USAID
FROM THE AMERICAN PEOPLE

PESTICIDE EVALUATION REPORT AND SAFER USE ACTION PLAN (PERSUAP)

MARCH 2009

This publication was produced for review by the United States Agency for International Development. It was prepared by DAI.

PESTICIDE EVALUATION REPORT AND SAFER USE ACTION PLAN (PERSUAP)

Program Title:	**Agricultural Linkages (AgLinks) Uzbekistan**
Sponsoring USAID Office:	**USAID/Central Asia**
Contract Number:	**EDH-I-05-00004-00**
Task Order Number:	**EDH-I-07-05-00004-00**
Contractor:	**DAI**
Date of Publication:	**March 2009**
Author:	**Dr. Uwe Scholz**

CONTENTS

ACKNOWLEDGMENTS

I am very grateful to all AgLinks Uzbekistan staff in Tashkent who were of great support. They supported me with any requirements and responded reliably and quickly. I should acknowledge the invaluable help of Dr. Charles May for the fruitfull discussions before and during the study tour and as well for his critical reading of the draft PERSUAP. Many thanks to Mr. Shuhrat Abrorov who arranged the meetings with government, non-government, private agencies and farmers and accompanied me during the study tour. Many thanks also to all people, who were willing to answer questions during the interview process in Uzbekistan.

ABBREVIATIONS

ADB	Asian Development Bank
ADI	Average Daily Intakes
a.i.	active ingredient
BASF	Badische Anilin und Soda Fabrik
BEO	Bureau Environmental Officer
BT	Bacillus thuringiensis
CABI	British Consortium for Overseas Pest Management
CFR	Code of Federal Regulations
CGIAR	Consultative Group on International Agricultural Research
CIA	Central Intelligence Agency
CIS	Commonwealth of Independent States
COC	Chlororganic Compounds
CSTO	Collective Security Treaty Organization
CTO	Cognizant Technical Officer
DCI	Development Cooperation Instrument
DDT	Dichloro-Diphenyl-Trichloroethane
DGD	Decision Guidance Document
DNA	Designated National Authorities
DNOC	4,6-Dinitro-ortho-cresol
EA	Environmental Assessment
EAEC	Eurasian Economic Community
EAPC	Euro-Atlantic Partnership Council
EBRD	European Bank for Reconstruction and Development
EC	European Community
EC	Emulsifiable Concentrate (a pesticide formulation)
EC-FSP	European Community-Food Security Programme
ECO	Economic Cooperation Organization

EEC	European Economic Community
E&E	Europe and Eurasia Bureau, USAID
ENCAP	Environmental Assessment Capacity Building Program (Africa Bureau)
EPA	US Environmental Protection Agency (also known as USEPA)
EPA	Economic Partnership Agreement
EU	European Union
EURASEC	Euro-Asian Economic Community
EXTOXNET	Ecotoxicology Network Pesticides Website (Oregon State University)
FAO	Food and Agriculture Organization (part of UN)
FLO	Fairtrade Labeling Organization
FRAC	Fungicide Resistance Action Committee
GAP	Good Agricultural Practice
GCCG	Gexa-Chlor-Cyclo-Gexan (chlororganic compounds)
GCTU	General Confederation of Trade Unions
GDP	Gross Domestic Product
GSP	General System of Preferences (EU)
GUP	General Use Pesticide
HACCP	Hazard Analysis and Critical Control Points
HRAC	Herbicide Resistance Action Committee
IAEA	International Atomic Energy Agency
IBRD	International Bank for Reconstruction and Development
ICAO	International Civil Aviation Organization
ICCT	International Criminal Court
ICRM	International Red Cross and Red Crescent Movement
IDA	International Development Association
IDB	Islamic Development Bank
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IFOAM	International Federation of Organic Agriculture Movements

IFRCS	International Federation of Red Cross and Red Crescent Societies
ILO	International Labour Organization
IMF	International Monetary Fund
IOC	International Olympic Committee
IPM	Integrated Pest Management
IPPMSUAP	Integrated Pest and Pesticide Management and Safer Use Action Plan
IRAC	Insecticide Resistance Action Committee
IRED	Interim Re-registration Eligibility Decision
IRPTC	International Register of Potentially Toxic Chemicals
ISO	International Organization for Standardization
ITSO	International Telecommunications Satellite Organization
ITU	International Telecommunication Union
JBIC	Japan Bank for International Cooperation
LD	Lethal Dose
MEO	Mission Environmental Officer
MIGA	Multilateral Investment Guarantee Agency
MAWR	Ministry of Agriculture and Water Resources (Uzbekistan)
MRL	Minimum Residue Levels
MRP	Minimum Reentry Period (safety period after pesticide spraying)
MSDS	Material Safety Data Sheet
NBSAP	National Biodiversity Strategic Action Plan
NGO	Non-Governmental Organization
OGS	Organic Guarantee System (IFOAM)
OIC	Organization of the Islamic Conference
OPCW	Organization for the Prohibition of Chemical Weapons
OSCE	Organization for Security and Co-operation in Europe
PA	Protected Area
PAN	Pesticide Action Network
PCA	Partnership and Cooperation Agreements

PER	Pesticide Evaluation Report
PERSUAP	Pesticide Evaluation Report and Safe Use Action Plan
PFP	Partnership for Peace
PIC	Prior Informed Consent (a treaty related to pesticides)
POC	Phosphorus Organic Compounds
POPs	Persistent Organic Pollutants (a treaty related to toxic pesticides)
PPE	Personal Protective Equipment
PUC	Pesticide Use Checklist
PVO	Private Volunteer Organization
RED	Re-registration eligibility decision
Reg 216	Regulation 216 (USAID Environmental Procedures)
REO	Regional Environmental Officer
RESP	Rural Enterprise Support Project
RUP	Restricted Use Pesticide
SCC	State Chemicals Commission
SCO	Shanghai Cooperation Organization
SPS	Sanitary and Phytosanitary
SUAP	Safe Use Action Plan
TACIS	Technical Aid to the Commonwealth of Independent States
TIFA	Trade Investment Framework Agreement
TRED	Tolerance Reassessment Eligibility Decision
TRIMs	Trade-Related Investment Measures
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
UNWTO	United Nations World Tourism Organization
UPU	Universal Postal Union

USAID	United States Agency for International Development
USEPA	US Environmental Protection Agency (also known as EPA)
USSR	Union of Soviet Socialist Republics
WCO	World Customs Organization
WFTU	World Federation of Trade Unions
WHO	World Health Organization
WIPO	World Intellectual Property Organization
WMO	World Meteorological Organization
WP	Wettable Powder (a pesticide formulation)
WSP	Water Soluble Packet (a pesticide formulation)
WTO	World Trade Organization
WUA	Water User Associations
WUASP	Water User's Association Support Project
WWW	World Wide Web

EXECUTIVE SUMMARY

Following USEPA regulations, all USAID funded projects that use pesticides need to file an amended Initial Environmental Evaluation (IEE). USAID established an appropriate methodology for this through which a consultant conducts a Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP). The PERSUAP provides the technical, analytical, and mitigative information to support decision(s) in the IEE by examining the pesticide system from import through distribution to disposal using a system analysis approach. This PERSUAP is performed for the USAID AgLinks project in Uzbekistan. Its objective is to provide a survey and analysis of pesticide products for selected commodities within Uzbekistan and to address pesticide safer use and handling issues. The report provides background information in the first four sections that provide information needed to comply with the 12 evaluation criteria mandated by USAID Environmental Procedures. Section 5 complies with federal regulations for the pesticide evaluation component while Section 6 is the Safe Use Action Plan (SUAP) that lists required actions and tasks related to pesticide use based on the consultancy findings. In total, This PERSUAP has approved 41 pesticides including 16 additionally suggested. It has approved 25 pesticides out of 56 requested. Ten recommended replacements for those disallowed (14 fungicides and 17 insecticides) are additionally suggested. Moreover, three herbicides, one nematicide and two fumigants are additionally recommended to control major weed problems in cotton, wheat, and onions, root-knot nematode in Tomato and pests in raisin and other dried fruit products, respectively. Of the 31 rejected pesticides, 19 did not have an active EPA registration, 6 did not have an active EPA registration for AgLinks target crops and 6 were disallowed as being too hazardous to those applying them or to the environment.

All activities covered by this PERSUAP and carried out correctly will not have significant adverse impact on environment and human health. Some of the active ingredients approved in this PERSUAP are used in RUPs registered or formerly registered by the EPA. Since RUPs pose a higher risk for health and/or the environment the special safety regulations must be applied. These regulations are included and monitored when pesticide user are certified in USA. To use these pesticides safely in AgLinks Uzbekistan project activities, all respective pesticide users must receive special training on how to use RUPs. This training should be repeated annually and skills examined at the end of each training. Partners are asked to follow the AgLinks Uzbekistan PERSUAP for compliance.

For the time being some of the requested pesticides containing RUPs could not be rejected as this would result in seriously reduced yields and quality of AgLinks target crops. However, they should be replaced by less toxic substances over time. Exceptions are the fumigants since there are no viable alternatives at present. These fumigants should only be used by licensed professional fumigators wearing full protective equipment and following the directions set in the appendix attached to this document. A transition period for those conditionally accepted pesticides is suggested to allow the development and purchase of alternative pesticides for farmers, importers and distributors. Products with active RUP ingredients should be phased out and replaced through 2012 by product groups free of RUPs. Ongoing changes in EPA regulations have to be monitored by qualified AgLinks Uzbekistan personnel or external experts. In addition, registration of modern and more environmentally sound products can be expected in Uzbekistan, especially in the growing area of fruit and vegetable production, which can be requested to be used in an amended PERSUAP.

If AgLinks Uzbekistan will plan to use or assist procurement or use of other pesticides than requested and approved herein, AgLinks Uzbekistan will have to place an amendment to this PERSUAP. This document will request the specific pesticides, in accordance with USAID's Pesticide Procedures (22 CFR 216.3). USAID Mission Director will submit the PERSUAP on the "Positive Determination" template.

UZBEKISTAN PESTICIDE SYSTEM PROFILE

Traditionally in Uzbekistan, and until recently, only small amounts of pesticides have been used on most crops including orchards, vineyards and vegetable field crops, due to a lack of financial resources and absence of a well-developed in-country pesticide system. Pesticide use was relatively high only for cotton and wheat. However, the last few years has seen increased pesticide use. A few shops in the Fergana, Samarkand and Tashkent area now offer pesticides products along with Tashkent-based trading companies licensed to import pesticides.

The PERSUAP sampled shops had approximately 20 to 30 different products in stock with material from Bayer, BASF, and Syngenta. In addition, Russian, Turkish, Iranian, Indian and Chinese products were found, including several highly toxic pesticides. Package size is usually 1 to 10 L or 1 to 10 kg. Smaller amounts (100 ml or 0.5 kg or less) are packed in unlabeled, or inappropriately labeled, flasks and plastic bags, respectively. Sales personnel provide the only instruction to farmers.

In addition to the AgLinks Uzbekistan requested pesticides, which consisted of all Uzbekistan registered material, more pesticides are being considered for registration this year and several international companies intend to introduce additional products based on marketing studies of their distributors (IFODA and Euro-Team). Registration must be done carefully so no highly toxic products (ex., no POP or PIC chemicals) are permitted during this process and FAO's code of conduct should be followed. Generally, imported products are currently not tested regarding concentration and quality of active ingredients. However, sealed bottles and packages of European origin are generally experienced as effective pesticides. Analytical capacity for testing pesticide products is currently very limited, concentrated in Tashkent, the time required for, and extent of needed improvements is uncertain.

Pesticide registration tests involve multi-location and multi-season trials in Uzbekistan. For dosage and crop use, farmers rely on pesticide seller recommendations and very rarely the label information. The most recent pesticide registration brochure was from 2008 but was not readily available to salesmen and farmers. The 2009 brochure is scheduled for spring 2009 publication. However, crop wise listings of pesticides, toxicity classification for bees, beneficial insects, and groundwater, as well as an active ingredient index, pesticide law and regulations, safety provisions, mixture calculations and first aid procedures are missing.

For most field and greenhouse vegetable crops, spraying is done by plastic hand-pump backpack sprayers. Applicators use minimal or no safety equipment, although based on shop owner information, safety equipment is available. This equipment was not readily displayed in the shops during PERSUAP site visits. For orchards, the use of motorized backpack sprayers to propel the spray covering the entire tree is rare. Old tractor-pulled spray booms are used, but the exact calibration of pesticide dosage is not possible due to the lack of good nozzles and good quality replacement parts. Many plastic hand-pump backpack sprayers, even after two or three years, begin to leak at several points at and on the tank, boom and pump handle. Motorized backpack sprayers and tractor driven spray booms have similar leak problems. Despite using more pesticides than required, the leak poses a higher risk for the applicator as clothes are contaminated. Moreover, if clothes exposed to pesticides are not washed after spraying they constitute a

permanent source of contamination. Therefore, appropriate personal protection equipment, as well as regular maintenance and proactive repair, are of utmost importance.

