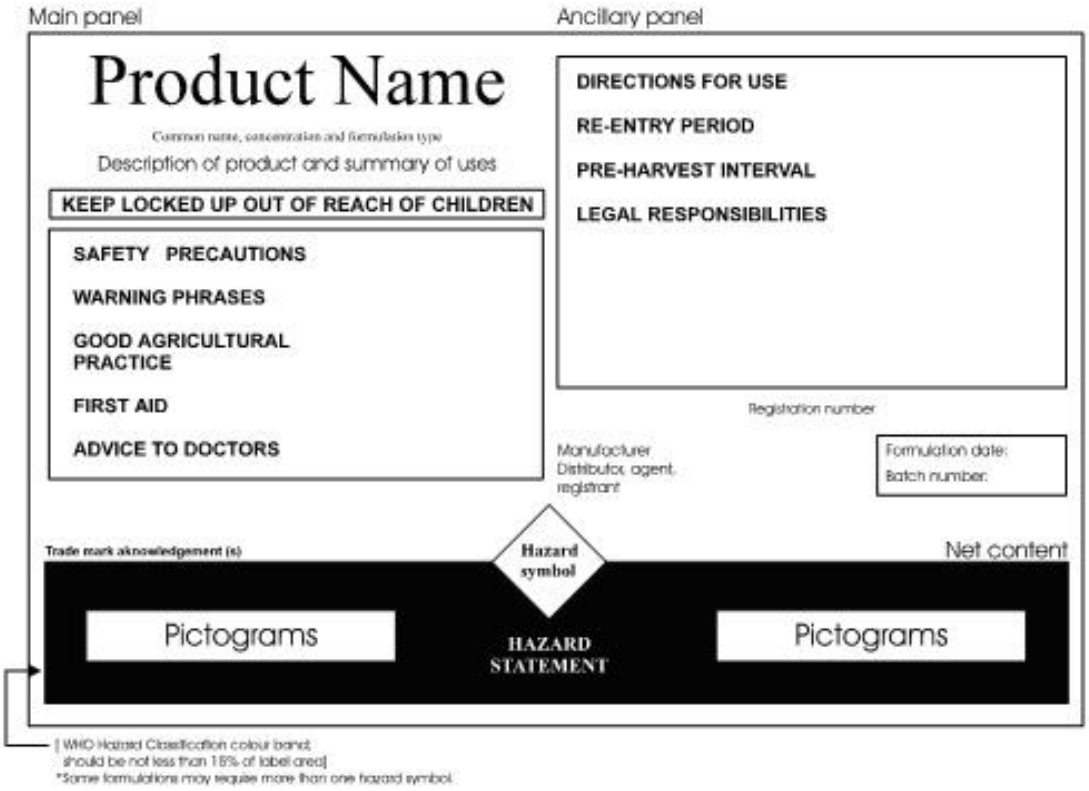
Avoid excessive pruning	Fire blight
Keep low cover of grass and weeds between trees	Prevents dusty conditions, which encourage red spider mite
Ensure area around base of trunk is free of grass and weeds	Rodents, Stemborer
Keep grass and weeds between trees cut short	Rodents
Remove and bury/burn all fallen fruit	Codling moth, Rodents, Apple scab
Remove and burn/compost fallen leaves at the end of the season	Codling moth, Apple scab

APPENDIX II: CONTAINER LABELS – LAYOUT EXAMPLES

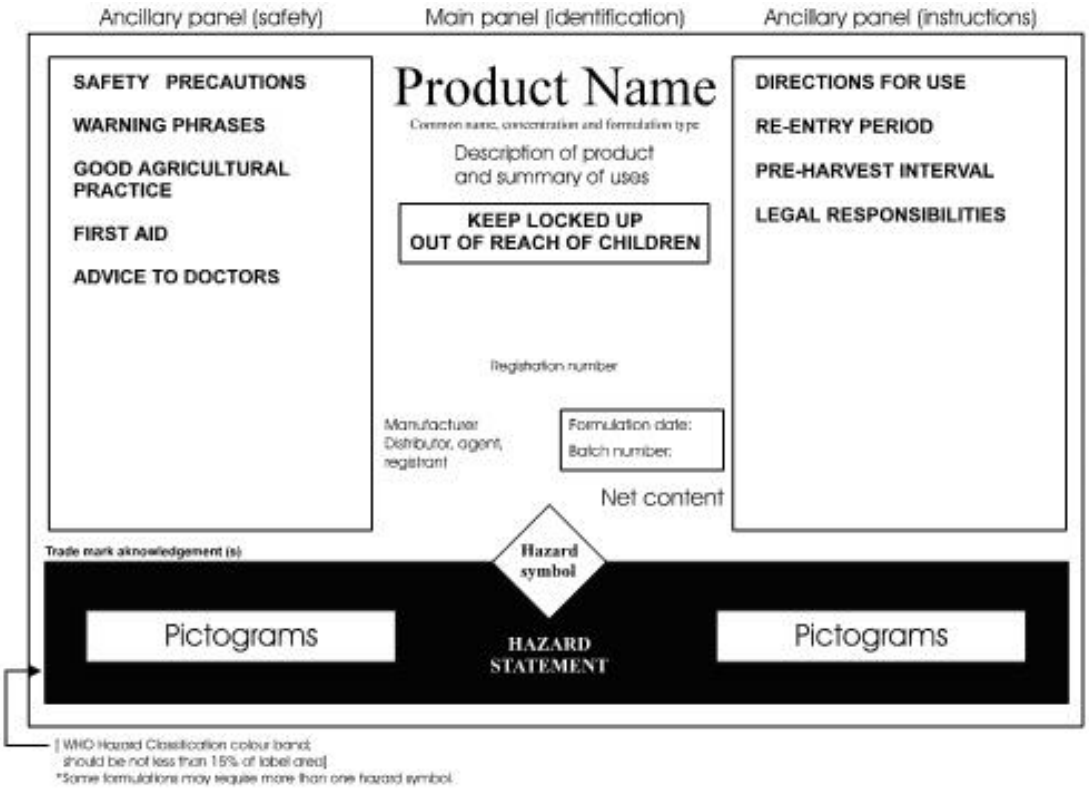
A One Panel Label:



A Two Panel Label:



A Three Panel Label:

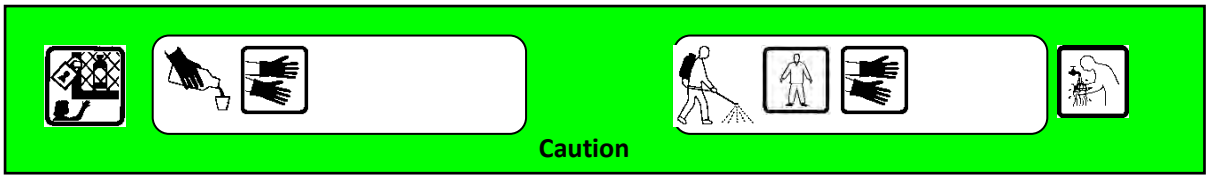


Examples of Colour Bands and Pictograms

Class Ia or Ib Product

Class II Product

Unclassified Product



Bibliography

The following sources of information have been used in support of the preparation of this Handbook.

International Code of Conduct on the Distribution and Use of Pesticides. FAO. 2003

Pesticide Storage and Stock Control Manual. FAO. 1995

Guidelines for Retail Distribution of Pesticides with Particular Reference to Storage and Handling at the Point of Supply to Users in Developing Countries. FAO. 1988

Guidelines for Personal Protection When Working With Pesticides in Tropical Climates. FAO. 1990

Guidelines on Good Labelling Practice for Pesticides. FAO.1995

Links to the above FAO documents:
http://www.fao.org/agriculture/crops/core-themes/theme/pests/pm/code/list-guide/en/

Code of Practice for Suppliers of Pesticides to Agriculture, Horticulture and Forestry (The Yellow Code). Department for Environment, Food and Rural Affairs, UK. 1998.
http://www.pesticides.gov.uk/uploadedfiles/Web_Assets/PSD/yellow_code.pdf

Guidelines for the Safe and Effective Use of Crop Protection Products. Crop Life International. 2006

Guidelines for Personal Protection When Using Crop Protection Products in Hot Countries. Crop Life International. 2005

Guidelines for Safe Transport of Crop Protection Products. Crop Life International. 2006

Guidelines for Emergency Measures in Cases of Crop Protection Product Poisoning. Crop Life International. 1997.

Links to the above CropLife International documents:
http://www.croplife.org/public/guidelines

Multilevel Course on the Safe Use of Pesticides and on the Diagnosis and Treatment of Pesticide Poisoning. UNEP / ILO / WHO. 1994
http://whqlibdoc.who.int/hq/1994/WHO_PCS_94.3.pdf

Safety and Health in the Use of Agrochemicals: A Guide. ILO. 1991
http://www.ilo.org/safework/info/instr/lang--en/docName--WCMS_110196/index.htm

Pre- and Post Course Evaluation

Participant Name _____

1 How can a retailer ensure the long term success of his business and maximise his profits.

- [X] a) By attracting as many farmers as possible.
- [ ] b) By selling pesticides at the highest price possible.
- [ ] c) By selling each farmer as much pesticide as possible.