Overall knowledge about IPM is very limited throughout Uzbekistan with the exception of a few, high ranking staff in the crop protection institute, crop protection services and on some farms. Understanding of IPM rational is generally absent, not applied or lost at training, educational, management and farm levels. However, during the Soviet era there was wide use of beneficial insects produced by bio-laboratories for pest control which Uzbekistan maintained, mainly for cotton and wheat, and this bio-laboratory system could be widened. Orchard farmers occasionally try introducing beneficial insects for their crops, but most use insecticide sprays afterwards, killing any previously introduced pest predators or parasites. A history of massive use of highly toxic pesticides resulted in extensive damage to beneficial insects, again most seriously in major cotton and wheat growing areas. Annex 2 provides examples of IPM techniques used in the USA and Europe for the same or similar plant-pest systems that can be tried and integrated to current production systems in Uzbekistan, as well as expand pest control tactics beyond the current dominant role of pesticides. IPM measures are more efficient, if the general GAP is applied, but this is certainly not presently the case for many crops in Uzbekistan. Numerous pest problems occurring in Uzbekistan are due to poor crop management practices. Therefore, addressing the interaction between crop and pest management is critical in making IPM relevant for farmers. A deeper understanding of farmers' management strategies is required to frame meaningful specific IPM recommendations.

AGLINKS LIST OF TARGET CROPS

The AgLinks Uzbekistan project lists, and this PERSUAP recognizes, the following target crops:

1) Stone fruits (especially apricots and peaches plus plums & cherries)
2) Grapes
3) Tomato
4) Onion
5) Melons (cucurbits especially melons, including watermelons, and cucumbers)
6) Pomegranate
7) Wheat
8) Rice
9) Cotton*

**Cotton is not an AgLinks target crop. However, USAID office in Tashkent recommended to include it because it has the highest pesticide use in Uzbekistan.*

AGLINKS LIST OF MAJOR DISEASES AND PESTS ON TARGET CROPS

The AgLinks Uzbekistan project compiled, and this PERSUAP recognizes based on the country study tour, the following major pests of each crop for which AgLinks Uzbekistan and their project stakeholders may wish to control. Please note that information about relevant pests and diseases, inside and outside the PERSUAP listed crops, except for the strategic commodities of cotton and wheat is difficult to obtain due to the collapse of the detailed monitoring system 20 years ago and not much has been done to improve the situation. At present, laboratories capable to address crop protection problems in a professional manner only exist in Tashkent and, to some extent, in Samarkand. All information on relevant pests and diseases were obtained during the interview process. In addition to an incomplete list of existing pests and diseases in Uzbekistan, new pests and diseases might have been introduced, or formerly less important pests might have become major biotic stresses, due to climate changes, non-functional quarantine measures, production changes and uninformed pesticide use. Therefore, it is crucial that all target crops are thoroughly monitored during the entire AgLinks Uzbekistan life of project and any suspected new disease and pests confirmed by internationally respected experts. Therefore, this list will require amending as new or better information becomes available.

Apricot (Prunus americana)	
Pests:	**Common name:**
• Carpocapsa pomonella	• codling moth, walnut worm
• Laspeyresia funebrana	• plum moth, red plum maggot
• Quadraspidiotus perniciosus	• San Jose scale
• Parthenolecanium corni (not Samarkand)	• European fruit lecaneum
• Sphaerolecanium prunastri	• plum scale
• Rhynchites auratus s.sp ferghanensis (Tashkent and Samarkand)	• apricot weevil
• Pterochloroides persicae	• brown peach aphid
• Hyalopterus arundinis	• mealy plum aphid
Diseases:	**Common name:**
• Clasterosporium carpophilum (Stigmina carpophila)	• shot whole disease
• Monilinia cinerea	• spure canker, brown rot
Peach (Prunus persica)	
Pests:	**Common name:**
• Carpocapsa pomonella (Tashkent and Samarkand)	• codling moth, walnut worm
• Laspeyresia funebrana (Tashkent and Samarkand)	• plum moth, red plum maggot
• Quadraspidiotus perniciosus	• San Jose scale
• Parthenolecanium corni (not Samarkand and Fergana)	• European fruit lecaneum
• Sphaerolecanium prunastri	• plum scale
• Pterochloroides persicae	• brown peach aphid
• Hyalopterus arundinis	• mealy plum aphid
Diseases:	**Common name:**
• Clasterosporium carpophilum (not in Namangan)	• shot whole disease
• Exoascus pruni (Taphrina pruni)	• plum pockets, bladder plums
• Podosphaera tridactyla (Fergana)	• powdery mildew

Cherry (Prunus avium and P. cerasus)	
Pests:	**Common name:**
• Myzus cerasi (Tashkent and Samarkand) Quadraspidiotus perniciosus • Parthenolecanium corni (Tashkent and Fergana) • Sphaerolecanium prunastri (Tashkent and Fergana • Rhynchites auratus (not in Samarkand) • Pterochloroides persicae (not in Fergana) • Hyalopterus arundinis (Tashkent)	• black cherry aphid • San Jose scale • European fruit lecanium • plum scale • cherry weevil • brown peach aphid • mealy plum aphid
Diseases:	**Common name:**
• Clasterosporium carpophilum • Mycosphaerella cerasella Aderhold	• shot whole disease • shot whole disease of sweet cherry
Grape (Vitis vinifera)	
Pests:	**Common name:**
• Eriophyes vitis Nal. (not in Samarkand) • Polychrosis botrana Schiff • Clysia ambiguella Hb • Pseudococcus citri Riss. Further, additional problems might be caused by aphids.	• grape erineum mite, grape gall mite • grape berry moth • grapevine moth • citrus mealybug
Diseases:	**Common name:**
• Uncinula necator • Plasmopara viticola • Gloeosporium ampelophagum (Fergana and Samarkand) Further problems might be caused by Botrytis cinerea (Botrytis bunch rot).	• grapevine powdery mildew • grapevine downy mildew • grape anthracnose

In vineyards, rye grass (Lolium ssp.) seems to be a serious problem. Although less frequent, thistles are considered a threat as well.

Concerns regarding mycotoxin contamination in black raisins were voiced by AgLinks Uzbekistan based upon partner experience. The important mycotoxins found in raisins are the Ochratoxin A and to lesser extent Ochratoxin B. These mycotoxins are secondary metabolites, which are often produced in minute quantities but are toxic to humans. Ochratoxins are produced mainly by Aspergillus and Penicillium species, which can infect grapes. These fungi are either present in the soil, on plants or in storage buildings.

Pomegranate (Punica granatum)	
Pests:	**Common name:**
• Euzophera punicaeella (Tashkent and Fergana) • Aphids, no species given (Tashkent) • Spider mites, no species given (Tashkent and Namangan) • Pseudococcus comstocki (Tashkent and Namangan) Further problems can be caused by whiteflies	• pomegranate moth • aphids • spider mites • comstock mealybug
Diseases:	**Common name:**
• Пятнистость (Tashkent and Namangan) • Sphaceloma punicae (Tashkent)	• necrosis, fruit rot (Phomopsis?) • pomegranate spot anthracnose
Cucurbits: Water Melon (Citrullus lanatus), Sweet Melon (Cucumis melo) and Cucumber (Cucumis sativus)	
Pests:	**Common name:**
• Epilachna chrysomelina • Myiopardalis pardalina Further potential problems by whiteflies and aphids!	• melon ladybird beetle • Baluchistan melon fly
Diseases:	**Common name:**
• Sphaerotheca fuliginea • Fusarium oxysporum f.sp. cucumerinum • Pseudomonas syringae pv. lachrymans Further potential problems by Pseudoperonospora cubensis (downy mildew), and Colletotrichum orbiculare (anthracnosis) and cucumber mosaic virus	• powdery mildew • Fusarium wilt of cucumber • cucurbit angular leaf spot, bacterial leaf spot
Tomato (Solanum lycopersicum)	
Pests:	**Common name:**
• Aculops lycopersici Massee • Trialeurodes vaporariorum Further problems can be caused by Helicoverpa armigera (tomato fruitworm), Agrotis segetum (cutworm), Aphis gossypii (aphids) and Thrips tabaci (thrips) as well as nematodes (i.e. Meloidogyne spp. as root knot nematodes).	• tomato russet mite • whitefly
Diseases:	**Common name:**
• Corynebacterium michiganense (not in Namangan) • Cladosporium fulvum (not in Namangan) • Phytophthora infenstans Further problems can be caused by Verticillium spp. (Verticillium wilt) and Erwinia carotovora (black stem, bacterial wilt). In vegetables, rye grass (Lolium ssp.) seems to be a serious problem. Thistles are considered a threat as well but less frequently.	• bacterial canker of tomato • tomato leaf mold • late blight
Potential weeds:	
Cyperus rotundus, Amaranthus retroflexus,, Solanum nigrum, Xanthium strumarium, Abutilon theophrastii, Hibiscus trionum, Portulaca oleracea, Sorgum halepense, Convolvulus arvensis, Plantago major	

Onion (Allium cepa)	
Pests:	**Common name:**
• Agrotis segetum (not in Fergana) • Hylemyia antiqua or Delia antiqua (not in Fergana and Samarkand) • Thrips tabaci L. (not in Fergana) Further, additional problems can be caused by aphids.	• cut worm, turnip moth • onion fly • onion thrips
Diseases:	**Common name:**
• Peronospora destructor (not in Fergana)	• downy mildew of onion
Potential weeds:	
Cyperus rotundus, Amaranthus retroflexus, Solanum nigrum, Xanthium strumarium, Abutilon theophrastii, Hibiscus trionu, Portulaca oleracea, Sorgum halepense, Convolvulus arvensis, Plantago major, Cynodon dactylon, Cuscuta campestris.	•
Rice (Oryza sativa)	
Pests:	**Common name:**
• Ephydra macellaria • Triops cancriformis • Haplothrips aculeatus	• shore fly, rice fly • horseshoe crab • panicle thrips
Diseases:	**Common name:**
• Magnaporthe grisea (Pyricularia oryzae) • Fusarium spp.	• rice blast disease • Fusarium head blight
Wheat (Triticum aestivum)	
Pests:	**Common name:**
• Eurygaster integriceps (in Tashkent and Namagan) • Zabrus tenebrioides Further, additional problems can be caused by aphids.	• sunn pest • corn ground beetle
Diseases:	**Common name:**
• Puccinia striiformis (not in Namangan) • Puccinia triticina (not in Namangan) • Erysiphe graminis • Ustilago tritici (not in Fergana and Samarkand) • Tilletia caries, Tilletia laevis (Tashkent) Additional problems can be caused by Septoria tritici (Septoria tritici blotch) and S. nodorum (glume blotch), as well as foot and root rots.	• yellow rust • brown wheat rust • powdery mildew • loose wheat smut • common bunt
Cotton (Gossypium)	
Pests:	**Common name:**
• Agrotis segetum • Helicoverpa armigera (Chloridae obsoleta) • Tetranychus telarius • Thrips tabaci Zind • Adelphocoris lineolatus • Lygus pratensis • Aphis gossypii • Aphis medicaginis • Acyrthosiphon gossypii	• cut worm, turnip moth • cotton bollworm • carmine spider mite • cotton seedling thrips • lucerne bug • tarnished plant bug • cotton aphid • groundnut aphid • aphid

• Trialeurodes vaporariorum • Bemisia tabaci	• whitefly • tobacco whitefly
Diseases:	**Common name:**
• Xanthomonas axonopodis pv. malvacearum • Rhizoctonia ssp., Pythium ssp., Fusarium ssp. • Chalara elegans (Thielaviopsis basicola)	• bacterial blight • foot rot • black root rot

AGLINKS UZBEKISTAN-REQUESTED PESTICIDES

Annex 1 contains a list of all pesticides requested, with their respective toxicity, human acute and chronic health and environmental issues.

The following are the AgLinks Uzbekistan-requested pesticides, by active ingredient with their status in the present PERSUAP and additional pesticides suggested by the consultant:

Fungicides	Status
Bordeaux mixture	REJECTED
Bromuconazole	REJECTED
Bronopol	REJECTED
Calcium hydroxide	REJECTED
Carboxin	ACCEPTED
Copper sulfate (anhydrous)	REJECTED
Copper sulfate (basic)	RUP (Special Safety Training Required)
Diniconazole	REJECTED
Epoxiconazole	REJECTED
Ferrous-sulfate	REJECTED
Flutriafol	REJECTED
Guazatine	REJECTED
Oxadixyl	REJECTED
Penconazole	REJECTED
Pencycuron	REJECTED
Propamocarb hydrochloride	ACCEPTED
Propiconazole	ACCEPTED
Tebuconazole	ACCEPTED
Thiophanate-methyl	ACCEPTED
Thiram	ACCEPTED
Triadimefon	ACCEPTED
Triforine	REJECTED
Triticonazole	ACCEPTED

Fungicides Additionally Suggested

Copper ammonium complex
Copper octanoate
Cymoxanil
Mancozeb
Sulfur

Insecticides

Acephate	REJECTED
Acetamiprid	RUP (Special Safety Training Required)
Amitraz	REJECTED
Avermectin	RUP (Special Safety Training Required)
Bifenthrin	RUP (Special Safety Training Required)
Bromopropylate	REJECTED
Buprofezin	ACCEPTED
Carbosulfan	REJECTED
Chlorpyrifos	RUP (Special Safety Training Required)
Cyhalothrin, gamma	RUP (Special Safety Training Required)
Cyhalothrin, lambda	RUP (Special Safety Training Required)
Cypermethrin	REJECTED
Cypermethrin, beta	RUP (Special Safety Training Required)
Cypermethrin, zeta (WHO 1b)	REJECTED
Deltamethrin	REJECTED
Diazinon	REJECTED
Dimethoate	ACCEPTED
Etoxazole	ACCEPTED
Fenpropathrin	REJECTED
Fenvalerate	REJECTED
Fipronil	REJECTED
Flubenzimine	REJECTED
Hexylthiofos	REJECTED
Hexythiazox	ACCEPTED
Imidacloprid	RUP (Special Safety Training Required)
Indoxacarb	ACCEPTED
Malathion	ACCEPTED
Phosalone	REJECTED
Propargite	REJECTED
Pyriproxyfen	ACCEPTED
Teflubenzuron	REJECTED
Thiacloprid	ACCEPTED
Triazophos	REJECTED

Insecticides Additionally Suggested

Azadirachtin
Bacillus thuringiensis (berliner), subsp. Kurstaki, strain EG2371
Mineral oil, a petroleum derivative
Potash soap
Spinosad

Herbicides Additionally Suggested

Bentazon sodium salt
Fluazifop-P-butyl
Pendimethalin

Nematicide Additionally Suggested

Dazomet

Fumigants Additionally Suggested

Aluminum phosphide (RUP)
Magnesium phosphide (RUP)

PESTICIDES REQUESTED BY AGLINKS UZBEKISTAN FOR USE IN THE PROJECT AND ACCEPTED OR CONDITIONALLY ACCEPTED FOR USE

Based upon same or similar use products registered by EPA, this PERSUAP approves for use on AgLinks Uzbekistan crops the following AgLinks Uzbekistan-requested pesticides, by active ingredient with additional pesticides for consideration suggested by the consultant:

Fungicides

Carboxin	ACCEPTED
Copper sulfate (basic)	RUP (Special Safety Training Required)
Propamocarb hydrochloride	ACCEPTED
Propiconazole	ACCEPTED
Tebuconazole	ACCEPTED
Thiophanate-methyl	ACCEPTED
Thiram	ACCEPTED
Triadimefon	ACCEPTED
Triticonazole	ACCEPTED

Fungicides Additionally Suggested

Copper ammonium complex
Copper octanoate
Cymoxanil
Mancozeb
Sulfur

Insecticides

Acetamiprid	RUP (Special Safety Training Required)
Avermectin	RUP (Special Safety Training Required)
Bifenthrin	RUP (Special Safety Training Required)
Buprofezin	ACCEPTED
Chlorpyrifos	RUP (Special Safety Training Required)

Cyhalothrin, gamma	RUP (Special Safety Training Required)
Cyhalothrin, lambda	RUP (Special Safety Training Required)
Cypermethrin, beta	RUP (Special Safety Training Required)
Dimethoate	ACCEPTED
Etoxazole	ACCEPTED
Hexythiazox	ACCEPTED
Imidacloprid	RUP (Special Safety Training Required)
Indoxacarb	ACCEPTED
Malathion	ACCEPTED
Pyriproxyfen	ACCEPTED
Thiacloprid	ACCEPTED

Insecticides Additionally Suggested

Azadirachtin
Bacillus thuringiensis (berliner), subsp. Kurstaki, Strain EG2371
Mineral oil, a petroleum derivative
Potash soap
Spinosad

Herbicides Additionally Suggested

Bentazon sodium salt
Fluazifop-P-butyl
Pendimethalin

Nematicide Additionally Suggested

Dazomet

Fumigants Additionally Suggested

Aluminum phosphide (RUP)
Magnesium phosphide (RUP)

These active ingredients are actively EPA-registered for same or similar use products and are general use products, unless otherwise stated. They can be used in Uzbekistan if safety conditions for use are followed, and training (and some oversight) provided. Active ingredients followed by “Special Safety Training Required” (if active ingredients are used in products labeled as RESTRICTED USE PRODUCTS by USEPA), can be used in Uzbekistan, if safety conditions are followed and specific safety training has been annually and repeatedly provided (and skills testing obtained) for any person, who uses this group of pesticides. In addition, these pesticides have to be replaced, wherever practical and at the latest, by 2012 with less toxic pesticides. If an EPA permitted use of a specific product on AgLinks’ targeted crops is not specifically listed in the respective Uzbekistan registration documents, then the project should seek official Uzbek clarification to get permission to use the product on the specific targeted crop.

Use only EPA acute toxicity Class III and Class IV products. If Class III and Class IV products within the PERSUAP-permitted active ingredients are not produced and do not have active EPA registration, then the use of Class II products with an active EPA registration for the respective active ingredient is allowed for farmers having received Special Safety Training. Do not recommend or use any EPA Class I pesticide products containing active ingredients approved by this PERSUAP.

To plan "most safe" pesticide use for subsequent seasons, competent authorities should be asked if permission exists to use the specific pesticides (active ingredients without RUPs and EPA III and IV) on newly permitted crops based on the current and ongoing registration process in Uzbekistan. The use of PERSUAP approved pesticides will not have significant adverse environmental impact and significant adverse impact on human health if all pesticide safe use regulations are followed and pesticide users of EPA Restricted Use Product active ingredients receive Special Safety Training and the subsequent acquired skills thoroughly examined. Appropriate mitigation and training activities are recommended and discussed elsewhere in this document.

The EPA issues information for registered products or for all products of a specific active ingredient regarding ineligibility for re-registration, banning of pesticides or immediate removal of a registration for a certain product based on new informations concerning any potential hazards or serious concerns. AgLinks Uzbekistan is responsible for frequent checking of EPA information releases to determine if any decisions subsequent to this PERSUAP affect the herein approved pesticides. Accordingly, all orders should be cancelled for a product of a revised ruling and – if feasible – stored pesticides be rapidly utilized, if allowed under the specific EPA decision. Re-registration eligibility decisions (REDs) are, if scheduled for a specific pesticide, listed in Annex 1 (first column, last line per cell).

PESTICIDES REQUESTED BY AGLINKS UZBEKISTAN BUT REJECTED FOR USE ON PROJECT SITES, WITH REASON FOR REJECTION

This PERSUAP rejects the recommendation or use of the following proposed pesticides on AgLinks Uzbekistan sites, based on the following reasons:

Fungicides

Bordeaux mixture	no active EPA registration
Bromuconazole	no active EPA registration for intended use
Bronopol	no active EPA registration for intended use
Calcium hydroxide	no active EPA registration for intended use
Copper sulfate (anhydrous)	no active EPA registration
Diniconazole	no active EPA registration
Epoxiconazole	no active EPA registration
Ferrous-sulfate	no active EPA registration
Flutriafol	no active EPA registration
Guazatine	no active EPA registration
Oxadixyl	no active EPA registration
Penconazole	no active EPA registration
Pencycuron	no active EPA registration
Triforine	no active EPA registration for intended use

Insecticides

Acephate	too toxic, banned in EU (qualified for PIC notification)
Amitraz	no active EPA registration for intended use
Bromopropylate	no active EPA registration
Carbosulfan	no active EPA registration
Cypermethrin	no active EPA registration
Cypermethrin, zeta	too toxic to be used WHO 1b
Deltamethrin	too toxic to be used, all registered products in Uzbekistan are EPA toxicity Class I
Diazinon	too toxic, banned as plant protection product in EU
Fenpropathrin	too toxic, banned in EU, WHO Acute Hazard list
Fenvalerate	no active EPA registration for intended use
Fipronil	no active EPA registration for intended use
Flubenzimine	no active EPA registration
Hexylthiofos	no active EPA registration
Phosalone	no active EPA registration
Propargite	too toxic to be used, all EPA registered products are EPA toxicity Class I
Teflubenzuron	no active EPA registration
Triazophos	no active EPA registration

PESTICIDES REQUESTED AND CONDITIONALLY ACCEPTED FOR USE IN THE PROJECT, WITH REASONS AND CONDITIONS

Pesticides containing the following active ingredients are conditionally accepted. These active ingredients are used in restricted use products registered, or formerly registered, with the EPA. Since restricted use products pose a higher risk for health and/or the environment, special safety regulations must be applied. These regulations are included and monitored when the pesticide is certified for specific users in the USA. To safely use these pesticides in AgLinks Uzbekistan project activities, all respective pesticide users must receive special training on how to use RUPs safely. This training should be repeated annually and skills have to be examined at the end of each training. Products containing the active ingredients of Restricted Use Products must be phased out through 2012 and replaced by product groups free of RUPs. Additionally, ongoing changes in EPA regulations must be monitored by qualified AgLinks personnel or by external experts. Moreover, registration of modern and more environmentally sound products should be sought in Uzbekistan, especially in the fruit and vegetable growing areas. However, for any new pesticide being considered and not covered in the present PERSUAP, an amended PERSUAP will be required prior to pesticide use.

Fungicides

Copper sulfate (basic)	RUP (Special Safety Training Required)

Insecticides

Acetamiprid	RUP (Special Safety Training Required)
Avermectin	RUP (Special Safety Training Required)
Bifenthrin	RUP (Special Safety Training Required)

Chlorpyrifos	RUP (Special Safety Training Required)
Cyhalothrin, gamma	RUP (Special Safety Training Required)
Cyhalothrin, lambda	RUP (Special Safety Training Required)
Cypermethrin, beta	RUP (Special Safety Training Required)
Imidacloprid	RUP (Special Safety Training Required)

OTHER PESTICIDE ALTERNATIVES THAT MAY BE USED BY THE PROJECT THAT MAY BE AVAILABLE AND ARE OR COULD BE REGISTERED BY UZBEKISTAN

This PERSUAP also accepts the use of additional EPA-approved pesticides:

- **Fungicides:** Copper ammonium complex; Copper octanoate; Cymoxanil; Mancozeb; Sulfur
- **Insecticides:** Azadirachtin; Bacillus thuringiensis (berliner), subsp. Kurstaki, Strain EG2371; Mineral oil (a petroleum derivative); Potash soap; Spinosad
- **Herbicides:** Bentazon sodium salt; Fluazifop-P-butyl; Pendimethalin
- **Nematicide:** Dazomet
- **Fumigants:** Aluminum phosphide; Magnesium phosphide

These fumigants are additionally suggested upon request from AgLinks Uzbekistan because the export market in Uzbekistan includes both fresh produce and dried fruit exports. These fumigants are Restricted Use Pesticides (RUPs) due to high acute inhalation toxicity of the phosphine gas produced. While phosphine is considered less toxic than other currently registered chemical fumigants, exposure to the gas can lead to serious illness or even death at concentrations as low as 0.3 ppm. An applicator manual is attached to this PERSUAP and should be strictly followed. Projects which are storing dried fruits need to contract with a licenses fumigator and have the bags fumigated. Only professionals should handle these dangerous fumigants. To date no less toxic fumigants are available.

INTEGRATED PEST MANAGEMENT (IPM)

USAID recognizes and promotes as official policy the development and use of integrated approaches to pest management (IPM) whenever possible. IPM is an ecological approach with a main goal of significantly reducing or eliminating the use of pesticides while at the same time managing pest populations at an acceptable level.

Annex 2 provides examples of IPM techniques used in the USA and Europe for the same or similar plant-pest systems that can be tried and integrated to current production systems in Uzbekistan, as well as expand pest control tactics beyond the current dominant role of pesticides. IPM measures are more efficient, if the general GAP is applied, but this is certainly not presently the case for many crops in Uzbekistan. Numerous pest problems occurring in Uzbekistan are due to poor crop management practices. Therefore, addressing the interaction between crop and pest management is critical in making IPM relevant for farmers. A deeper understanding of farmers' management strategies is required to frame meaningful specific IPM recommendations.

IPM uses a combination of behavioral, biological, chemical, cultural and mechanical methods to reduce pest populations to acceptable levels. The conscious integration of pesticides with the above-mentioned control measures and with farmers' traditional cropping and pest management systems is possible in AgLinks Uzbekistan project activities. Due to low toxicity (EPA III and IV) of PERSUAP approved pesticides, a conscious integration of chemical control in the overall IPM approach per plant-pest system is possible and must be followed.

RECOMMENDATIONS

This PERSUAP includes recommendations, which will mitigate significant adverse impacts of pesticide use on the environment and human health. If carried out correctly the use of the approved pesticides will not have significant adverse impact on environment and human health. The following is a summary of the recommendations, which are described in detail in the Safer Use Action Plan and elsewhere in the document.

IMMEDIATE ACTIONS

1. Do not use non-EPA registered or EPA Acute Toxicity Class I pesticide products on AgLinks Uzbekistan project activities (except for raisin and dried fruit fumigation of AgLinks Uzbekistan target crops).

2. Begin phase out in 2009 through 2012 of all EPA registered active ingredients used in Restricted Use Products.

3. Develop Crop protection training manuals and training sessions (including accurate pest diagnostics, pest scouting and assessment, economic threshold, IPM measures, spray mixture preparation, spraying equipment, etc.) and safety training (including personal protection, environmental protection, health issues, first aid measures and consumer protection) for:

a) Pesticide use of all general use products

b) Specifically addressing any issues related to the use of restricted use products

c) Fumigation and other post harvest pesticide use on raisins and dried fruits of

AgLinks Uzbekistan target crops

4. Use only single active ingredient products.

5. From PERSUAP approved active ingredients always use EPA Class III and IV products and train farmers and all other users accordingly.

6. Use EPA Class II products from PERSUAP approved active ingredients only if Classes III and IV are not produced and have no active EPA registration.