2 How can a retailer earn the trust of a farmer

- [X] a) By understanding the farmers problems and providing appropriate solutions
- [ ] b) By selling the farmer high quality pesticides
- [ ] c) By offering the farmer tea when he comes to the shop

3 To identify a farmer's pest problem, a retailer should first

- [ ] a) Look at the pictures on a pesticide container
- [ ] b) Refer to a leaflet about the crop or pest
- [X] c) Ask the farmer questions

4 Crop rotation is a form of:

- [X] a) Cultural control
- [ ] b) Mechanical control
- [ ] c) Sanitation

5 High plant densities in a field:

- [ ] a) Increase the farmers yield
- [X] b) Make the plants more susceptible to pest attack
- [ ] c) Help the plants to grow quickly

6 Repeated cultivation of the same crop on the same field:

- [ ] a) Helps to control weeds
- [X] b) Encourages the build-up of soil pests, weeds and diseases
- [ ] c) Promotes higher yields

7 The place of pesticides in pest management is:

- [ ] a) The first line of defence against pests.
- [X] b) To be used only when other methods have failed.
- [ ] c) To provide a quick solution to a pest problem.

8 One of the most common causes of the failure of a pesticide application is:

- [X] a) Using the wrong pesticide.
- [ ] b) Using out-of-date pesticide.
- [ ] c) The pests have developed resistance to the pesticide.

9 Pesticide laws and regulations exist so as to:

- [ ] a) Enable the government to control pesticide dealers.
- [ ] b) Ensure that out-of-date pesticides are not sold.
- [X] c) Ensure safe manufacture, transport, storage and use of pesticides.

10 According to international agreements, if high pesticide residues are found in Afghanistan agricultural produce by an overseas importer:

- [ ] a) The Afghanistan exporter can be fined.
- [ ] b) The overseas importer can pay the Afghanistan exporter less for the consignment.
- [X] c) The consignment can be rejected.

11 A main pesticide classification system is by:

- [X] a) Chemical group
- [ ] b) Contact
- [ ] c) Class II

12 A contact pesticide is one which:

- [ ] a) Is effective when inhaled by the pest
- [X] b) Is effective when it touches the body of the pest
- [ ] c) Is effective when eaten by the pest

13 A fumigant is:

- [ ] a) A pesticide for the control of fungi
- [ ] b) A chemical that helps the pesticide stick to sprayed surfaces
- [X] c) A pesticide that forms poisonous gases

14 The component of a pesticide product which actually kills the pest is called:

- [ ] a) The insecticide.
- [X] b) The active ingredient.
- [ ] c) The chemical.

15 A systemic pesticide is most suitable for the control of:

- [X] a) Pests which suck the juices of plants.
- [ ] b) Pests which live in the soil and feed on roots.
- [ ] c) Pests which eat the leaves of plants.

16 For a contact pesticide to have the greatest effect on the pest it should:

- [ ] a) Be sprayed in a high volume of water.
- [ ] b) Be used at the highest recommended dose rate.
- [X] c) Have a high number of pesticide droplets per unit area of treated surface.

17 One of the disadvantages of a wettable powder formulation is that:

- [ ] a) It is less phytotoxic than an emulsifiable concentrate formulation.
- [X] b) It can quickly settle out in the spray tank.
- [ ] c) It is not abrasive to nozzles and pumps.

18 The label on the pesticide container from a high quality manufacturer:

- [ ] a) Ensures that the product can be distinguished from similar pesticides.
- [ ] b) Provides information on the type and toxicity of the pesticide.
- [X] c) Provides all the information needed about the product.

19 The name given in the largest sized letters on the label is the:

- [ ] a) Chemical name
- [ ] b) Common name

[X] c) Product name

20 When is it permissible to transfer small amounts of pesticides from the original container into smaller containers for sale?

[ ] a) Only with Class III and unclassified pesticides

[X] b) Never

[ ] c) Only if the name and toxicity of the pesticide are marked on the smaller container

21 The most common way in which pesticides enter the body is:

[X] a) Through the skin.

[ ] b) Through the lungs.

[ ] c) Through the mouth.

22 The primary safety consideration when handling pesticides is to:

[X] a) Avoid exposure.

[ ] b) Wear protective clothing.

[ ] c) Avoid pesticide drifts when spraying.

23 When stored on shelves, dry pesticides should be placed:

[X] a) Above liquid pesticides.

[ ] b) Below liquid pesticides.

[ ] c) On the same shelves as liquid pesticides.

24 Older stock should be kept:

[ ] a) In a separate store

[X] b) At the front of shelves.

[ ] c) At the back of shelves.

25 The correct application of a pesticide:

[ ] a) Does not contaminate the environment.

[X] b) Contaminates the environment.

[ ] c) Minimises the pre-harvest interval of the pesticide.

SAMPLE PESTICIDE SAFETY POSTER (DARI)

ANNEX II: LIST OF PROTECTED SPECIES

Latin Name	Common Name
AMPHIBIA	
Batrachuperus mustersi	Paghman Salamander
REPTILES	
Testudo horsefieldii	Tortoise
BIRDS	
Accipiter badius	Shikra
Accipiter nisus	Sparrowhawk
Ageypius monachus	Cinereous Vulture
Anas formosa	Baikal Teal
Aquila chrysaetos	Golden Eagle
Aquila clanga	Greater Spotted Eagle
Aquila nipalensis	Steppe Eagle
Asio flammeus	Short-eared Owl
Asio otus	Long-eared Owl
Athene noctua	Little Owl
Aythya nyroca	Ferruginous Duck
Bubo bubu	Eurasian Eagle-owl
Buteo buteo	Buzzard
Buteo rufinus	Long-legged Buzzard
Circaetus gallicus	Short-toed Snake Eagle
Circus aeruginosus	Western Marsh-harrier
Circus cyaneus	Northern Harrier
Circus pygargus	Montagu's Harrier
Circus macrourus	Pallid Harrier
Falco columbarius	Merlin
Falco jugger	Laggar Falcon
Falco pelegrinoides	Barbary Falcon
Falco peregrinus	Peregrine Falcon
Falco subbuteo	Eurasian Hobby
Falco tinnunculus	Common Kestrel
Falco vespertinus	Red-footed Falcon
Glaucidium brodiei	Collared Owlet
Gypaetus barbatus	Lammergeier
Gyps fulvus	Griffon Vulture
Gyps himalayensis	Himalayan Vulture
Haliaeetus albicilla	White-tailed Eagle
Hieraaetus fasciatus	Bonelli's Eagle
Hieraaetus pennatus	Booted Eagle
Milvus lineatus	Black-eared Kite
Milvus migrans	Black Kite

Otus brucei	Pallid Scops-owl
Otus scops	Common Scops-owl
Pandion haliaetus	Osprey
Pelecanus onocrotalus	Great White Pelican
Strix aluco	Tawny Owl
Acrocephalus orinus	Large-billed Reed Warbler
Aquila heliaca	Eastern Imperial Eagle
Falco naumanni	Lesser Kestrel
Pelecanus crispus	Dalmation Pelican
Gyps bengalensis	White-Rumped Vulture
Oxyura leucocephala	White-headed Duck
Vanellus gregarius	Sociable Lapwing
Haliaeetus leucoryphus	Pallas' Fish Eagle
Marmaronetta angustirostris	Marbled Teal
Neophron percnopterus	Egyptian Vulture
Chlamydotis macqueenii	Macqueen's Bustard
Grus leucogeranus	Siberian Crane
Phoenicopterus roseus	Greater Flamingo
Falco cherrug	Saker Falcon
MAMMALS	
Asellia tridens	Trident Leaf-nosed Bat
Canis aureus	Golden Jackal
Eptesicus bottae	Botta's Serotine
Eptesicus gobiensis	Gobi Big Brown Bat
Eptesicus serotinus	Serotine
Equus hemionus	Asiatic Wild Ass
Felis margarita	Sand Cat
Hipposideros fulvus	Fulvus Leaf-nosed Bat
Lutra lutra	Otter
Megaderma lyra	Greater False Vampire
Miniopterus fulinginosus	Eastern Bent-winged Bat
Miniopterus schreibersii	Bechstein's Myotis
Myotis blythii	Lesser Mouse-eared Bat
Myotis bucharensis	Bokhara Whiskered Bat
Myotis emarginatus	Geoffroy's Bat
Myotis longipes	Kashmir Cave Bat
Myotis muricola	Nepalese Whikered Bat
Myotis nipalensis	Nepal Myotis
Nyctalus leisleri	lesser Noctule
Nyctalus montanus	Mountain Noctule
Otonycteris hemprichii	Desert Long-eared Bat
Pipistrelluss javanicus	Javan Pipistrelle