7. PERSUAP approved active ingredients with EPA II toxicity will only be used by trained farmers and other trained users.

8. For AgLinks Uzbekistan to use the accepted pesticide products in the short term, users require immediate and repeated training (before the 2009 spraying season ends) in pesticide safe use (including risks to open water, farm animals, users and consumers) and IPM techniques.

9. Help secure safety equipment, or personal protection equipment, for farmer use and enforce its use.

10. Begin a collection of pesticide company Labels and Material Safety Data Sheets (MSDS) for each pesticide product used on AgLinks Uzbekistan plots in Uzbekistan. Produce a quick reference guide for all project use pesticides for each anticipated pest, with use rates, safety measures, environmental concerns, and minimum reentry periods (MRPs). Update the collection repeatedly as EPA initiated label changes are common especially regarding safety measures, environmental precautions and permitted crop use as new scientific data, concerns and incidences are addressed.

11. Continue to choose and use the least toxic pesticides practical.

12. Intend to integrate and use more non-chemical tactics, such as those used in the USA or in Europe.

13. Produce a pest control guide, including IPM tactics, for each crop and pest combination found in AgLinks Uzbekistan project activities and use and build an electronic database collection as a reference.

14. Develop training manuals and videos, stressing effective sprayer usage, calibration, and pesticide safety, and focusing on the assembly, use and maintenance of the sprayers itself.

15. Provide maintenance facilities to repair sprayers, foster local repair shops in each community, hold sprayer inspection, and calibration sessions where farmers bring their sprayers to test by filling with water to find leaks and calibrate them by checking the nozzles and spray patterns.

16. Additional information provided, or obtained in electronic form, can be translated and distributed (i.e. IPM methods for AgLinks Uzbekistan targeted crops, always respecting copyrights).

17. AgLinks Uzbekistan shall only work with farmer and farmer groups who agree to use only PERSUAP approved pesticides within an IPM program for their target crops.

18. For PERSUAP approved pesticides without an Uzbek registration, the registration process should be initiated and, ideally, a temporary permission to use those already on project sites should be obtained, where possible.

19. If the EPA permitted use of a specific product on AgLinks Uzbekistan target crops is not specifically listed in the respective Uzbek registration documents then seeks official Uzbek permission to use it on the AgLinks Uzbekistan target crops, where practicable.

20. AgLinks Uzbekistan might also initiate cancellation of some highly toxic and non-EPA approved pesticides with Uzbek registration bodies to improve environmental and human safety.

21. Clarify for all AgLinks Uzbekistan partners receiving USAID funds, or other donor funds in joint activities, that only PERSUAP approved pesticides are permitted. Cooperation by AgLinks Uzbekistan in joint activities using non-PERSUAP approved pesticides in a given location or group of farmers is not permitted.

CONTINUOUS ACTIONS

1. Make note of leaking backpack sprayers and assist farmers to remedy this issue, as practical.

2. Continue to educate farmers on the need for pesticide safety, wearing of protective clothing and emphasize the proper disposal of empty pesticide bottles.

3. Advise everybody, with special focus on children, to be away from the field while spraying and do not enter fields where such products have been recently applied (until the EPA approved re-entry time limit has passed).

4. Closely monitor planned and factual use of RUPs and conduct frequent training prior to any use of RUPs. Moreover, design feedback protocols into training programs, undertake training needs assessments, and carry out short adoption surveys.

5. Monitor and train on fumigation of raisins and other dry fruits and ensure any product users follows all safety regulations regarding fumigated product processing and consumption.

6. Educate farmers on rotating pesticide families to reduce the resistance build-up.

7. Monitor pest resistance to pesticides by noting efficacy reduction of each product.

8. Recommend farmers apply pesticides early in the morning or early in the evening when bees are not active.

9. In areas with sandy soil, utilize pesticides with low ground water contamination potential.

10. AgLinks Uzbekistan staff should ensure farmers apply buffer zones requirements for surface water according to the USA EPA label information.

11. Research and try 'biological pesticides' and 'botanical pesticides', as practical, and seek registration, thereafter, if MAWR decision makers are positive about the results.

12. If practical, research and try pheromone mating disruption techniques for moth related pests combined with good orchard sanitation and fertilization.

13. Continue to work with the MAWR and the department for environmental protection as they implement environmental compliance legislation and encourage them to establish IPM as a national policy, develop standards for pesticide packaging and repacking in country, enforce standards for pesticide labels in terms of quality and disseminate information.

14. Monitor the EPA pesticide registration changes, including expiring registrations, ineligibility for re-registration, changes in EPA toxicity classifications, crop use permissions of products and the suitability of new products.

15. Monitor for any adverse effect on target and non-target environments and respond by appropriately utilizing mitigation measures up to discontinuing use of the respective pesticide.

16. The use of appropriate personal protection equipment is absolutely mandatory for any pesticides labeled as suspected and proven carcinogens, reproductive and developmental toxins, and endocrine disruptors (see Annex 1 and current EPA approved product label).

BY JUNE 30, 2009 ACTIONS

1. Train Uzbek pesticide shopkeepers in proper storage, handling and labeling of pesticides.

2. Update the PERSUAP to take into account new information received and new pesticides requested, and amend the PERSUAP to reflect these changes.

ANNUAL ACTIONS

Write pesticide and GAP/IPM issues and mitigation actions into all work plans, especially annual work plans, including intentions to monitor progress of the project in implementing their specific SUAP, any outstanding pesticide risk issues, use of IPM tactics, farm certification issues, and other risk mitigation measures taken. Submit semiannual and annual reports to USAID that include project progress implementing the specific AgLinks SUAPs, outstanding pesticide risk issues, use of IPM tactics, farm certification issues, and other risk mitigation measures taken.

BY END OF PROJECT ACTIONS

Update any changes to the list of crops, pests and proposed pesticides for use and communicate these changes to USAID to amend this PERSUAP as needed.

MONITORING/CONTINUOUS IMPROVEMENT OF PROJECT COMPLIANCE IN PESTICIDE SYSTEM

Send completed and AgLinks Uzbekistan Director signed action plans as a method of tracking compliance with PERSUAP recommendations.

INTRODUCTION AND BACKGROUND

PURPOSE AND SCOPE FOR AN IEE/PERSUAP

Yields of many crops can be significantly reduced by pests, diseases and weeds. Since the end of World War II, control of plant diseases and other plant pests has depended increasingly on the extensive use of pesticides. However, it is well documented that uncontrolled use of pesticides can lead to several harmful effects on public health and safety as well as the environment. To permit safer pesticide use while maintaining a reasonable level of control over pesticide choice and use, all USAID funded projects that include the procurement or use of pesticides are required to file an Initial Environmental Examination (IEE). USAID environmental regulations require 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. These factors are examined in a "Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP)" which is attached to the IEE. USAID Mission Directors submit the PERSUAP on the "Positive Determination" template. The PERSUAP describes the particular circumstances of the program in question, is locally adapted, assesses the hazards posed by the use of proposed pesticides, outlines available risk management choices, and recommends how a risk management plan would be implemented in the field.

Local-level assessments, such as PERSUAPs, are needed for USAID programs employing pesticides because many farmers and pesticide users in developing countries cannot be expected to handle pesticides in the same ways as US users, even though the USEPA may consider a pesticide safe for use in the US where all USEPA's safer-use regulations are formulated and enforced. Literacy rates are much lower, thus most users cannot read labels. Moreover, most farmers/users do not use safety equipment; and do not know how to properly calibrate or use sprayers safely. Government regulations are generally not enforced and inappropriate pesticides and formulations are widely used. The finalized and approved PERSUAP provides guidance on best practices to reduce the risks associated with pesticide use in the country under study, and describes the capacities and limitations of project partners involved.

WHO PREPARES A PERSUAP?

USAID Cognizant Technical Officers and/or program managers are generally responsible for assuring that environmental review requirements for their programs are met, including PERSUAPs. Guidance and assistance for PERSUAPs is available from the appropriate Mission Environmental Officer (MEO), Regional Environmental Officer (REO), and the Bureau Environmental Officer (BEO). Some reference materials and examples of other PERSUAPs are available through these contacts. PERSUAPs are currently prepared for USAID by experienced independent consultants.

COMPONENTS OF AN ACTIVITY-LEVEL PERSUAP

A PERSUAP consists basically of two parts, a "PER" and a "SUAP." The Pesticide Evaluation Report (PER) section performs the systems analysis of the country's pesticide sector from production and/or import to ultimate disposal. It addresses the 12 informational elements required in the Agency's Pesticide Procedures contained in the Code of Federal Regulations, Regulation 216. The Safer Use Action Plan

(SUAP) puts the conclusions and recommendations reached in the PER into a plan of action, including assignment of responsibility to appropriate parties connected with the program or project proposing the use of pesticides. This PERSUAP supports a pesticide IEE for AgLinks activities in Uzbekistan and is produced to address use of pesticides on crop commodities presented below.

PROJECT DESCRIPTION

The project mandate of AgLinks Uzbekistan is to develop the capacity of local service providers to examine and capitalize on market opportunities, provide needed farmer production assistance to meet market demand, and ameliorate choke points in the market linkages between producers, input suppliers and buyers.

For achieving the above-mentioned objectives, AgLinks project in Uzbekistan has chosen several agricultural crops and products that are consumed locally and can be exported to international markets. In collaboration with the major project stakeholders, USAID and the Ministry of Agriculture and Water Resources (MAWR) of the Government of Uzbekistan, the project has targeted specific geographic areas and client groups to support over the life of the project (LOP- thru July 2011). Given the geographic and client focus, the project focuses on a select number of agricultural commodities (stone fruits and grapes) within these areas while remaining open to targets of opportunity presented by the market. The initial list of AgLinks commodities in Uzbekistan has been expanded to include some of these other potential crops of interest to AgLinks and other USAID projects now and in the near future. Project staff and the approach remain flexible to add to or replace these targeted crops depending on the opportunities that may arise during the life of the project.

AgLinks Uzbekistan is focused on specific clients for the project's activities with emphasis given to agricultural producers. Individual crop producers are targeted via existing organizational structures in the form of restructured agricultural cooperatives (AgriFirms) and the farmer-members that make up Water User's Associations (WUA). Efforts at supporting these two categories of agricultural producers are complemented with assistance to both public and private entities involved in the targeted crop commodity chains. Public institutions involved in research, extension, testing, food safety and environmental pesticide impacts will be assisted to increase the impact and sustainability of project activities on targeted production clients. Linkages to private sector entities involved in processing and exporting stone fruits and grapes will also be undertaken to provide an outlet for the increased production from the primary AgLinks clients, AgriFirms and WUA farmer-members. The AgLinks client base is thus AgriFirms, farmer-members of WUAs, plus select public and private entities relevant to the targeted crop commodities.

Geographic Focus. Both USAID Uzbekistan and the Uzbek Ministry of Agriculture and Water Resources have agreed that the AgLinks Project geographic focus be limited to four provinces (viloyat or oblast) and specific districts (tumani or rayon) within them. The four targeted provinces consist of two within the Fergana Valley (Namangan and Fergana) and two outside the Valley (Samarkand and Tashkent). Tashkent Province is included because of the importance of both public and private entities within the region (i.e. government ministries, agencies and institutes plus private agro-processors). Another criteria used in selecting the provinces and districts was to optimize the collaboration with the existing USAID Water User's Association Support Project. The collaboration between these two USAID projects occurs in Samarkand and Namangan regions and directly impacts the selection of districts within

these regions. The district level targeting, in turn, influences the commodity choice because of the specific agro-climatic zones and existing cropping patterns.

Client Focus. AgLinks Project proposes to work primarily with two specific groups that organize farmers within Uzbekistan. The first are the recently created AgriFirms which involve all former state fruit and vegetable production units. These farming entities are making a slow transition to the private market and need assistance and examples of how to successfully and sustainably orient services, production, post-harvest handling and marketing for their founder members. AgLinks proposes to work with a select number of AgriFirms within the targeted geographic areas to serve as pilot program examples of how to provide services to their members and become viable agribusinesses.

The farmer-members of the WUAs supported by the existing USAID WUASP are the second main category of client targeted by the AgLinks project. With geographic overlap in two regions between these two USAID funded projects, the opportunity exists for AgLinks and WUASP to reinforce each other's efforts. WUASP's mandate for irrigation and drainage infrastructure rehabilitation, combined with institutional strengthening, is complementary to AgLinks' focus on agronomic and marketing best practices. Once the water user member-farmers have access to regulated and effective water use, their farming output and incomes can be further enhanced by improved agronomic and marketing techniques and technologies.

COUNTRY BACKGROUND

Uzbekistan has an area of 447,400 km^2 and is the 56th largest country in the world by area and the 42nd by population. Among the CIS countries, it is the 5th largest by area and the 3rd largest by population. Major cities include: Bukhara, Samarkand, Namangan, and the capital Tashkent. Uzbekistan stretches 1,425 km from West to East and 930 km from North to South. Uzbekistan borders Kazakhstan and the Aral Sea to the North and Northwest, Turkmenistan to the Southwest, Tajikistan to the Southeast, and Kyrgyzstan to the Northeast. It also shares a short border (less than 150 km) with Afghanistan to the South. Uzbekistan is a dry, landlocked country with almost 80 percent desert, dominated by the Qizilqum (Kyzyl Kum) Desert of the North-central part of the country. The mountains of the far Southeast and far Northeast, which are foothills of the Tian Shan Range, reach 4,500 m in elevation. In the Northeast, the Fergana Valley, which is the country's center of population, agriculture, and industry, is 200 to 500 meters above sea level, surrounded by mountain ranges, and intersected by the Syr Darya River. The far West is dominated by the Turan Lowland, the Amu Darya valley, and the Southern half of the shrinking Aral Sea. Some 10.5 percent of Uzbekistan's land, most of it in the Fergana Valley, is classified as arable, and 0.8 percent is planted to permanent crops, while about 0.4 percent is forested.

The climate of landlocked Uzbekistan is continental, with hot summers and cool winters. Summer temperatures average 32°C, but can reach 40°C, while winter temperatures average between –2 to -10°C, although –38°C has been recorded. Rainfall averages vary between 100 millimeters per year in the Northwest compared to 800 millimeters in the Tashkent region. Precipitation falls mainly in the winter and spring. The July 2007 population estimate is 27.7 million people of which 37 % is urban and 63 % rural. According to official sources, Uzbeks comprise a majority (80%) of the total population. Other ethnic groups include Russians 5.5%, Tajiks 5%, Kazakhs 3%, Karakalpaks 2.5%, and Tatars 1.5% (1996 estimates). The population of Uzbekistan is very young: 34.1% of its people are younger than 14 (2008 estimate).

ENVIRONMENT

The Aral Sea, half of which is in Uzbekistan, has been severely desiccated by overuse of its tributary rivers, a situation recognized as one of the world's worst environmental disasters. Enormous water losses from these rivers are caused by the extremely low efficiency of irrigation systems in Turkmenistan and Uzbekistan. Without the moderating influence of the sea, winters became significantly colder and summers hotter. Vozrozhdeniye Island in the Aral Sea, now connected to the shore by shrinkage of the sea, contains the lethal remains of a Soviet era anthrax testing laboratory, most of which lies in Uzbekistan territory. The desiccation and salinization of the lake have caused extensive storms of salt and dust from the sea's dried bottom, wreaking havoc on the region's agriculture and ecosystems and on the population's health. Desertification has led to the large-scale loss of plant and animal life, loss of arable land, changed climatic conditions, depleted yields on the cultivated land that remains, and destruction of historical and cultural monuments. Every year, many tons of salts are reportedly carried as far as 800 kilometers away. Regional experts assert that salt and dust storms from the Aral Sea have raised the level of particulate matter in the earth's atmosphere by more than 5 percent, impacting global climate change.

Drinking water quality also is a major problem, especially in the Western province of Karakalpakstan, where water is poorly distributed, and sources are exposed to various types of surface and underground contamination. Inadequate sewage disposal adds to Uzbekistan's water pollution problem: only 40 percent of the population is served by sewage systems. Some 15,000 hectares of pastureland are lost to salt and dust annually. Soil contamination is highest in agricultural areas that have been subjected to annual overdoses of fertilizers and pesticides. Uncontrolled timber cutting has endangered the few remaining stands of forests.

The Soviet era approach to environmental management yielded decades of poor water management and lack of water or sewage treatment facilities; inordinately heavy use of pesticides, herbicides, defoliants, and fertilizers in the fields; and construction of industrial enterprises without regard to human or environmental impact. Those policies present enormous environmental challenges throughout present day Uzbekistan.

WATER POLLUTION

Large-scale use of chemicals for cotton cultivation, inefficient irrigation systems, and poor drainage systems are examples of the conditions that led to a high filtration of salinized and contaminated water back into the soil.

According to one report, virtually all the large underground fresh-water supplies in Uzbekistan are polluted by industrial and chemical wastes. An official in Uzbekistan's Ministry of Environment estimated about half of the country's population lives in regions where the water is severely polluted.

BIODIVERSITY

Uzbekistan is globally and regionally important due to its location between the European, Middle Eastern, and Asian biogeographical regions. Its varying landscapes of high mountain ranges, wide steppes, deserts, riparian wetlands, and the Aral Sea has resulted in a diversity of habitats. Uzbekistan is a very important flyway for many migratory bird species between northern Europe and their wintering grounds in Africa and Asia.

The main ecosystems in Uzbekistan include lowland desert, mountain and inland water ecosystems, some of which are included as "Eco-regions 200." They provide important habitats for migratory species. More

than 27,000 species are found in Uzbekistan. Among them, there are over 15,000 animals and 4,500 higher plants. These include: 83 fish; 3 amphibian; 59 reptile; 424 bird and 97 mammal species. Among them, 30 reptiles, 8 birds and 15 mammals are endemic. The major threats to biodiversity in Uzbekistan include unsustainable agriculture, pesticides, soil erosion, water pollution, deforestation, shrinking of lakes and climate change. In addition, land clearing for agriculture, water irrigation projects, overuse of pastures as well as mining and drilling activities have strong impacts on the Uzbekistan ecosystems. There are 27 mammals, 62 birds, 14 reptiles and 10 fish, which are identified as endangered species with 182 animal and 301 plant species considered extinct.

24 protected areas have been established, of which there is one Ramsar site and one Biosphere Reserve. Protected areas account for 5.8% of the total land area of the country.

Forests cover a total of 1,969,000 ha, with 1,669,000 ha of natural forest and 300,000 ha of plantations.

NATIONAL BIODIVERSITY STRATEGIC ACTION PLAN (NBSAP)

Uzbekistan's NBSAP contains strategy statements covering three aspects: the protected areas system; public awareness, participation and education; and sustainable use. For each of these aspects, the action plan identified goals, steps and outputs. For example, on protected areas, the action plan covers development of institutional and legal frameworks, expansion of the protected areas system, management of protected areas, national biodiversity information system, captive breeding and ex situ conservation. In addition, the NBSAP outlines specific schedules and outputs for implementing identified priority activities.

Uzbekistan aims to establish an ecologically stable system of protected areas which will represent all ecosystems and whose coverage will be 10% of the total land area. For example, a target has been set to protect 80% of biodiversity in Tien-Shan. A number of laws have been adopted including: Nature Protection Law; Law on Protection and Use of Animals and Plants; Forest Law; and Protected Area Law. To protect endangered species, Uzbekistan has set up targets to preserve and further increase rare and severely threatened species and control the use of protected plants. Uzbekistan has also established breeding centers for priority protected species. To protect traditional knowledge, Uzbekistan is developing programmes to research and disseminate traditional knowledge and to promote use of indigenous languages and traditional ways of sustainable use of biodiversity. Challenges identified for achieving these targets include inadequate research capacity, education and awareness, training, stakeholder involvement and cooperation, demographic pressures, improper documentation of biodiversity loss and goods and services provided, and natural disasters.

INITIATIVES IN PROTECTED AREAS

Uzbekistan has protected 5.8% of the country's total land area, an increase of 1.07% in the last decade. Uzbekistan has adopted a law on protected areas that covers low land desert, mountain and aquatic ecosystems. As a follow-up, Uzbekistan has expanded its existing protected areas and established a number of new reserves. Currently Uzbekistan is considering creation of a large reserve in Central Kyzylkum covering 5000 square kilometers to protect desert ecosystems and migration sites of the houbara bustard.

AGRICULTURE

Agriculture in Uzbekistan employs 29% of the country's labor force and contributes 30% of its GDP (2007 data). Crop agriculture requires irrigation and occurs mainly in river valleys and oases. Cultivable land is 4.4 million ha, or about 10% of Uzbekistan's total area and it has to be shared between crops and cattle. Desert pastures cover fully 50% of the country, but they support only sheep.

Cotton is Uzbekistan's main cash crop accounting for 14% of its exports in 2007. With annual cotton production of about 1 million metric ton of fiber (4%-5% of world production) and exports of 700,000-800,000 tons (10% of world exports), Uzbekistan is the 4th largest producer and the 2nd largest exporter of cotton in the world. However, because of the risks associated with a one-crop economy, as well as food security considerations, Uzbekistan has been moving to diversify its production into cereals, while reducing cotton production. Thus, area sown to cotton was reduced from 1.8 million ha in 1990 to 1.4 million ha in 2006, while the area under cereals increased from 1.0 million to 1.6 million ha (partly at the expense of area allocated to feed crops). Another reason for crop diversification might be environmental, because the large quantities of irrigated water and fertilizer needed to produce cotton have contributed to the drying up of the Aral Sea and to the severe soil pollution in the surrounding area.

The main cereals produced are wheat, barley, corn, and rice, which are intensively cultivated in irrigated oases. Minor crops include sesame, onions, flax, and tobacco. Fresh fruits are mainly consumed domestically, while dried fruits are also exported. Uzbek melons, known for their long life and unique taste, are widely sought after in the large cities of the CIS.

Pelts of the Karakul sheep bred in Bukhara and its environs are a traditional export commodity, but their contribution to total exports today is negligible. The production of karakul pelts dropped from 1.4 million pieces in 1990 to less than 700,000 pieces in 2004.

Cattle, sheep, and chickens are raised for meat. There are 3 million cows in Uzbekistan, and they produce 5 million liters of milk per year. The achieved yields of around 1,600 kg of milk per cow per year are among the lowest in the CIS (compared to 2,500 kg per cow per year for Russia, Ukraine, and Moldova) and dismally low compared to those in the EU countries or North America. The low milk yields are attributable to insufficient feed and reluctance of peasants to use artificial insemination for breed improvement.

Although silkworms and mulberry trees have existed in Uzbekistan since the 4th century and the country is renowned for its colorfully patterned silks, the silk industry continues to be statistically insignificant.

CHANGING FARM STRUCTURE

Up to 1991, agriculture in Uzbekistan (then Uzbek SSR), as in all other Soviet republics, was organized in a dual system, in which large-scale collective and state farms coexisted in a symbiotic relationship with quasi-private individual farming on subsidiary household plots. The process of transition to a market economy that began in independent Uzbekistan after 1992 led to the creation of three types of farms: the traditional household plots were renamed *dehkan* (or *dehqon*) farms; the large-scale collective and former state farms were reclassified as *shirkats* (agricultural production cooperatives) or other corporate forms (joint-stock societies, limited liability companies, partnerships); and a new category of midsized peasant farms or farmers was introduced between the small dehkan farms and the large-scale shirkats. As of 2006, farmers cultivate 75% of the sown area, while dehkan farms cultivate 12.5% and various corporate farms control the remaining 12.5%. The situation is totally different with regard to livestock: 95% of cows are

on dehkan farms, 4% in peasant farms, and just 1% on corporate farms. Dehkan farms produce 62% of gross agricultural output, followed by 32% in peasant farms, and a mere 6% on corporate farms.

PRIORITY GEOGRAPHIC PLACES OR AREAS OF PROJECT INTERVENTION

The geographic focus of the AgLinks Project is limited to four provinces (viloyat or oblast) and specific districts (tumani or rayon) within those provinces. The four targeted regions consist of two within the Fergana Valley (Namangan and Fergana) and two outside the Valley (Samarkand and Tashkent). Tashkent Province is included because of the importance of both public and private entities within the region (i.e. government ministries, agencies and institutes plus private agro-processors). Details are given in Section 1.5.

USAID PROJECT PARTNERS INVOLVED IN AND INFLUENCED BY THE PERSUAP

The following table presents the main selected AgLinks Project partners in Uzbekistan with their geographic location.

Targeted crops	Organization	Location in Uzbekistan (district, province)	Name of contact persons
Peach, cherry, plum, apricot	"Muyan sohibkorlari" Agrifirm	Quvasoy, Ferghana	Alijon Burkhanov, Director
	"Quvasoy bekhizor" Agrifirm	Quvasoy, Ferghana	Habibullo Razzoqov, Director
Apricot, grape	"To'raqo'rg'on sohibkorlari" Agrifirm	Turakurgan, Namangan	Matvali Ahmedov, Director
Apricot	"Shirinsuv yangier" WUA	Pop, Namangan	Joraboy Matoirov, Manager
Peach	"Agromir" processing company	Samarqand, Samarqand	Mehroj Fayzilov, Director
Grape	"Istiqlol meva sabzavot" Agrifirm	Samarqand, Samarqand	Jamshid Bahriev, Director
	"Dilkusho sifat" Agrifirm	Toylok, Samarqand	Islom Usmonov, Director
	"Pungon" Water user's association (WUA)	Pop, Namangan	Xusanboy Ermatov, Manager
	"Qarshiboy Mirob AUS" WUA	Payarik, Samarqand	Allayor Umirzoqov, Manager
	"Hujabo'ston suv tarmog'i" WUA	Payarik, Samarqand	Erkin Eshquvvatov, Manager
	"Damhasa arig'I MHA" WUA	Payarik, Samarqand	Mirzaev Hudoyor, Manager
	"BERAD-AGRO" private company	Parkent, Tashkent	Mirrahim Adilov, Director

STUDY METHODOLOGY

The consultant Uwe Scholz was contacted in October by DAI's Representative Office in Tashkent, Uzbekistan, about the need for a PERSUAP for target crops under the AgLinks Uzbekistan country program (Annex 3). AgLinks contacted the partners to explain the rational of the PERSUAP and prepared a preliminary list of crops and pesticides for consideration. Information requests for crops, pests of concern (Section 2.2) and pesticides considered were sent to the AgLinks Uzbekistan project staff to begin the review process. The country study tour took place from November 24 until December 9, 2008.