Pipistrelluss pipistrelluss	Common Pipistrelle
Pipistrelluss savii	Savi's Pipistrelle
Pipistrelluss tenius	Least Pipistrelle
Pipistrelluss coromandra	Coromandel Pipistrelle
Pipistrelluss kuhlii	Kuhl's Pipistrelle
Rhinolophus blasii	Blasius' Horseshoe Bat
Rhinolophus bocharicus	Bokhara Horseshoe Bat
Rhinolophus ferrumequninum	Greater Horseshoe Bat
Rhinolophus hipposideros	Lasser Horseshoe Bat
Rhinolophus lepidus	Blyth's Horseshoe Bat
Rhinopoma hardwickii	Lasser Mouse-tailed Bat
Rhinopoma microphyllum	Greater Mouse-tailed Bat
Rhinopoma muscatellum	SmallMouse-tailed Bat
Scotophilus heathii	Greater Asiatic Yellow House Bat
Tadarida aegyptiaca	Egyptian Free-tailed Bat
Tadarida teniotis	European Free-tailed Bat
Taphozous nudiventris	Naked-rumped Tomb Bat
Vespertilio murinus	Particoloured Bat
Vormela Peregusna	Marbled Polecat
Vulpes ruepellii	Rupell's Fox
Eoglaucomys fimbriatus	Small Kashmir Flying Squirrel
Petaurista Petaurista	Common Giant Flying Squirrel
Barbastella leucomelas	Eastern Barbastelle
Cervus elaphus bactrianus	Bactrian Deer
Gazella bennettii	Indian Gazelle
Gazella subgutturosa	Goitered Gazelle
Hyaena hyaena	Striped hyaena
Martes foina	Stone marten
Rhinolophus mehelyi	Mehely's Horseshoe Bat
Vulpes cana	Blanford's fox
Capra falconeri	Markhor
Capra sibirica	Siberian Ibex (Bamyan Population
Caracal caracal	Caracal
Acinonyx jubatus	Asiatic Cheetah
Lepus capensis	Cape Hare
Lynx lynx	Eurasian Lynx
Canis lupus	Wolf
Moschus cupreus	Musk Deer
Otocolobus manul	Pallas Cat
Ovis orientalis	Urial
Panthera pardus	Persian Leopard
Prionailurus bengalensis	Leopard Cat

Ovis ammon polii	Argali
Felis chaus	Jungle Cat
Uncia uncia	Snow Leopard
Ursus arctos	Brown Bear
Ursus thibetanus	Asiatic Black Bear
Felis silvestris	Wildcat
Vulpes corsac	Corsac Fox
INSECTS	
Parnassius autocrator	No common name
PLANTS	
Pinus gerardiana	Jalghoza Pine
Pinus wallichiana	Himalayan White Pine
Abies spectabilis	East Himalayan Fir
Taxus contorta	Himalayan Yew
Ulmus wallichiana	Himalayan Elm
Corydalis hindukushensis	No common name
Corydalis adiantifolia	No common name

ANNEX III: LIST OF PESTICIDES PROHIBITED IN AFGHANISTAN

Active Ingredient	Class	category	POP	PIC
diazinon	Organo-Phosphate	insecticide/acaricide	NO	NO
maleic hydrazide	unclassified	plant growth regulator	NO	NO
2,4 5-T	unclassified	herbicide	NO	YES
Aldicarb	Carbamate	insecticide/nematicide	NO	YES
Aldrin	Organo-chloride	insecticide/acaricide	YES	NO
Ammonium sulphamate	Inorganic	herbicide	NO	NO
Azinphos ethyl	Organo-Phosphate	insecticide/acaricide	NO	NO
Azinphos methyl	Organo-Phosphate	insecticide/acaricide	NO	NO
Formulation	Organo-Phosphate	insecticide/acaricide	NO	NO
BHC	Organo-chloride	insecticide/acaricide	YES	YES
Binapacryl	Dinitrophenol	insecticide/acaricide	NO	YES
Calcium arsenate	Inorganic	Herbicide, Insecticide, Rodenticide, Molluscicide	NO	NO
Calcium cyanide	Inorganic	rodenticide	NO	NO
Captafol	Phthalimide	fungicide	NO	YES
Carbofuron	Carbamate	insecticide/nematicide	NO	NO
Carbophenothion	Organo-Phosphate	insecticide/acaricide	NO	NO
Chinomethionate	Dithiocarbamate	fungicide/acaricide	NO	NO
Chlordane	Organo-chloride	insecticide/acaricide	YES	YES
Chlordimeform	Formamidine	insecticide/acaricide	NO	YES
Chlorobenzilate	Organo-chloride	insecticide/acaricide	NO	YES
Copper acetoarsenite	Inorganic	wood preservative	NO	NO
Dalapon	Organo-chloride	herbicide	NO	NO
DDT	Organo-chloride	insecticide/acaricide	YES	YES
Dieldrin	Organo-chloride	insecticide/acaricide	YES	YES
Dicrotophos	Organo-Phosphate	insecticide/acaricide	NO	NO

Dinoseb	Dinitrophenol	herbicide	NO	YES
DNOC	Dinitrophenol	insecticide/acaricide	NO	YES
Endosulfan	Organo-chloride	insecticide/acaricide	NO	YES
Endrin	Organo-chloride	insecticide/acaricide	YES	NO
EPM			NO	NO
Ethyl mercury chloride	Organo-mercury	fungicide	NO	NO
Ethyl parathion	Organo-Phosphate	insecticide/acaricide	NO	NO
Ethylene dibromide	Halogenated organic	fumigant	NO	NO
Ethylene dichloride	Halogenated organic	fumigant	NO	YES
Ethylene oxide	Alcohol	fumigant	NO	YES
Fenitrothion	Organo-Phosphate	insecticide/acaricide	NO	NO
Fenthion	Organo-Phosphate	insecticide/avicide	NO	NO
Fentin acetate	Organotin	fungicide/herbicide	NO	NO
Fentin hydroxide	Organotin	fungicide/mollusicide/herbicide	NO	NO
Ferbam	Dithiocarbamate	fungicide	NO	NO
Fluoroacetamide	Unclassified	insecticide/rodenticide	NO	YES
Parathion	Organo-Phosphate	insecticide	NO	YES
Lead arsenate	Inorganic	herbicide/insecticide/rodenticide	NO	NO
Leptophos	Organo-Phosphate	insecticide	NO	NO
Menazon	Organothiophosphate	insecticide	NO	NO
Mephosfolan	Organo-Phosphate	insecticide	NO	NO
Metamidophos	Organo-Phosphate	insecticide	NO	YES
Methomyl	N-Methyl Carbamate	insecticide	NO	NO
Methyl- parathion	Organo-Phosphate	insecticide	NO	YES
Metoxuron	Urea	herbicide	NO	NO
Mevinphos	Organo-Phosphate	insecticide/acaricide	NO	NO
Nickel chloride	Inorganic		NO	NO
Nicotin sulfate			NO	NO
Nitrofen	Diphenyl ether	herbicide	NO	NO
Paradichlorbenzene		fumigant	NO	NO
Paraquat dimethyl sulphate	Bipyridylium	herbicide	NO	NO
Pentachloronitrobenzene	Substituted Benzene	fungicide	NO	NO
Phenyl mercury acetate	Organo-mercury	fungicide/herbicide	NO	NO
Phosphamidon	Organo-Phosphate	insecticide	NO	YES
Simazine	Triazine	herbicide	NO	NO
Sodium cyanide	Inorganic	rodenticide	NO	NO
Sodium methane arsenate	Organoarsenic	herbicide	NO	NO
Tri-chloro Acetic Acid		herbicide	NO	NO
Tetradiform	unclassified	insecticide	NO	NO
Thiodemeton	Organo-Phosphate	insecticide	NO	NO
Toxaphene	Organo-chloride	insecticide	YES	YES
Vamidothion	Organo-Phosphate	insecticide	NO	NO
Warfarin	Comarin	rodenticide		

ANNEX IV: DRAFT PESTICIDE ACT

NB. This Bill is to be submitted to Parliament and is subject to amendment before becoming law

Islamic Republic of Afghanistan

Ministry of Agriculture, Irrigation, and Livestock

Draft Pesticides Act

TABLE OF CONTENT

CHAPTER 1. GENERAL PROVISIONS ..... **Error! Bookmark not defined.**
Article 1. Legal Basis ..... **Error! Bookmark not defined.**
Article 2. Objectives ..... **Error! Bookmark not defined.**
Article 3. Application ..... **Error! Bookmark not defined.**
Article 4. Definitions ..... **Error! Bookmark not defined.**
CHAPTER 2. DUTIES AND AUTHORITIES ..... **Error! Bookmark not defined.**
Article 5. Functions and Authorities of the Ministry of Agriculture, Irrigation and Livestock**Error! Bookmark not**
Article 6. Pesticides Board ..... **Error! Bookmark not defined.**
Article 7. Functions and Authorities of the Board ..... **Error! Bookmark not defined.**
Article 8. Decisions of Board ..... **Error! Bookmark not defined.**
CHAPTER 3. REGISTRATION ..... **Error! Bookmark not defined.**
Article 9. Registration of Pesticides ..... **Error! Bookmark not defined.**
Article 10. Unregistered Pesticide ..... **Error! Bookmark not defined.**
Article 11. Research Permits ..... **Error! Bookmark not defined.**
Article 12. Emergency Permits ..... **Error! Bookmark not defined.**
Article 13. Cancellation of a Pesticide from the Registry ..... **Error! Bookmark not defined.**
Article 14. Prohibition of Pesticides ..... **Error! Bookmark not defined.**
CHAPTER 4. LICENSES ..... **Error! Bookmark not defined.**
Article 15. The License Issuance Authority ..... **Error! Bookmark not defined.**
Article 16. Licenses ..... **Error! Bookmark not defined.**
Article 17. ..... **Error! Bookmark not defined.**
Article 18. Responsibilities of License Holder ..... **Error! Bookmark not defined.**
Article 19. Revocation, Suspension and Amendment of Licenses ..... **Error! Bookmark not defined.**
Article 20. Reissuance of License ..... **Error! Bookmark not defined.**
CHAPTER 5. PRESENTATION AND PROTECTIVE MEASURES OF PESTICIDES**Error! Bookmark not defin**
Article 21. Labeling ..... **Error! Bookmark not defined.**
Article 22. Packaging ..... **Error! Bookmark not defined.**
Article 23. Storage ..... **Error! Bookmark not defined.**
Article 24. Transport ..... **Error! Bookmark not defined.**
Article 25. Advertisement of Pesticides ..... **Error! Bookmark not defined.**
Article 26. Pesticides Disposal ..... **Error! Bookmark not defined.**
CHAPTER 6. LABORATORIES ..... **Error! Bookmark not defined.**
Article 27. Laboratory ..... **Error! Bookmark not defined.**
Article 28. Functions of Laboratories ..... **Error! Bookmark not defined.**
Article 29. Responsibilities of Pesticide Laboratory Staff ..... **Error! Bookmark not defined.**
CHAPTER 7. CONTROL & INSPECTION ..... **Error! Bookmark not defined.**