Prior to the arrival of the consultant, a workplan including a list of potential key interviewees including institutes, ministries, and agricultural organizations was sent to AgLinks Uzbekistan. The AgLinks Uzbekistan office in Tashkent arranged for these meetings and the consultant was accompanied by Mr. Shuhrat (an AgLinks staffer). The consultant's main task was debriefing key informants in all relevant disciplines and agencies relevant to pesticide usage in Uzbekistan. This began with USAID partners and then expanded into government, non-government, and private agencies. A final list of commodities and pests was soon developed. Current pest control knowledge, attitudes, and practices of farmers and extension workers was determined by interviewing secondary sources, as well as undertaking field visits to Fergana, Namangan, and Samarkand. Pesticide wholesale and retail stores and shops, as well as open markets, were visited in all targeted provinces to assess the availability of pesticides and protective equipment and clothing. Several organizations were interviewed to determine the current state of registered pesticides, importation, and registration practices and capacity. A list of people contacted is given in Annex 13.

This diverse set of target groups was interviewed based on the provisions laid out in the USAID Environmental Procedures for pesticide "use" (as provided in USAID Environmental Procedures: Title 22, Code of Federal Regulations Part 216, Reg. 216) which requires all projects involving assistance for the procurement or use, or both, of pesticides shall be subject to the procedures prescribed in 22 CFR 216.3 (b)(1)(i)(a-l). USAID broadly interprets "use" to include all direct or actual use or acquisition of pesticides, including handling, transporting, storing, mixing, loading, applying and disposing of pesticides, as well as cleaning up spray equipment. It also includes any indirect support for pesticide use, such as providing fuel for transporting pesticides and giving technical assistance on pesticide management operations. An environmental review is required when USAID supports any such actions. In contrast, support for limited pesticide research and pesticide regulatory activities are not subject to scrutiny under the pesticide procedures. Likewise, USAID may provide support to train people in safer pesticide use without environmental review when the training does not involve actual application of pesticides. This definition of "use" applies throughout this PERSUAP document. USAID strongly encourages including instruction in IPM and alternatives to pesticides in any training on pesticide use as defined above. Under this approach, pesticides are considered a tool of last possible control measures, following all non-chemical approaches. Pesticide choice should be practical and 'least toxic.'

USAID pesticide procedures require that 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 (IEE) 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.

The rationale for a PERSUAP-type environmental review (as opposed to a full-scale Environmental Assessment) is the affected projects are reviewed and an IEE approved for all other activities in the programs. The IEE approves a Positive Determination and/or a Negative Determination with conditions as appropriate to each case, with deferrals for pesticide use pending completion of PERSUAPs. Another rationale is the pesticides are used under tight management, with well laid conservation practices, guided by trained and experienced staff members who implement actions in the SUAP. Pesticides are defined as synthetic or natural product-derived chemical products intended to kill, control, and repel insects, plant diseases, weeds, and other pest organisms. Annex 5 includes natural plant-derived pesticides. The PERSUAP analysis will cover those pesticides proposed for use by the project that are a) at minimum registered by USEPA for the same or similar uses without restrictions; b) registered by the local

government; c) available in the country; d) alternative low toxic pesticide choices available in the region that could be used if registered and imported. It will also specifically list project-proposed pesticides that are rejected for use by the study, with reasons for rejection. This PERSUAP is designed considering and following the new IPPMSUAP concept developed in the Africa Bureau. Websites and other information sources used to gather information for this report are found in Annex 12. The document should be distributed to all institutions and persons listed in Annex 11.

CROPS, PESTS AND PESTICIDES

CROPS

The targeted PERSUAP crops are apricot, peach, plum, cherry, grapes, pomegranate, tomato, onion, cucurbits, cotton, wheat, and rice for all four provinces.

PEST CHALLENGES/PRODUCTION CONSTRAINTS OF EACH CROP

Apricot, peach, plum and cherries: All are susceptible to diseases such as shot hole disease, while peach and plum are affected by Peach leaf curl and Plum pockets, respectively. In addition, apricot is attacked by spure canker and plum by powdery mildew. All stone fruits, except cherry, are damaged by codling moth and plum moth. Cherry is attacked by the cherry weevil. All stone fruits are infested by scales and aphids. Insufficient knowledge and information distribution to farmers about the development biology of the main stone fruit pests and diseases results in irregular timing of control measures and pesticide applications. Small garden treatment is carried out by backpack sprayers, which cannot effectively treat trees and large shrubs, while mostly old tractor sprayers are used in larger orchards. There is lack of pesticide rotation for pathogenic microorganisms and pest resistance development reduction. During the country study tour, pests like aphids, scales and borers were observed in their respective resting stages.

Grapes: Main diseases of grapes are powdery mildew, downy mildew and anthracnosis. Several unidentified diseases were observed, and accordingly, no protection measures are (and can be) recommended. Grape berry moths, spider mites and mealy bugs are the main grape pests. Aphids might cause additional problems in some locations. Small vineyards are treated by backpack sprayers. Mostly old tractor sprayers are used in larger vineyards. There is, as in stone fruits, a lack of pesticide rotation for pathogenic microorganisms and pest resistance development reduction.

Pomegranate: The main pomegranate pests are pomegranate moth, mealy bug, spider mite and aphids. Additional problems might occur with whiteflies. One control measure against moth is removal of eggs manually from the fruit or the removal of the former floret. Disease problems are caused by fungal necrosis and spot anthracnose. As mentioned above, spraying is by backpack sprayer or tractor driven equipment.

Cucurbits: The main cucurbit diseases are powdery mildew, angular leaf spot and Fusarium wilt. Downy mildew, anthracnosis and cucumber mosaic virus additionally reduce yield and fruit quality. Main pests are melon fly and melon ladybird. Melon fly is unknown to farmers and they are unaware of effective control measures. Additional damage can be caused by whiteflies and aphids. Pesticides are mostly applied by tractor driven equipment.

Tomato: The main tomato diseases are late blight, leaf mold and bacterial canker, which are very rarely controlled by pesticides. Additionally, tomatoes can be affected by black stem and Verticillium wilt. Spider mites, whiteflies, as well as tomato fruit worm and cutworm are important tomato pests. On some farms, the natural predators (lacewing, trichogramma and bracon) are used against tomato pests (aphids,

worms, mites and thrips). Generally, tomatoes are sprayed by backpack sprayer, except larger fields, where tractor driven equipment is used. Under continuous and intensive tomato cultivation, nematode populations, like root knot nematodes, reach very high population densities, resulting in the termination of tomato production. Weed control is usually done manually and mechanically. Farmers have insufficient knowledge about correct pesticide application regarding dosage, calibration, and appropriate coverage, effective pressure at the tips of sprayer and required droplet size.

Onion: A widespread onion disease is downy mildew. The basic onion pests are onion fly, cutworm, thrips and aphids. The most labor-consuming measure is manual weeding. Herbicides for onions are not used. As with tomato production, the majority of farmers have an insufficient knowledge about correct pesticide application.

Rice: Shore fly, thrips and crab are major rice pests. Rice blast and Fusarium head blight are major rice diseases. Insecticides and fungicides are usually applied by motor or manually operated backpack sprayers.

Wheat: Wheat is the second most important crop in Uzbekistan after cotton. Sunn pest, ground beetle and aphids are major pests in wheat. Rusts, powdery mildew and smuts are diseases with a strong yield impact in wheat. Special attention should be given to Septoria diseases and foot and root rots. Chemical control is done mostly by tractor driven equipments, but airborne application of chemicals is also undertaken. Seedborne diseases are reduced by seed treatments, using fungicides or bacterial treatments. Biocontrol measures, especially the application of predators and parasites of major wheat pests are well established in Uzbekistan and produced at an industrial level.

Cotton: Cotton is the major strategic crop in Uzbekistan. Cotton bollworm, cutworm, Lucerne bug, tarnished plant bug, spider mites, aphids, thrips and whitefly are all considered major cotton pests. Bacterial blight, black root rot and foot rot are major cotton diseases. Chemical control is done mostly by tractor driven equipment, but airborne chemical application also occurs. Seedborne diseases are reduced by seed treatments, using fungicidal and bactericidal treatments. Biocontrol measures, especially the application of predators and parasites of major cotton pests are well established and prioritized in Uzbekistan and produced at an industrial scale.

AgLinks list of major diseases and pests on target crops:

Apricot (Prunus americana)	
Pests:	**Common name:**
• Carpocapsa pomonella	• codling moth, walnut worm
• Laspeyresia funebrana	• plum moth, red plum maggot
• Quadraspidiotus perniciosus	• San Jose scale
• Parthenolecanium corni (not Samarkand)	• European fruit lecaneum
• Sphaerolecanium prunastri	• plum scale
• Rhynchites auratus s.sp ferghanensis (Tashkent and Samarkand)	• apricot weevil
• Pterochloroides persicae	• brown peach aphid
• Hyalopterus arundinis	• mealy plum aphid

Diseases:	Common name:
• Clasterosporium carpophilum (Stigmina carpophila)	• shot whole disease
• Monilinia cinerea	• spure canker, brown rot
Peach (Prunus persica)	
Pests:	**Common name:**
• Carpocapsa pomonella (Tashkent and Samarkand)	• codling moth, walnut worm
• Laspeyresia funebrana (Tashkent and Samarkand)	• plum moth, red plum maggot
• Quadraspidiotus perniciosus	• San Jose scale
• Parthenolecanium corni (not Samarkand and Fergana)	• European fruit lecaneum
• Sphaerolecanium prunastri	• plum scale
• Pterochloroides persicae	• brown peach aphid
• Hyalopterus arundinis	• mealy plum aphid
Diseases:	**Common name:**
• Clasterosporium carpophilum	• shot whole disease
• Taphrine (Exoascus) deformans (Tashkent and Fergana)	• peach leaf curl
Plum (Prunus domestica)	
Pests:	**Common name:**
• Carpocapsa pomonella (not in Namangan)	• codling moth, walnut worm
• Laspeyresia funebrana	• plum moth, red plum maggot
• Quadraspidiotus perniciosus	• San Jose scale
• Parthenolecanium corni	• European fruit lecaneum
• Sphaerolecanium prunastri	• plum scale
• Pterochloroides persicae	• brown peach aphid
• Hyalopterus arundinis (Tashkent and Samarkand)	• mealy plum aphid
Diseases:	**Common name:**
• Clasterosporium carpophilum (not in Namangan)	• shot whole disease
• Exoascus pruni (Taphrina pruni)	• plum pockets, bladder plums
• Podosphaera tridactyla (Fergana)	• powdery mildew
Cherry (Prunus avium and P. cerasus)	
Pests:	**Common name:**
• Myzus cerasi (Tashkent and Samarkand)	• black cherry aphid
• Quadraspidiotus perniciosus	• San Jose scale
• Parthenolecanium corni (Tashkent and Fergana)	• European fruit lecanium
• Sphaerolecanium prunastri (Tashkent and Fergana)	• plum scale
• Rhynchites auratus (not in Samarkand)	• cherry weevil
• Pterochloroides persicae (not in Fergana)	• brown peach aphid
• Hyalopterus arundinis (Tashkent)	• mealy plum aphid
Diseases:	**Common name:**
• Clasterosporium carpophilum	• shot whole disease
• Mycosphaerella cerasella Aderhold	• shot whole disease of sweet cherry

Grape (Vitis vinifera)	
Pests:	**Common name:**
• Eriophyes vitis Nal. (not in Samarkand) • Polychrosis botrana Schiff. • Clysia ambiguella Hb. • Pseudococcus citri Risso. Further, additional problems might be caused by aphids.	• grape erineum mite, grape gall mite • grape berry moth • grapevine moth • citrus mealybug
Diseases:	**Common name:**
• Uncinula necator • Plasmopara viticola • Gloeosporium ampelophagum (Fergana and Samarkand) Further problems might be caused by Botrytis cinerea (Botrytis bunch rot).	• grapevine powdery mildew • grapevine downy mildew • grape anthracnose

In vineyards, rye grass (Lolium ssp.) seems to be a serious problem. Although less frequent, thistles are considered a threat as well.

Concerns regarding mycotoxin contamination in black raisins were voiced by AgLinks Uzbekistan based upon partner experience. The important mycotoxins found in raisins are the Ochratoxin A and to lesser extent Ochratoxin B. These mycotoxins are secondary metabolites, which are often produced in minute quantities but are toxic to humans. Ochratoxins are produced mainly by *Aspergillus* and *Penicillium* species, which can infect grapes. These fungi are either present in the soil, on plants or in storage buildings. Strategies to minimize infection by these fungi are discussed in Annex 2.