Article 30. Pesticide Inspectors ..... **Error! Bookmark not defined.**
Article 31. Duties and Authorities of Pesticide Inspectors ..... **Error! Bookmark not defined.**
CHAPTER 8. OFFENCES AND SANCTIONS ..... **Error! Bookmark not defined.**
Article 32. Offences ..... **Error! Bookmark not defined.**
Article 33. Prosecution ..... **Error! Bookmark not defined.**
Article 34. Penalties and Charges ..... **Error! Bookmark not defined.**
Article 35. ..... **Error! Bookmark not defined.**
Article 36. Confiscation ..... **Error! Bookmark not defined.**
CHAPTER 9. FINAL PROVISIONS ..... **Error! Bookmark not defined.**

GENERAL PROVISIONS

LEGAL BASIS

This Act is enacted pursuant to Article 14 of the Constitution of Afghanistan for the management of pests and to control production, importing, handling, storage, distribution, and use of pesticides.

OBJECTIVES

This Act shall be interpreted and implemented consistent with the International Conventions and Regulations to which the Government of Afghanistan is a signatory including the following purposes:

(1) to facilitate the implementation of Integrated Pest Management practices;

(2) to prevent risks to human or animal health, resulting from the use of pesticides;

(3) to protect the environment;

(4) to facilitate sustainable crop production;

(5) to improve the handling and application of pesticides; and

(6) To ensure that agricultural products from Afghanistan comply with and meet international standards enabling international trade.

APPLICATION

(1) The Ministry of Agriculture, Irrigation and Livestock shall apply this Act to all aspects of the life cycle of pesticides, related research, extension services, awareness campaigns, educational curricula, as well as post-registration activities such as marketing, training, licensing, recycling, and disposal within the territory of Islamic Republic of Afghanistan.

(2) The life cycle of pesticides includes the registration, import, manufacture, distribution, packaging, labeling, sale, transportation, storage and use of pesticides.

DEFINITIONS

In this Act, unless the context otherwise requires**,**

(1) "**Active ingredient**" means the biologically active part of the pesticide present in a formulation.

(2) "**Advertising**" means the promotion of the sale and use of pesticides by printed and electronic media, signs, displays, gifts, demonstrations, or word of mouth.

(3) "**Application equipment**" means any technical aid, equipment, implement or machinery, which is used for the application of pesticides.

(4) "**Application technology**" means the actual physical delivery and distribution process of a pesticide to the target organism where the target organism comes into contact with the pesticide.

(5) "**Banned pesticide**" means a pesticide for which all uses have been prohibited by final regulatory action of the Government of Afghanistan and includes any pesticide that:

a) has been refused approval for first-time use, or

b) has been withdrawn by industry either from the domestic market,

c) Has been withdrawn from further consideration in the domestic approval process, and where there is clear evidence that any of the foregoing actions has been taken in order to protect human health or the environment.

(6) "**Biopesticides**" means naturally occurring substances or their synthetic analogues that are distinguished from conventional chemical pesticides by their unique modes of action, low use volume, and target species specificity.

(7) "**Board**" means the Pesticides Board (herein Board) constituted under 0 of this Act.

(8) "**Brand**" means the trade name displayed in a pesticide, under which the pesticide is marketed.

(9) "**Disposal**" means any operation to recycle, neutralize, destroy or isolate pesticide waste, used containers and contaminated materials.

(10) "**Distribution**" means the process by which pesticides are supplied through trade channels to local or international markets.

(11) "**Formulation**" means the combination of various ingredients designed to make a product useful and effective for the purpose or purposes claimed. .

(12) "**Good Agricultural Practice**", when used in reference to pesticides, means the officially authorized uses of pesticides under actual conditions necessary for effective and reliable pest control applied in a manner that leaves the smallest amount of residue practicable and does not exceed the maximum residue limit as established by the Ministry of Agriculture, Irrigation and Livestock.

(13) "**Inert ingredient**" means any ingredient in a formulated pesticide product, which is not biologically active and is intentionally included in the product, including, but is not limited to, ingredients such as solvents, emulsifiers, wetting agents, carriers, diluents, conditioning agents and other similar ingredients.

(14) "**Integrated Pest Management**" (herein IPM) means those measures that:

a. encourage the use of natural pest control mechanisms;

b. keep pesticides and other interventions to levels that are economically justified;

c. reduce or minimize risks to human health and the environment; and

d. promote healthy crops with the least possible disruption to agro-ecosystems

(15) "**Label**" means any written, printed or graphic matter on or attached to the immediate package and on every other covering in which the package is placed or packed and includes any written, printed or graphics matter accompanying the pesticides.

(16) "**Manufacture**" means the production of a pesticide's active ingredient or preparation of

its formulation or product.

(17) "**Manufacturer**" means any legal entity in the public or private sector engaged in the manufacture of a pesticide's active ingredient or preparing its formulation or product, whether directly or through an agent or through an entity controlled by or under contract with it.

(18) "**Marketing**" means the overall process of product promotion, including advertising, product public relations and information services as well as the distribution and sale on local or international markets.

(19) "**Maximum Residue Limit**" (herein MRL) means the maximum concentration of a residue that is legally permitted or recognized as acceptable by the Board in or on a food or agricultural commodity or animal feedstuff.

(20) "**Operator**" refers to the holder or entity responsible for the pesticide at each stage of the pesticide life cycle.

(21) "**Package**" or "**Packaging**" means the container together with the protective wrapping used to carry pesticide products via wholesale or retail distribution to users.

(22) "**Pest**" refers to any unwanted plants or animals that have been determined to cause harm during or otherwise interfere with the production, processing, storage, transport or marketing of food, agricultural commodities, wood and wood products or animal feedstuffs.

(23) "**Pesticide**" means any substance or mixture of substances intended for preventing, destroying or controlling any pest, including:

a) vectors of human and animal disease,

b) unwanted species of plants or animals as defined by this Act;

and may include:

c) Substances which may be administered to animals for the control of pests in or on their bodies.

d) substances intended for use as a plant growth regulator, defoliant, desiccant or agent for thinning fruit or preventing the premature fall of fruit, and

e) Substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport.

(24) "**Pesticide Division**" refers to the Pesticide Division of Plant Protection and Quarantine Department of the Ministry of Agriculture, Irrigation and Livestock.

(25) "**Poison**" means a substance that can cause disturbance of structure or function, leading to injury or death when absorbed in relatively small amounts by human beings, plants or animals.

(26) "**Poisoning**" means occurrence of damage or disturbance caused by a poison, and includes intoxication.

(27) "**Premises**" mean any land, shop, stall, place, or other physical location where any pesticide is sold, manufactured, stored or used, and includes any vehicle carrying pesticides.

(28) "**Product** (or pesticide product)" means the pesticide active ingredient(s) and other components, in the form in which it is packaged and sold.

(29) "**Protective Equipment**" means any clothes, materials, or devices that provide protection from pesticide exposure during handling and application, including both specifically designed equipment and clothing for application and handling.

(30) "**Registration**" means the process, as prescribed by this Act and its subordinate legislation, of approving the sale and use of a pesticide.

(31) "**Residue" or** "pesticide residue" means any specified substances in or on food, agricultural commodities or animal feed resulting from the use of a pes**ticide,** including:

a) any derivatives of a pesticide, such as conversion products, metabolites, reaction products and impurities considered to be of toxicological significance, and

b) Residues from unknown or unavoidable sources (e.g. environmental) as well as known uses of the chemical.

(32) "**Restricted use pesticide**" is a pesticide for which some uses have been restricted by this Act.

(33) "**Risk**" is a function of the probability of an adverse health or environmental effect, and the severity of that effect, following exposure to a pesticide.

(34) "**Toxicity**" means the physiological or biological property that determines the capacity of a chemical to do harm or produce injury to a living organism by other than mechanical means.

Duties and Authorities

Functions and Authorities of the Ministry of Agriculture, Irrigation and Livestock

(1) The Ministry of Agriculture, Irrigation and Livestock (here in the Ministry) shall have the authority to exercise the following functions:

a) issue pesticide's manufacture, import and use licenses;

b) prepare a proposal for a coordinated pesticides control program;

c) coordinate and make preparations for meetings of the Pesticides Advisory Committee created under this Act;

d) coordinate the quality control, monitoring, and inspections;

e) represent the country in pesticides related international organizations and meetings, and respond to the obligations of notification and information assumed by Afghanistan; and

f) Carry out other functions as required or necessary by this Act or its subordinate legislations.

PESTICIDES BOARD

(1) A Pesticides Board (herein Board) consist of the following members is hereby created:

a. The Deputy Minister Technical in the Ministry who shall act as Chairman;

b. The Head of the Plant Protection and Quarantine Department under the Ministry as deputy chairman;

c. Head of Agricultural Research Services in the Ministry as member;

d. Head of the General Directorate of Livestock and Animal Health in the Ministry as member;

e. One member from the Ministry of Public Health (MOPH),

f. One member from the National Environment Protection Agency (NEPA).

g. One member from the Afghanistan National Standard Agency

h. One member form the Ministry of Commerce and Industries

i. One member from the Faculty of Agriculture

(2) Head of Pesticides Division of Plant Protection and Quarantine Department functions as secretary of the Board and organize its meetings.

(3) The Chairman, at the request of any member of the Board, may invite other public authorities from departments related to food safety, health, environment, crop and animal production or protection or other departments to its meetings. Invited experts shall not have voting rights.

(4) The Board shall be responsible for establishing the necessary *Tarzulamal*, to regulate its structure and procedures, consistent with the provisions of this Act.

FUNCTIONS AND AUTHORITIES OF THE BOARD

(1) The Board shall have the following functions and authorities:

a. Provide opinions and approve or deny applications for the registration, re-registration, suspension, substitution and removal of pesticides from the registry;

b. Carry out periodic review of the pesticides included in the registry to determine if, based on new information, their status or inclusion in the registry should be amended;

c. Approve specific license requirements in implementation of this Act and its subordinate legislation;

d. Prepare a coordinated framework for pesticides control and monitor its implementation;

e. Provide advice in formulating national policies, draft legislation, procedures,

guidelines, standards and criteria related to the appropriate use and management of pesticides;

f. Provide advice, pursuant to provisions of this Act, in performing good agricultural practices, determination of maximum residue limits, and fees to be collected for the services provided;

g. Establish ad hoc or permanent Pesticides Advisory Committees, with the participation of all pesticides management stakeholders, and ensure adequate consultation;

h. Prepare opinions, studies and policy analysis at the request of the Minister;

i. At the request of the relevant administration or two of the members, when there is scientific information, discuss the revision, suspension, substitution or removal of a product from the registry if necessary or appropriate;

j. Make sure the registration of pesticides

k. Research capacity development and undertaking research programs on pesticides;

l. Carry out capacity building programs in implementation of pesticide legislation.

DECISIONS OF BOARD

(1) Decisions of the Board shall be made by simple majority of the members, provided that at least one member of the Ministry of Public Health and one member from NEPA also vote in favor, unless the terms of the Board's *Tarzulamal* require a greater majority.

(2) In the event of a tie, the Chairman shall have the authority to break the tie by casting a second vote.

REGISTRATION

REGISTRATION OF PESTICIDES

(1) Pesticides are registered in the registry of relevant division of Plant Protection Department of the Ministry.

(2) Any person, desiring to register a pesticide product in Afghanistan, shall submit an application for registration, in the manner prescribed by this Act and its subordinate legislation, to the relevant administration.

(3) Quantity and the time period for the use of pesticides' stock existing prior to the approval of this Act which cannot be registered shall be determined by the Board, and if the use of such pesticides prohibited shall be subject to disposal.

UNREGISTERED PESTICIDE

(1) No person shall import, manufacture, transport, store, advertise, market, sell, distribute, apply, possess, handle, or use in any manner, an unregistered pesticide in Afghanistan.

(2) Pesticides used for the purpose of research or to prevent a pest outbreak in emergency cases are excluded from the above provision.

RESEARCH PERMITS

The Pesticide Division after the approval of the Board, in accordance with the provisions of this Act and its subordinate legislations, may grant a temporary permit to licensed individuals or entities authorizing them to import, formulate or use of pesticide for the purpose of scientific research.

EMERGENCY PERMITS

(1) The Board may grant permits to licensed individuals or entities for the use of unregistered product in case of emergency or a pest outbreak provided that:

   a. there is no product in the Registry available and affordable in sufficient quantities to manage the pest outbreak causing the emergency;

   b. the permit is limited to a specific time period and for a specific quantity and use, and

   c. The permit holder and consignments are clearly identified.

CANCELLATION OF A PESTICIDE FROM THE REGISTRY

The Board may cancel the registration of a pesticide and remove it from the list when:

(1) it is not effective for its intended purpose;

(2) there is existing or new scientific information that it presents unacceptable hazards to humans, plants, animal health or the environment;

(3) other products or integrated pest management measures are available that are equally or more effective, but less hazardous;

(4) the pesticide is banned or severely restricted in a country with comparable uses and circumstances, by an international agreement signed by Afghanistan, or an international forum of relevance for pesticides management.

PROHIBITION OF PESTICIDES

(1) If the Board has reason to believe that the use of any registered pesticide may result in an unacceptable risk to human beings, animals or the environment, it may:

   a. temporarily prohibit the sale, distribution or use of the pesticide, or a specified batch;

   b. specify the area and period of validity in its official notification to the registrant; and

   c. Establish an investigation into the matter.

(2) According to the results of the investigation, the Board shall order either the removal of the temporary prohibition, or the amendment, suspension, or cancellation of the registration.

(3) The Board shall complete the investigation on a prohibited Pesticide within the period of

3 months and shall, based on the findings of the investigation, decide on temporary prohibition or its removal.

(4) In the event a pesticide is permanently banned as a result of the procedure, existing stock shall be disposed of in the manner prescribed in Paragraph (3) of Article 9 of this Act.

LICENSES

THE LICENSE ISSUANCE AUTHORITY

The Pesticides Division of the Ministry after approval of the Board is the authority to issue license for import, formulation, manufacture, distribution, and sale or advertise of a Pesticide.

LICENSES

(1) Pesticide License shall be granted for 3 years pursuant to the submission of an application in accordance to the provisions of this Act.

(2) The Board after reviewing the application set forth in paragraph (1) of this article shall decide on approval or denial of the application.

(3) Where an application set forth in paragraph (1) of this article is refused, the Board shall review the refusal reasons and notify the applicant in writing within the time period of 2 months.

(4) Any person whose application is refused can reapply for a license after fulfilling the required information and documents.

(5) The issuance of a license shall be accompanied by a fee in the amount determined in the subordinate legislation.

Storage of Pesticides for use on and proportionate to personal farms in limited quantity is allowed for famers and Agricultural Cooperatives without holding a license.

RESPONSIBILITIES OF LICENSE HOLDER

(1) Every person holding a license shall keep records of his license, all quantities of pesticides imported, manufactured, purchased, stored, sold or applied, and any other information related to pesticides.

(2) Records kept in accordance with paragraph (1) shall be made available, upon request, to an inspector, public authority or other interested individual.

(3) Where a holder of a license cannot continue to his activities, he shall submit in writing the license to the Pesticide Division or to the Board.

REVOCATION, SUSPENSION AND AMENDMENT OF LICENSES

(1) The Board may revoke, suspend or modify a license if it determines that subsequent to it being granted:

a. it has become aware of new facts or an unforeseen change in circumstances or a violation of any conditions on which the license was granted;

b. it is demonstrated that the license holder, its establishment or facilities no longer fulfill the provision of this Act and the prescribed requirements;

c. there are safety reasons which justify limiting the trade or use of a product, a premise or other element included in the license; and

d. When the license holder dies or his entity is dissolved.

(2) Where a license is revoked, suspended or modified, the pesticide stocks shall be subject to the provision set forth in paragraph (3) of Article 9 of this Act.

REISSUANCE OF LICENSE

Any license which is revoked under the conditions set forth in article 19 of this Act may be re-granted after fulfilling the requirements of this Act.

PRESENTATION AND PROTECTIVE MEASURES OF PESTICIDES

LABELING

All containers of pesticides which may be delivered separately shall be accompanied by a label or an individual leaflet in one of official languages of the Islamic Republic of Afghanistan that includes:

(1) the names of all the active ingredients using their common and trade names, their concentration, and the formulation type;

(2) the type of product (e.g. insecticide, fungicide, herbicide, rodenticide);

(3) the pests for which the product is most adequate and the recommended dosages;

(4) the application method, use instructions, persistency and pre-harvest interval;

(5) warning and cautionary statements including signs and symptoms of poisoning and information on safety, health and first aid measures, warning symbols or pictograms and environmental precautions;

(6) the date of the formulation, expiry and the batch number;

(7) Other requirements as set forth in relevant *Tarzulamal*.

PACKAGING

Packages containing pesticides, offered for transport, storage, distribution, or sale shall conform to specific requirements as prescribed in subordinate legislation issued pursuant to this Act.

STORAGE

(1) The rooms or premises meant for storing pesticides shall fulfill all the requirements of this Act and any subordinate legislation issued in conformity with it, and shall be located away from residential areas.

(2) The distance of premises for storing pesticides form the residential areas shall be determined by the Board.

TRANSPORT

The transportation of pesticide products must conform to the standards for transport of dangerous goods as set-forth in relevant legislation, including any additional special transportation rules established by the Board.

ADVERTISEMENT OF PESTICIDES

(1) No person shall advertise any pesticide:

a. not included in the registry, or where the use is restricted to trained operators and technical equipments;

b. In a manner that is false or misleading, or that may cause confusion or deceive consumers.

PESTICIDES DISPOSAL

(1) Obsolete, deteriorated, or unwanted pesticides, containers that contain pesticides residues, empty containers, contaminated rinsing, shall be disposed of in an environmentally sound manner as prescribed by the Board.

LABORATORIES

LABORATORY

(1) The Board shall designate the laboratory or laboratories to carry out analysis of pesticide formulations for registration purposes, pesticides quality control as well as analyses of the pesticide samples collected by the pesticide inspectors.