Pomegranate (Punica granatum)	
Pests:	**Common name:**
• Euzophera punicaeella (Tashkent and Fergana) • Aphids, no species given (Tashkent) • Spider mites, no species given (Tashkent and Namangan) • Pseudococcus comstocki (Tashkent and Namangan) Further problems can be caused by whiteflies.	• pomegranate moth • aphids • spider mites • comstock mealybug
Diseases:	**Common name:**
• Пятнистость (Tashkent and Namangan) • Sphaceloma punicae (Tashkent)	• necrosis, fruit rot (Phomopsis?) • pomegranate spot anthracnose
Cucurbits: Water Melon (Citrullus lanatus), Sweet Melon (Cucumis melo) and Cucumber (Cucumis sativus)	
Pests:	**Common name:**
• Epilachna chrysomelina • Myiopardalis pardalina Further potential problems by whiteflies and aphids!	• melon ladybird beetle • Baluchistan melon fly
Diseases:	**Common name:**
• Sphaerotheca fuliginea • Fusarium oxysporum f.sp. cucumerinum • Pseudomonas syringae pv. lachrymans Further potential problems by Pseudoperonospora cubensis (downy mildew), and Colletotrichum orbiculare (anthracnosis) and cucumber mosaic virus.	• powdery mildew • Fusarium wilt of cucumber • cucurbit angular leaf spot, bacterial leaf spot

Tomato (Solanum lycopersicum)	
Pests:	**Common name:**
• Aculops lycopersici Massee • Trialeurodes vaporariorum Further problems can be caused by Helicoverpa armigera (tomato fruitworm), Agrotis segetum (cutworm), Aphis gossypii (aphids) and Thrips tabaci (thrips) as well as nematodes (i.e. Meloidogyne spp. as root knot. nematodes).	• tomato russet mite • whitefly
Diseases:	**Common name:**
• Corynebacterium michiganense (not in Namangan) • Cladosporium fulvum (not in Namangan) • Phytophthora infenstans Further problems can be caused by Verticillium spp. (Verticillium wilt) and Erwinia carotovora (black stem, bacterial wilt). In vegetables, rye grass (Lolium ssp.) seems to be a serious problem. Thistles are considered a threat as well but less frequently.	• bacterial canker of tomato • tomato leaf mold • late blight
Potential weeds:	
Cyperus rotundus, Amaranthus retroflexus, Solanum nigrum, Xanthium strumarium, Abutilon theophrastii, Hibiscus trionum, Portulaca oleracea, Sorgum halepense, Convolvulus arvensis, Plantago major	
Onion (Allium cepa)	
Pests:	**Common name:**
• Agrotis segetum (not in Fergana) • Hylemyia antiqua or Delia antiqua (not in Fergana and Samarkand) • Thrips tabaci L. (not in Fergana) Further, additional problems can be caused by aphids.	• cut worm, turnip moth • onion fly • onion thrips
Diseases:	**Common name:**
• Peronospora destructor (not in Fergana)	• downy mildew of onion
Potential weeds:	
Cyperus rotundus, Amaranthus retroflexus, Solanum nigrum, Xanthium strumarium, Abutilon theophrastii, Hibiscus trionu, Portulaca oleracea, Sorgum halepense, Convolvulus arvensis, Plantago major, Cynodon dactylon, Cuscuta campestris.	•
Rice (Oryza sativa)	
Pests:	**Common name:**
• Ephydra macellaria • Triops cancriformis • Haplothrips aculeatus	• shore fly, rice fly • horseshoe crab • panicle thrips
Diseases:	**Common name:**
• Magnaporthe grisea (Pyricularia oryzae) • Fusarium spp.	• rice blast disease • Fusarium head blight

Wheat (Triticum aestivum)	
Pests:	**Common name:**
• Eurygaster integriceps (in Tashkent and Namagan) • Zabrus tenebrioides Further, additional problems can be caused by aphids.	• sunn pest • corn ground beetle
Diseases:	**Common name:**
• Puccinia striiformis (not in Namangan) • Puccinia triticina (not in Namangan) • Erysiphe graminis • Ustilago tritici (not in Fergana and Samarkand) • Tilletia caries, Tilletia laevis (Tashkent) Additional problems can be caused by Septoria tritici (Septoria tritici blotch) and S. nodorum (glume blotch), as well as foot and root rots.	• yellow rust • brown wheat rust • powdery mildew • loose wheat smut • common bunt
Cotton (Gossypium)	
Pests:	**Common name:**
• Agrotis segetum • Helicoverpa armigera (Chloridae obsoleta) • Tetranychus telarius • Thrips tabaci Zind • Adelphocoris lineolatus • Lygus pratensis • Aphis gossypii • Aphis medicaginis • Acyrthosiphon gossypii • Trialeurodes vaporariorum • Bemisia tabaci	• cutworm, turnip moth • cotton bollworm • carmine spider mite • cotton seedling thrips • lucerne bug • tarnished plant bug • cotton aphid • groundnut aphid • aphid • whitefly • tobacco whitefly
Diseases:	**Common name:**
• Xanthomonas axonopodis pv. malvacearum • Rhizoctonia ssp., Pythium ssp., Fusarium ssp. • Chalara elegans (Thielaviopsis basicola)	• bacterial blight • foot rot • black root rot

HISTORY OF MAGNITUDE OF PEST PROBLEMS IN COUNTRY

Information on Uzbekistan's crop losses is very hard to obtain. The same holds true for any information about relevant pests and diseases, inside and outside the PERSUAP listed crops, except for the strategic commodities of cotton and wheat. Since the collapse of the detailed monitoring system 20 years ago, not much has been done to improve the situation. All information on relevant pests and diseases were obtained during the interview process. In addition to an incomplete list of existing pests and diseases in Uzbekistan, new pests and diseases might have been introduced, or formerly less important pests might have become major biotic stresses, due to climate changes, non-functional quarantine measures, production changes and uninformed pesticide use. Therefore, it is crucial that all target crops are thoroughly monitored during the entire AgLinks Uzbekistan life of project and any suspected new disease and pests confirmed by internationally respected experts. Koch's postulates have to be fulfilled for pathogen confirmation, especially for new fungal, bacterial and viral problems. In addition, pests like

aphids, thrips and whiteflies show resistance against pesticides, which were used intensively over the past thirty or more years. Therefore, pesticide resistance management strategies should be sought and applied.

HISTORY OF IPM AND CROP PROTECTION RESEARCH AND DEVELOPMENT RELEVANT TO CROPS, PESTS, PESTICIDES IN THIS STUDY

There have been very few IPM courses or programs implemented in Uzbekistan in the past. Most of the IPM knowledge exists in the country through educated older individuals in government, universities, and international projects. Most farmers, as well as economists and crop protection specialists, are unfamiliar with IPM methodology.

Almost all the investigated crops have a long-term history of cultivation in this region. Therefore, diseases and pests of these crops have evolved over a long time. Plant protection issues remain highly problematic in Uzbekistan. Although pests and diseases of the AgLinks Uzbekistan recommended crops were studied by the scientific and key specialists in the state departments or institutes, the majority of farmers and specialists in the villages and at district level (county) are not sufficiently informed of effective plant protection principles and measures. However, due to the long tradition of utilizing predators and parasites against cotton and wheat pests, the concept of IPM is much better developed than in many other regions of the world in these two crops. These concepts can be adopted to fruit and vegetable production when combined with the correct utilization of pest scouting, modeling, forecasting and environmentally sound use of pesticides with low impact on beneficial insects.

Despite sufficient farming experience, farmers and even farm specialists are unable to provide the scientific name of the pests and diseases present on their crops. They often give local names or provide very basic terms, which make it impossible, even for regional specialists, to make exact identifications. Therefore, pest and disease surveys should be carried out at the proper time by local extensionists to provide accurate pest and disease identification. During the study tour, skilled experts at the province level were helping to determine and verify the regional relevance of the diseases and pests reported. These observations can be utilized in combination with specialized information and within the framework of information exchange to make exact identification.

The system of simple identification at field level (when feasible) to the laboratory has to be drastically improved. At minimum, simple optical equipment, ranging from magnifiers to basic binoculars and microscopes, as well as simple plant clinics at provincial level should be created. These measures would allow for self-motivated and faster response to common and newly emerging biotic stresses at the regional level. At present, laboratories capable to address crop protection problems in a professional manner only exist in Tashkent and, to some extent, in Samarkand. Given the limited identification capacity at the district and farm levels, specific and effective protection measures cannot presently be selected and recommended for fields and orchards. Correct recommendations, conclusions and appropriate measures must be based on frequent analysis, name and specific characteristics of the pathogen or pest, their biological and potentially regional characteristics and knowledge of historical outbreaks.

Most specialists who received their education during the Soviet period are not familiar with modern environmentally sound pesticides, integrated pest management and specific biological control methods. Some still desire old and more harmful preparations for application, such as DNOC (4,6-Dinitro-Ortho-Cresol), Dust (DDT) and Nitrofen which will be discussed in more detail below.

VIABLE AND PRACTICAL IPM OPTIONS TO TRY IN UZBEKISTAN AND TO POTENTIALLY INTEGRATE INTO AN IPM SYSTEMS APPROACH TO PEST MANAGEMENT

Integrated Pest Management (IPM) is the coordinated use of pest and environmental information to design and implement pest control methods that are economically, environmentally and socially sound. IPM promotes prevention over remediation and advocates integration of at least two or more strategies to achieve long-term solutions. IPM measures suggested for the target crops grown in Uzbekistan are summarized in Annex 2. These measures are based on experimentation carried out in other countries that were successful in managing the corresponding pest.

In general, IPM combines the following measures: pest monitoring (ex., pest detection, pest population build-up monitoring to apply economic thresholds for pesticide application) and prediction based models (ex., degree-day calculations, software solutions), cultural methods (ex., resistant varieties, crop rotation, cultivation of alternate hosts, selection of planting sites, crop specific traps, adjusting the timing of planting or harvest, crop residue destruction or incorporation, pruning), mechanical methods (collection, hand weeding, barrier exclusion, trapping), physical methods (ex., heat, cold, humidity, traps, sound), and biological methods (ex., introduction of imported natural enemies and protection of indigenous natural pest enemies, dissemination and establishment of microbial control agents). IPM can also include the use of natural chemical methods (ex., attractants, repellents, sterilants and growth inhibitors), plant extracts (ex., neem oil extracts, pyrethrum extracts from Chrysanthemum flowers), genetic methods (ex., release of sterile or genetically incompatible pests that disrupt natural mating), and regulatory means (ex., plant and animal quarantines, suppression and eradication programs). These measures must allow the safe integration of pesticides as the last control resort within farmers' traditional cropping and pest management systems.

As noted earlier the pests list is not complete and will require constant updating as new or more correct information becomes available over the course of the AgLinks Uzbekistan program. The relative importance of certain diseases and pests in specific locations is influenced by the quality of agricultural practices. Annex 2 provides and describes a set of IPM measures that may be used for the target crops grown in Uzbekistan. More details can be found on the web, in modern textbooks and current publications.

Pesticide resistance management strategies include minimizing pesticide use, shunning tank mixes, avoiding persistent chemicals, and using long-term rotations of pesticides. These should involve alternating among pesticide classes with different modes of action to delay or mitigate onset of the existing resistance by pests. Pesticide classes are established by the different **R**esistance **A**ction **C**ommittees (RAC) labeled FRAC for **F**ungicides, IRAC for **I**nsecticides and **H**RAC for Herbicides followed by numbers or letters. (For an explanation of what the various numbers and letters indicate please visit the following sites:

(http://www.irac-online.org/Crop_Protection/MoA.asp#area223, for Insecticides

http://www.frac.info/frac/publication/anhang/FRAC_Code_List_2007_web.pdf, for Fungicides

http://www.hracglobal.com/Publications/ClassificationofHerbicideModeofAction/tabid/222/Default.aspx) for Herbicides.

The classifications for each pesticide are given in Annex 1.

PESTICIDES REQUESTED FOR USE IN THE PROJECT

Annex 1 contains a list of all pesticides requested, with their respective toxicity, human acute and chronic health and environmental issues.

The following are the AgLinks Uzbekistan-requested pesticides, by active ingredient with their status in the present PERSUAP and additional pesticides suggested by the consultant:

Fungicides	Status
Bordeaux mixture	REJECTED
Bromuconazole	REJECTED
Bronopol	REJECTED
Calcium hydroxide	REJECTED
Carboxin	ACCEPTED
Copper sulfate (anhydrous)	REJECTED
Copper sulfate (basic)	**RUP** (Special Safety Training Required)
Diniconazole	REJECTED
Epoxiconazole	REJECTED
Ferrous-sulfate	REJECTED
Flutriafol	REJECTED
Guazatine	REJECTED
Oxadixyl	REJECTED
Penconazole	REJECTED
Pencycuron	REJECTED
Propamocarb hydrochloride	ACCEPTED
Propiconazole	ACCEPTED
Tebuconazole	ACCEPTED
Thiophanate-methyl	ACCEPTED
Thiram	ACCEPTED
Triadimefon	ACCEPTED
Triforine	REJECTED
Triticonazole	ACCEPTED

Fungicides Additionally Suggested

Copper ammonium complex
Copper octanoate
Cymoxanil
Mancozeb
Sulfur

Insecticides	
Acephate	REJECTED
Acetamiprid	**RUP** (Special Safety Training Required)
Amitraz	REJECTED
Avermectin	**RUP** (Special Safety Training Required)
Bifenthrin	**RUP** (Special Safety Training Required)

Bromopropylate	REJECTED
Buprofezin	ACCEPTED
Carbosulfan	REJECTED
Chlorpyrifos	**RUP** (Special Safety Training Required)
Cyhalothrin, gamma	**RUP** (Special Safety Training Required)
Cyhalothrin, lambda	**RUP** (Special Safety Training Required)
Cypermethrin	REJECTED
Cypermethrin, beta	**RUP** (Special Safety Training Required)
Cypermethrin, zeta (WHO 1b)	REJECTED
Deltamethrin	REJECTED
Diazinon	REJECTED
Dimethoate	ACCEPTED
Etoxazole	ACCEPTED
Fenpropathrin	REJECTED
Fenvalerate	REJECTED
Fipronil	REJECTED
Flubenzimine	REJECTED
Hexylthiofos	REJECTED
Hexythiazox	ACCEPTED
Imidacloprid	**RUP** (Special Safety Training Required)
Indoxacarb	ACCEPTED
Malathion	ACCEPTED
Phosalone	REJECTED
Propargite	REJECTED
Pyriproxyfen	ACCEPTED
Teflubenzuron	REJECTED
Thiacloprid	ACCEPTED
Triazophos	REJECTED