FUNCTIONS OF LABORATORIES

The functions of the other designated laboratories shall include:

a. supporting applicants wishing to register a pesticide to generate pesticide residue data for the purpose of registration;

b. performing studies on the presence and fate of the Persistent Organic Pollutant pesticides, banned pesticides or unregistered pesticides in environmental components;

c. supporting the development and/or adoption of protocols for pesticide residue studies;

d. Coordinating pesticide residue and other pesticide related studies in collaboration with NEPA.

RESPONSIBILITIES OF PESTICIDE LABORATORY STAFF

(1) The pesticide laboratory shall preserve the confidentiality of the formulae submitted for analysis or test.

(2) The pesticide laboratory shall maintain records of the analysis performed in implementation of this Act.

CONTROL & INSPECTION

PESTICIDE INSPECTORS

(1) The Board shall appoint Pesticides Inspectors.

(2) No person with any financial interest in the manufacture, import or sale of any pesticide may be appointed as or maintain the position of Pesticide Inspector.

DUTIES AND AUTHORITIES OF PESTICIDE INSPECTORS

(1) Carry out periodic inspections of all establishments which import, export, manufacture, pack, label, store, sell, distribute, transport, use, or advertise pesticides.

(2) Require all relevant documents, including licenses, records, or other documents under this Act to be presented for inspection.

(3) Take samples of any substances to which this Act relates and, as may be prescribed, submit such samples for analysis and taking necessary measures.

(4) Seize any equipment, pesticide, document, record, or any other thing which the inspector believes has been used in a contravention of this Act.

(5) Provide opinions on seizure and disposal of articles set forth in paragraph (4) of this article.

(6) Pesticides inspectors shall be responsible for reporting violations of the provisions of this Act to the Board.

OFFENCES AND SANCTIONS

OFFENCES

The followings are considered violation of this act:

7- Import, manufacture, sell, stock or exhibit for sale or distribute any unregistered pesticide, or a pesticide for a use or with a label except in accordance with the requirements set forth in the registration.
8- Function without a license or permit.
9- Use of banned pesticide.
10- Obstruct a Pesticide Inspector in the exercise of his powers or discharge of his legal duties.
11- Make false or misleading declarations or allowing or authorizing their entry in any relevant records.
12- Transfer permits or licenses without authorization.
13- Otherwise violate this Act, or its subordinate legislations.

PROSECUTION

Whoever commits the offences set forth in Article 32 of this Act shall be subject to prosecution.

PENALTIES AND CHARGES

(1) A person who commits the offences set forth in Article 32 of this Act shall, considering the type of the offense, be punished with the fine not less than X and not more than Y.

(2) Any person referred in paragraph (1) of this article shall, proportionate to his offence, be subject to additional punishments by the authorized court.

(1) All fines and penalties established by this Act shall be reviewed and adjusted annually by the Board to account for inflation, the value of the damages, or the degree of harm caused.

(2) A person who is convicted of an offence under this Act may, in addition to any other penalty, forfeit any registration, license or permit granted under this Act.

(3) The cost of any analysis or laboratory report, inspection, treatment, testing, analysis of any animal, plant or product or the removal, disposal or return of an animal, plant or product, seizure, detention or disposal of a product may recover from the person who is punished with the fine.

CONFISCATION

(1) Where any person has been convicted under this Act for contravening any of the provisions of this Act or any of its subordinate legislation, the stock of the pesticide related to the contravention shall be confiscated.

(2) Without prejudice to the provisions contained in paragraph (1), where the Court has verified that, on the application of a Pesticide Inspector or other person, the pesticide does not respond to the characteristics included in the label, or is not suitable or particularly hazardous for use, such pesticide may be confiscated.

(3) Pesticides seized or confiscated will be disposed or destroyed at the expense of the legal owner.

Final Provisions

(1) The Customs Authority, the Ministry of Commerce and Industries (MOCI) and relevant authorities shall coordinate with the Ministry to control the import of pesticides in Afghanistan.

(2) The Customs Authority shall only permit the entrance into the country of pesticides for which an import permit has been granted.

(1) Any person aggrieved by a decision of the Board, Inspector, Licensing Officer, or Pesticide Analyst may appeal to the Minister or the Board within a period of thirty (30) days from the date on which the decision is communicated to him.

(2) On receipt of an appeal under paragraph (1) of this article, the Board shall address the

appeal within a period of 30 days.

The Board shall, under this Act, promote a pesticide uses policy for Integrated Pest Management.

The Ministry and the Board shall propose and approve subordinate legislation for the purpose of giving effect to the provisions of this Act.

This Act shall come into force after signed by the President and published in official gazette. With the commencement of this Act, the Pesticide Regulation in the Official gazette, Issue No. 795, and any other regulation contravening the provisions of this Act, shall be repealed.

ANNEX V: SPECIES AT RISK IN AFGHANISTAN

Afghan species listed as being at threat by the global IUCN Red List, the AWEC and by CITES.

Species Listing	**Population/Sub-species Listing**	**Common Name**	**Global Threat**	**National Threat**	**Protected/ Harvestable**	**CITES**
MAMMALS						
Acinonyx jubatus		Cheetah	VU	CR	P	
Canis lupus		Grey Wolf	LC	VU	P	II
Capra aegagrus		Wild Goat	VU			
Capra falconeri		Markhor	EN	EN	P	I
Capra sibirica	Bamiyan Province	Siberian Ibex	LC (sp)	CR	P	
Capra sibirica	Badakhshan Province	Siberian Ibex	LC (sp)	LC	H	
Caracal caracal		Caracal	LC	VU	P	I
Cervus elaphus	bactrianus	Bactrian Deer	LC (sp)			II (ssp)
Equus onager	onager or kulan	Wild Ass	EN (sp) (extinct in Afghanistan)			II (ssp)
Felis chaus		Jungle Cat	LC	DD	P	II
Felis sylvestris		Wildcat	LC	DD	P	II
Gazella subgutturosa		Goitered Gazelle	VU			
Lepus capensis		Cape Hare	LC	DD	P	
Lutra lutra		Eurasian Otter	NT			I
Lynx lynx		Lynx	LC	VU	P	II
Macaca mulatta		Rhesus macaque	LC			II
Moschus cupreus [chyrsogaster]		Musk Deer	EN	EN	P	I

Otocolobus manul		Pallas Cat	NT	DD	P	II
Ovis ammon	polii	Marco Polo Argali	NT (sp)	VU	P	II (ssp)
Ovis orientalis	cycloceros	Afghan Urial	VU (sp)	DD	P	II (ssp)
Panthera pardus	saxicolor	Persian Leopard	EN (ssp)	EN	P	I (sp)
Panthera tigris	virgata	Caspian Tiger	EX (ssp)			I (sp)
Prionailurus bengalensis		Leopard Cat	LC	DD	P	II
Rhinolophus mehelyi		Mehely's Horseshoe Bat	VU			
Uncia uncia		Snow Leopard	EN	EN	P	I
Ursus arctos		Brown Bear	LC	DD	P	I
Ursus thibetanus		Asiatic Black Bear	VU	EN	P	I
Vormela peregusna		Eurasian Marbled Polecat	VU			
Vulpes cana		Afghan (Blandford's) Fox	VU			II
Vulpes corsac		Corsac Fox	LC	DD	P	
Vulpes vulpes		Red Fox	LC	NT	H	
BIRDS						
Accipiter badius		Shikra	LC			II
Accipiter gentilis		Northern Goshawk	LC			II
Accipiter nisus		Eurasian Sparrowhawk	LC			II
Aegypius monachus		Cinereous Vulture	NT			II
Alectoris chukar		Chukar	LC	NT	H	
Aquila chrysaetos		Golden Eagle	LC			II
Aquila clanga		Greater Spotted Eagle	VU			II
Aquila heliaca		Imperial Eagle	VU			I
Aquila nipalensis		Steppe Eagle	LC			II
Asio flammeus		Short-eared Owl	LC			II
Asio otus		Long-eared Owl	LC			II

Athene noctua		Little Owl	LC			II
Bubo bubo		Eurasian Eagle-Owl	LC			II
Butastur teesa		White-eyed Buzzard	LC			II
Buteo lagopus		Rough-legged Hawk	LC			II
Buteo rufinus		Long-legged Buzzard	LC			II
Chlamydotis macqueenii		Houbara Bustard	VU	VU	P	I
Ciconia nigra		Black Stork	LC			II
Circaetus gallicus		Short-toed Eagle	LC			II
Circus aeruginosus		Western Marsh-Harrier	LC			II
Circus cyaneus		Northern Harrier	LC			II
Circus macrourus		Pallid Harrier	NT			II
Circus pygargus		Montagu's Harrier	LC			II
Columba eversmanni		Pale-Backed Pigeon	VU			
Falco cherrug		Saker Falcon	EN	VU	P	II
Falco columbarius		Merlin	LC			II
Falco jugger		Laggar Falcon	NT			I
Falco naumanni		Lesser Kestrel	VU			II
Falco pelegrinoides		Barbary Falcon	LC			I
Falco peregrinus		Peregrine Falcon	LC			I
Falco subbuteo		Eurasian Hobby	LC			II
Falco tinnunculus		Eurasian Kestrel	LC			II
Glaucidium brodiei		Collared Owlet	LC			II
Grus grus		Common Crane	LC			II
Grus leucogeranus		Siberian Crane	CR	CR	P	I
Grus virgo		Demoiselle Crane	LC			II
Gypaetus barbatus		Lammergeier	LC			II
Gyps bengalensis		White-rumped Vulture	CR			II

Gyps fulvus		Eurasian Griffon	LC			II
Gyps himalayensis		Himalayan Griffon	LC			II
Haliaeetus albicilla		White-tailed Eagle	LC			I
Haliaeetus leucoryphus		Pallas's Fish-Eagle	VU			II
Hieraaetus fasciatus		Bonelli's Eagle	LC			II
Marmaronetta angustirostris		Marbled Duck	VU			
Milvus lineatus [migrans]		Black Kite	LC			II
Neophron percnopterus		Egyptian Vulture	EN			II
Otis tarda		Great Bustard	VU			II
Oxyura leucocephala		White-Headed Duck	EN			II
Pandion haliaetus		Osprey	LC			II
Pelecanus crispus		Dalmatian Pelican	VU			I
Phoenicopterus roseus		Greater Flamingo	LC	VU	P	II
Picus squamatus		Scaly-bellied Woodpecker	LC			
Platalea leucorodia		Eurasian Spoonbill	LC			II
Psittacula eupatria		Alexandrine Parakeet	LC			II
Psittacula himalayana		Slaty-headed Parakeet	LC			II
Psittacula krameri		Rose-ringed Parakeet	LC			
Saxicola macrorhyncha		Stoliczka's Bushchat	VU			
Tetrax tetrax		Little Bustard	NT			II
Vanellus gregarius		Sociable Lapwing	CR			II
REPTILES						
Eryx elegans		Elegant Sand Boa				II
Eryx johnii		Indian Sand Boa				II
Eryx miliaris		Dwarf Sand Boa				II
Eryx tataricus		Tartary Sand Boa				II

Naja oxiana		Central Asian Cobra				II
Ptyas mucosus		Oriental Rat Snake or Whipsnake				II
Testudo horsfieldii		Afghan Tortoise	VU			II
Uromastyx asmussi		Iranian Uromastyx				II
Uromastyx hardwickii		Indian Spiny Tail Lizard				II
Varanus bengalensis		Bengal Monitor				I
Varanus griseus		Desert Monitor				I
AMPHIBIANS						
Batrachuperus mustersi		Afghani Brook Salamander	CR	CR	P	
FISH						
Acipenser nudiventris		Fringebarbel sturgeon	EN			II
Cyprinus carpio		Wild Common Carp	VU			
Luciobarbus brachycephalus		Shorthead Barbel	VU			
Luciobarbus capito		Bulatmai Barbel	VU			
Pseudoscaphirhynchus hermanni		Dwarf sturgeon	CR			II
Pseudoscaphirhynchus kaufmanni		Amu Darya sturgeon	EN			II
INSECTS						
Parnassius autocrator		None	VU	EN	P	
PLANTS						
Corydalis adiantifolia		No Common Name		EN	P	
Corydalis hindukushensis		No Common Name		EN	P	

Dactylorhiza hatagirea		No Common Name				II
Dactylorhiza majalis	majalis	Southern Marsh Orchid				II
Dioscorea deltoidea		Elephant's foot				II
Eulophia turkestanica		No Common Name				II
Ferula spp.		Hing		NT	H	
Glycyrrhiza spp.		Liquorice		NT	H	
Habenaria josephii		No Common Name				II
Malus niedzwetzkyana		No Common name	EN			
Orchis latifolia		No Common Name				II
Sternbergia fischeriana		No Common Name				II
Taxus wallichiana		Himalayan yew				II
Ulmus wallichiana		Himalayan elm	VU			

EX = Extinct
CR = Critically Endangered
EN = Endangered
VU = Vulnerable
NT = Near Threatened
LC = Least Concern
DD = Data Deficient

P = Protected
H= Harvestable
I = Appendix I
II = Appendix II

sp = listing at species level

ssp = listing at subspecies level

ANNEX VI: IMPORTED PESTICIDES FOUND FOR SALE WITH COUNTRY OF ORIGIN

Active Ingredient	category	Country of origin
2,4-D	herbicide	China
2,4-D	herbicide	Iran
2,4-D	herbicide	Pakistan
abamectin (avermectin)	insecticide/acaricide	China
abamectin (avermectin)	insecticide/acaricide	Iran
abamectin (avermectin)	insecticide/acaricide	Pakistan
abamectin (avermectin)	insecticide/acaricide	Turkey
acetamiprid	insecticide/acaricide	China
acetamiprid	insecticide/acaricide	Pakistan
aluminium phosphide	fumigant	China
aluminium phosphide	fumigant	Pakistan
bromoxynil	herbicide	China
bromoxynil	herbicide	Iran
Carbaryl	insecticide/acaricide	China
Carbofuron	insecticide/nematicide	Pakistan
Carbophenothion	insecticide/acaricide	unknown
Carbophenothion	insecticide/acaricide	Pakistan
chlorothanolil	fungicide	Switzerland
Chlorpyriphos	insecticide/acaricide	unknown
Chlorpyriphos	insecticide/acaricide	China
Chlorpyriphos	insecticide/acaricide	Jordan
Chlorpyriphos	insecticide/acaricide	Pakistan
clodinafop-propargyl	herbicide	China

clodinafop-propargyl	herbicide	Iran
Copper oxychloride	fungicide	unknown
Copper oxychloride	fungicide	China
Copper oxychloride	fungicide	Germany
Copper oxychloride	fungicide	India
Copper oxychloride	fungicide	Pakistan
cypermethrin (alpha)	insecticide/acaricide	unknown
cypermethrin (alpha)	insecticide/acaricide	China
cypermethrin (alpha)	insecticide/acaricide	China
cypermethrin (alpha)	insecticide/acaricide	India
cypermethrin (alpha)	insecticide/acaricide	Iran
cypermethrin (alpha)	insecticide/acaricide	Korea
cypermethrin (alpha)	insecticide/acaricide	Malasia
cypermethrin (alpha)	insecticide/acaricide	Pakistan
deltamethrin	insecticide/acaricide	unknown
deltamethrin	insecticide/acaricide	China
deltamethrin	insecticide/acaricide	India
deltamethrin	insecticide/acaricide	Malaysia
deltamethrin	insecticide/acaricide	Pakistan
diazinon	insecticide/acaricide	Iran
diazinon	insecticide/acaricide	Pakistan
diaionon	insecticide/acaricide	Switzerland
diclofop-methyl	herbicide	China
diclofop-methyl	herbicide	Iran
diflubenzuron	insecticide/acaricide	China
diflubenzuron	insecticide/acaricide	Jordan
dimethoate	insecticide/acaricide	China

dimethoate	insecticide/acaricide	Iran
endosulfan	insecticide/acaricide	unknown
fenoxaprop-p-ethyl	herbicide	China
fenoxaprop-p-ethyl	herbicide	Iran
fenoxaprop-p-ethyl	herbicide	Pakistan
fenvalerate		Iran
glyphosate	herbicide	China
imidacloprid	insecticide/acaricide	China
imidacloprid	insecticide/acaricide	Pakistan
lambda cyhalothrin	insecticide/acaricide	China
lambda cyhalothrin	insecticide/acaricide	Iran
lambda cyhalothrin	insecticide/acaricide	Jordan
lambda cyhalothrin	insecticide/acaricide	Malaysia
lambda cyhalothrin	insecticide/acaricide	Pakistan
malathion	insecticide/acaricide	China
malathion	insecticide/acaricide	Iran
malathion	insecticide/acaricide	Pakistan
malathion	insecticide/acaricide	Turkey
mancozeb	fungicide	China
mancozeb	fungicide	France
mancozeb	fungicide	Iran
mancozeb	fungicide	Pakistan
mancozeb	fungicide	Turkey
methidathion	insecticide/acaricide	unknown
mineral oil	insecticide/acaricide	unknown
mineral oil	insecticide/acaricide	Jordan
oxyfluorfen	herbicide	China

oxyfluorfen	herbicide	Pakistan
pendimethilin	herbicide	Turkey
propineb	fungicide	Holland
Propineb	fungicide	Malaysia
Propineb	fungicide	Pakistan
Propineb	fungicide	Turkey
sulfur	fungicide	China
sulfur	fungicide	Pakistan
sulfur	fungicide	Turkey
Thiophanate-methyl	fungicide	China
thiram	fungicide	China
thiram	fungicide	Iran
thiram	fungicide	Switzerland
trichlorfon	insecticide	unknown
trichlorfon	insecticide	China
trichlorfon	insecticide	Iran
trichlorfon	insecticide	Pakistan
zinc phosphide	rodenticide	China
zinc phosphide	rodenticide	India
zineb	fungicide	China
zineb	fungicide	Iran

ANNEX VII: USAID AGRICULTURAL PROJECTS IN AFGHANISTAN

Accelerating Sustainable Agriculture Project (ASAP)
Advancing Afghan Agriculture Alliance (A-4)
Afghan Agricultural Research and Extension Development (AGRED) Program
Afghanistan Biodiversity and Community Forestry (ABCF)
Afghanistan Famine Early Warning System Network (FEWS-NET)
Afghanistan Farm Service Alliance (AFSA)
Afghanistan Immediate Needs Program
Afghanistan Vouchers for Increased Production in Agriculture – Plus (AVIPA Plus)
Afghanistan Vouchers for Increased Production in Agriculture (AVIPA)
Afghanistan Water, Agriculture and Technology Transfer (AWATT) Project
Agricultural Development Fund (ADF) and Agricultural Credit Enhancement (ACE)
Agroenterprise Support Program
Alternative Development Program/Eastern Region (ADP/E)
Alternative Development Program/Northern Region (ADP/N)
Alternative Development Program/Southern Region (ADP/S)
Alternative Development Program/Southwestern Region (ADP/SW)
Alternative Licit Livelihoods Initiative (ALLI) (formerly Agro-enterprise Development Alliance)
Badakhshan Alternative Employment for Rural Workers
Biodiversity Conservation and Natural Resources Management
Biodiversity Support Program (BSP)
Cash for Work Hilmand Program
Commercial Horticulture and Agricultural Marketing Project (CHAMP)
Community Development Agriculture in Paktya, Paktika, Khost and Southeast Ghazni (CDA-P2KG)
Cotton & Alternative Crops Pilot Project in Helmand Province

Dairy Industry Revitalization
Development Credit Authority (DCA)
Environmental Assessment of the Alternative Livelihoods Program
Fund to IFDC For Seed/Fertilizer
Global Development Alliance for Strengthening Market Chains for Afghan Raisins and Pomegranates (GDA)
Good Performance Initiative (GPI)
Hilmand Food Zone Project (HFZP)
Improving Livelihoods and Governance through Natural Resource Management Project (ILG-NRMP)
Incentives Driving Economic Alternatives for the North, East, West (IDEA-NEW)
Incentives to Reduce Poppy Cultivation in Afghanistan
Irrigation and Watershed Management Program
Nangahar Canal and Alternative Crops Program
Pastoral Engagement, Adaptation, and Capacity Enhancement (PEACE) Project
Private Community Forestry for Natural Resource Management
Provincial Reforestation and Integrated Environmental Protection Project (IEPP)
Quick Impact Shamli
Rebuild Agriculture Markets Program (RAMP)
Rebuilding Agricultural Markets and Conserving Biological Diversity
Southern Region Agricultural Development Project (SRADP)
Strengthening Afghan Agricultural Faculties (SAAF) Project
Support to National Area Based Development Program
USAID Office of Foreign Disaster Assistance (OFDA) Afghanistan
USAID/Washington DCHA Office of Food for Peace (MYAP)
USAID/Washington DCHA Office of Food for Peace (PRRO)
Village-Based Watershed Reforestation in Ghor Province

ANNEX VIII: HUMAN TOXICOLOGY OF SELECTED PESTICIDES

Active Ingredient	EPA	WHO	Mammalian LD50 (mg/kg)	Carcinogen	Cholinesterase Inhibitor	Developmental or Reproductive Toxin	Endocrine Disrupter	Chemical Class
FUMIGANTS								
aluminium phosphide	-	FM	9	no data	No	?	no data	inorganic
methyl bromide	I	FM		unclassified	No	Yes	Suspected	inorganic
FUNGICIDES								
metalaxyl		II	633	not likely	No	?	?	Xylylalanine
boscalid	-	U	5000	?	No	?	No	anilide
Tebuconazole	II,III	II	1700	?	No	Yes	no data	Azole
thiram (TMTD)	III	III	1800	?	No	?	?	Carbamate
carboxin	III	III	2588	?	No	?	no data	Carboxamide
iprodione	III	III	2000	Yes	No	no data	?	Dicarboximide
Mancozeb	IV	U	5000	Yes	No	Yes	?	dithiocarbamate + inorganic zinc
Copper hydroxide	III	II	489	No	No	no data	No	inorganic
Copper sulfate	-	II	2000	no data	no data	no data	no data	Inorganic
Sulfur	IV	III	2000	No	No	No	no data	Inorganic
Copper oxychloride	III	II	950	no data	No	no data	no data	inorganic copper

quinoxyfen	no consensus	U	5000		No	No	no data	Quinoline
kresoxim-methyl	III	NL	5000	?	No	No	no data	Strobin
azoxystrobin	no consensus	II	5000	No	No	?	no data	strobin
HERBICIDES								
phenoxaprop-p-ethyl								Aryloxyphenoxypropionate
2,4-D	II-III	II	469	?	No	Yes	?	chlorophenoxy acid
sethoxydim	III	III	2676	No	No	No	no data	cyclohexadione
clethodim	III	NL	1133	No	No	no data	No	Cyclohexenone
bromoxynil	II	II	81	?	No	?	Yes	Hydroxybenzonitrile
glyphosate	III	III	2000					Phosphonoglycine
fenoxaprop-p-ethyl	-	NL	3150	no data	No	?	no data	propionic acid
INSECTICIDES/ACARICIDES								
cypermethrin	II	II	2000	?	No	?	?	pyrethroid
diflubenzuron	III	III	4640	No	No	No	No	benzoyl urea
azadirachtin (neem oil)	IV	NL	3540	?	No	?	suspected	Botanical
carbaryl	no consensus	II	614	?	?	no data	Yes	Carbamate
acetamiprid	no	II	213	No	No	no data	no data	chloro-nicotinyl

	consensus							
Imidacloprid	II	II	10	No	No	Yes	no data	chloro-nicotinyl
insecticidal soap		NL		?	No	?	?	fatty acids
Beauvaria bassiana								microbial
Spinosad	U		5000	No	No	No	no data	microbial
Abamectin (Avermectin)	IV	Ib	9	No	No	Yes	suspected	microbial
Bacillus thuringiensis-BT								microbial
mineral oil	IV		28000	Yes	No	?	?	petroleum
deltamethrin	II	II	87	?	No	?	Yes	Pyrethroid
cypermethrin (alpha)	II	II	57	no data	No	no data	?	Pyrethroid
lambda cyhalothrin	II	II	56	no data	No	No	no data	Pyrethroid
SPLAT-Cydia								pheromone
SPLAT-Ectomyoform								pheromone
MOLLUSCICIDE								
metaldehyde	III,II	II	283	No	No	?	no data	aldehyde
RODENTICIDES								
brodifacoum	I	Ia	0	No	No	No	No	Coumarin
bromadiolone	I	Ia	1	no data	No	Yes	?	Coumarin
warfarin	I	Ib	10	no data	No	Yes	no data	coumarin

zinc phosphide	-	Ib	12	No	no data	Yes	no data	inorganic
MICROBICIDES								
Soap								
Chlorhexidine	not registered		1710	no data	no data	no data	no data	
Ethanol			7060	No	No	Yes	-	alcohol
Chloroxylenol			1000	no data	no data	?	no data	chlorinated phenolic
Sodium hypochlorite	none		192					inorganic
phenol	I,II,III	not listed	669	not classified	No	no data	suspected	phenolic

ANNEX IX: ECOTOXICOLOGY OF SELECTED PESTICIDES

NAT= Not Acutely Toxic, PNT= Practically Non-toxic, ST = Slightly Toxic, MT=Moderately Toxic, HT=Highly Toxic, VHT= Very Highly Toxic, NL = Not Listed

Active Ingredient	amphib	Annelid	Crust	Fish	Insects	Molluscs	Phytoplankton	Zooplankton	Bees	Groundwater
FUMIGANTS										
aluminium phosphide										
methyl bromide				MT				MT		NL
FUNGICIDES										
Tebuconazole	-	-	-	MT	-	-	-	HT	-	NL
thiram (TMTD)	VHT	HT	NAT	VHT	HT			HT	ST	NL
carboxin	-	-	NAT	MT	-	-	-	-	NAT	NL
iprodione										
Mancozeb	HT			MT				NAT	NAT	NL
Copper sulfate										
sulfur	NAT			NAT				NAT	nd	NL
Copper oxychloride	-	HT	-	ST	-	-	-	VHT	-	NL
azoxystrobin				ST				HT	NAT	Potential
Kresoxim-methyl	-	-	-	ST	-	VHT	-	VHT	ST	NL
metalaxyl										

HERBICIDES										
2,4-D	NAT	NAT	NAT	NAT	NAT	NAT		NAT	ST	NL
sethoxydim	MT			ST	ST	ST		ST	MT	NL
clethodim				ST					ST	NL
bromoxynil				VHT						-
glyphosate	ST		ST	ST				ST		NL
fenoxaprop-p-ethyl										NL
INSECTICIDES/ACARICIDES										
cypermethrin										
Diflubenzuron	NAT		MT	NAT	VHT	NAT		MT	ST	NL
azadirachtin (neem oil)										
Carbaryl	MT	MT	MT	MT	HT	ST	ST	MT	HT	
Imidacloprid	NAT	HT	MT	NAT	VHT			ST	HT	Potential
insecticidal soap										
Abamectin (Avermectin)	-	-	-	ST	VHT	-	-	VHT	HT	NL
Beauvaria bassiana										
Spinosad				ST	HT			MT	HT	NL
Malathion	MT	ST	MT	MT	HT	ST		ST	HT	Potential
mineral oil										

cypermethrin (alpha)				VHT	VHT				nd	
Deltamethrin	HT	MT	VHT	MT	VHT	NAT		VHT	HT	NL
lambda cyhalothrin			VHT	VHT	VHT			VHT	HT	NL
SPLAT-Cydia										
SPLAT-Ectomyoform										
MOLLUSCICIDE										
Metaldehyde				NAT						
RODENTICIDE										
warfarin			NAT	NAT				NAT		NL
zinc phosphide										
MICROBICIDES										
Ethanol										
Chloroxylenol										
chlorine										
Sodium hypochlorite										
phenol										
Chlorhexidine										
Soap										

Checchi and Company Consulting, Inc.

Afghanistan SUPPORT-II Project

Wazir Akbar Khan

Kabul, Afghanistan