Insecticides Additionally Suggested

Azadirachtin
Bacillus thuringiensis (berliner), subsp. Kurstaki, strain EG2371
Mineral oil, a petroleum derivative
Potash soap
Spinosad

Herbicides Additionally Suggested

Bentazon sodium salt
Fluazifop-P-butyl
Pendimethalin

Nematicide Additionally Suggested

Dazomet

Fumigants Additionally Suggested

Aluminum phosphide **(RUP)**
Magnesium phosphide **(RUP)**

PESTICIDES REQUESTED BY AGLINKS UZBEKISTAN FOR USE IN THE PROJECT AND ACCEPTED OR CONDITIONALLY ACCEPTED FOR USE

Based upon same or similar use products registered by EPA, this PERSUAP approves for use on AgLinks Uzbekistan crops the following AgLinks Uzbekistan-requested pesticides, by active ingredient with additional pesticides for consideration suggested by the consultant:

Fungicides

Carboxin	ACCEPTED
Copper sulfate (basic)	**RUP** (Special Safety Training Required)
Propamocarb hydrochloride	ACCEPTED
Propiconazole	ACCEPTED
Tebuconazole	ACCEPTED
Thiophanate-methyl	ACCEPTED
Thiram	ACCEPTED
Triadimefon	ACCEPTED
Triticonazole	ACCEPTED

Fungicides Additionally Suggested

Copper ammonium complex
Copper octanoate
Cymoxanil
Mancozeb
Sulfur

Insecticides

Acetamiprid	**RUP** (Special Safety Training Required)
Avermectin	**RUP** (Special Safety Training Required)
Bifenthrin	**RUP** (Special Safety Training Required)
Buprofezin	ACCEPTED
Chlorpyrifos	**RUP** (Special Safety Training Required)
Cyhalothrin, gamma	**RUP** (Special Safety Training Required)
Cyhalothrin, lambda	**RUP** (Special Safety Training Required)
Cypermethrin, beta	**RUP** (Special Safety Training Required)
Dimethoate	ACCEPTED
Etoxazole	ACCEPTED
Hexythiazox	ACCEPTED
Imidacloprid	**RUP** (Special Safety Training Required)
Indoxacarb	ACCEPTED
Malathion	ACCEPTED

Pyriproxyfen	ACCEPTED
Thiacloprid	ACCEPTED

Insecticides Additionally Suggested

Azadirachtin
Bacillus thuringiensis (berliner), subsp. Kurstaki, Strain EG2371
Mineral oil, a petroleum derivative
Potash soap
Spinosad

Herbicides Additionally Suggested

Bentazon sodium salt
Fluazifop-P-butyl
Pendimethalin

Nematicide Additionally Suggested

Dazomet

Fumigants Additionally Suggested

Aluminum phosphide **(RUP)**
Magnesium phosphide **(RUP)**

These active ingredients are actively EPA-registered for same or similar use products and are general use products, unless otherwise stated. They can be used in Uzbekistan if safety conditions for use are followed, and training (and some oversight) provided. Active ingredients followed by "Special Safety Training Required" (if active ingredients are used in products labeled as RESTRICTED USE PRODUCTS by USEPA), can be used in Uzbekistan, if safety conditions are followed and specific safety training has been annually and repeatedly provided (and skills testing obtained) for any person, who uses this group of pesticides. In addition, these pesticides have to be replaced, wherever practical and at the latest, by 2012 with less toxic pesticides. If an EPA permitted use of a specific product on AgLinks' targeted crops is not specifically listed in the respective Uzbekistan registration documents, then the project should seek official Uzbek clarification to get permission to use the product on the specific targeted crop.

Use only EPA acute toxicity Class III and Class IV products. If Class III and Class IV products within the PERSUAP-permitted active ingredients are not produced and do not have active EPA registration, then the use of Class II products with an active EPA registration for the respective active ingredient is allowed for farmers having received Special Safety Training. Do not recommend or use any EPA Class I pesticide products containing active ingredients approved by this PERSUAP. To further address toxicity concerns in insecticides like Dimethoate (WHO II), it can be replaced – if practical – by Malathion (WHO III) since it has a corresponding IRAC coding (IRAC 1B).

To plan "most safe" pesticide use for subsequent seasons, competent authorities should be asked if permission exists to use the specific pesticides (active ingredients without RUPs and EPA III and IV) on newly permitted crops based on the current and ongoing registration process in Uzbekistan. The use of PERSUAP approved pesticides will not have significant adverse environmental impact and significant

adverse impact on human health if all pesticide safe use regulations are followed and pesticide users of EPA Restricted Use Product active ingredients receive Special Safety Training and the subsequent acquired skills thoroughly examined. Appropriate mitigation and training activities are recommended and discussed elsewhere in this document.

The EPA issues information for registered products or for all products of a specific active ingredient regarding ineligibility for reregistration, banning of pesticides or immediate removal of a registration for a certain product based on new information concerning any potential hazards or serious concerns. AgLinks Uzbekistan is responsible for frequent checking of EPA information releases to determine if any decisions subsequent to this PERSUAP affect the herein approved pesticides. Accordingly, all orders should be cancelled for a product of a revised ruling and – if feasible – stored pesticides be rapidly utilized, if allowed under the specific EPA decision. Re-registration eligibility decisions (REDs) are, if scheduled for a specific pesticide, listed in Annex 1 (first column, last line per cell).

PESTICIDES REQUESTED BY AGLINKS UZBEKISTAN BUT REJECTED FOR USE ON PROJECT SITES, WITH REASON FOR REJECTION

This PERSUAP rejects the recommendation or use of the following proposed pesticides on AgLinks Uzbekistan sites, based on the following reasons:

Fungicides

Bordeaux mixture	no active EPA registration
Bromuconazole	no active EPA registration for intended use
Bronopol	no active EPA registration for intended use
Calcium hydroxide	no active EPA registration for intended use
Copper sulfate (anhydrous)	no active EPA registration
Diniconazole	no active EPA registration
Epoxiconazole	no active EPA registration
Ferrous-sulfate	no active EPA registration
Flutriafol	no active EPA registration
Guazatine	no active EPA registration
Oxadixyl	no active EPA registration
Penconazole	no active EPA registration
Pencycuron	no active EPA registration
Triforine	no active EPA registration for intended use

Insecticides

Acephate	too toxic, banned in EU (qualified for PIC notification)
Amitraz	no active EPA registration for intended use
Bromopropylate	no active EPA registration
Carbosulfan	no active EPA registration
Cypermethrin	no active EPA registration
Cypermethrin, zeta	too toxic to be used, WHO 1b

Deltamethrin	too toxic to be used, all registered products in Uzbekistan are EPA toxicity Class I
Diazinon	too toxic, banned as plant protection product in EU
Fenpropathrin	too toxic, banned in EU, WHO Acute Hazard list
Fenvalerate	no active EPA registration for intended use
Fipronil	no active EPA registration for intended use
Flubenzimine	no active EPA registration
Hexylthiofos	no active EPA registration
Phosalone	no active EPA registration
Propargite	too toxic to be used, all EPA registered products are EPA toxicity Class I
Teflubenzuron	no active EPA registration
Triazophos	no active EPA registration

PESTICIDES REQUESTED AND CONDITIONALLY ACCEPTED FOR USE IN THE PROJECT, WITH REASONS AND CONDITIONS

Pesticides containing the following active ingredients are conditionally accepted. These active ingredients are used in restricted use products registered, or formerly registered, with the EPA. Since restricted use products pose a higher risk for health and/or the environment, special safety regulations must be applied. These regulations are included and monitored when the pesticide is certified for specific users in the USA. To safely use these pesticides in AgLinks Uzbekistan project activities, all respective pesticide users must receive special training on how to use RUPs safely. This training should be repeated annually and skills have to be examined at the end of each training. Products containing the active ingredients of Restricted Use Products must be phased out through 2012 and replaced by product groups free of RUPs. These active ingredients are listed in Section 2.7, and are not followed by the terms “Special Safety Training Required”. Additionally, ongoing changes in EPA regulations must be monitored by qualified AgLinks personnel or by external experts. Moreover, registration of modern and more environmentally sound products should be sought in Uzbekistan, especially in the fruit and vegetable growing areas. However, for any new pesticide being considered and not covered in the present PERSUAP, an amended PERSUAP will be required prior to pesticide use.

Fungicides

Copper sulfate (basic)	**RUP** (Special Safety Training Required)

Insecticides

Acetamiprid	**RUP** (Special Safety Training Required)
Avermectin	**RUP** (Special Safety Training Required)
Bifenthrin	**RUP** (Special Safety Training Required)
Chlorpyrifos	**RUP** (Special Safety Training Required)
Cyhalothrin, gamma	**RUP** (Special Safety Training Required)
Cyhalothrin, lambda	**RUP** (Special Safety Training Required)
Cypermethrin, beta	**RUP** (Special Safety Training Required)
Imidacloprid	**RUP** (Special Safety Training Required)

OTHER PESTICIDE ALTERNATIVES THAT MAY BE USED BY THE PROJECT THAT MAY BE AVAILABLE AND ARE OR COULD BE REGISTERED BY UZBEKISTAN

This PERSUAP also accepts the use of additional EPA-approved pesticides:

- **Fungicides:** Copper ammonium complex; Copper octanoate; Cymoxanil; Mancozeb; Sulfur
- **Insecticides:** Azadirachtin; *Bacillus thuringiensis* (berliner), subsp. *Kurstaki*, Strain EG2371; Mineral oil (a petroleum derivative); Potash soap; Spinosad
- **Herbicides:** Bentazon sodium salt; Fluazifop-P-butyl; Pendimethalin
- **Nematicide:** Dazomet
- **Fumigants:** Aluminum phosphide; Magnesium phosphide

These fumigants are additionally suggested upon request from AgLinks Uzbekistan because the export market in Uzbekistan includes both fresh produce and dried fruit exports. These fumigants are Restricted Use Pesticides (RUPs) due to high acute inhalation toxicity of the phosphine gas produced. While phosphine is considered less toxic than other currently registered chemical fumigants, exposure to the gas can lead to serious illness or even death at concentrations as low as 0.3 ppm. An applicator manual is attached to this PERSUAP and should be strictly followed. Projects which are storing dried fruits need to contract with a licenses fumigator and have the bags fumigated. Only professionals should handle these dangerous fumigants. To date no less toxic fumigants are available.

COUNTRY PESTICIDE SYSTEM PROFILE

Traditionally in Uzbekistan, and until recently, only small amounts of pesticides have been used on most crops including orchards, vineyards and vegetable field crops, due to a lack of financial resources and absence of a well-developed in-country pesticide system. Pesticide use was relatively high only for cotton and wheat. However, the last few years has seen increased pesticide use. A few shops in the Fergana, Samarkand and Tashkent area now offer pesticides products along with Tashkent-based trading companies licensed to import pesticides.

The PERSUAP sampled shops had approximately 20 to 30 different products in stock with material from Bayer, BASF, and Syngenta. In addition, Russian, Turkish, Iranian, Indian and Chinese products were found, including several highly toxic pesticides. Package size is usually 1 to 10 L or 1 to 10 kg. Smaller amounts (100 ml or 0.5 kg or less) are packed in unlabeled, or inappropriately labeled flasks and plastic bags, respectively. Sales personnel provide the only instruction to farmers.

Many farmers or other pesticide users employ two to three years old plastic hand-pump backpack sprayers and air pressure pesticide blowers. Most of these applicators are insufficiently protected, although based on shop owner information, safety equipment is available. This equipment was not readily displayed in the shops during PERSUAP site visits. In addition to the AgLinks Uzbekistan requested pesticides, which consisted of all Uzbekistan registered material, more pesticides are being considered for registration this year and several international companies intend to introduce additional products based on marketing studies of their distributors (IFODA and Euro-Team). Registration must be done carefully so no highly toxic products (ex., no POP or PIC chemicals) are permitted during this process and FAO's code of conduct should be followed. Generally, imported products are currently not tested regarding concentration and quality of active ingredients. However, sealed bottles and packages of European origin are generally experienced as effective pesticides. Analytical capacity for testing pesticide products is currently very limited, concentrated in Tashkent and the time required for and extent of needed improvements is uncertain.

Pesticide registration tests involve multi-location and multi-season trials in Uzbekistan. For dosage and crop use, farmers rely on pesticide seller recommendations and very rarely the label information. The most recent pesticide registration brochure was from 2008 but was not readily available to salespersons and farmers. The 2009 brochure is scheduled for spring 2009 publication. Compared to the situation in neighboring countries like Tajikistan and Kyrgyzstan, this brochure represents significant progress. However, crop wise listings of pesticides, toxicity classification for bees, beneficial insects, and groundwater, as well as an active ingredient index, pesticide law and regulations, safety provisions, mixture calculations and first aid procedures are missing.

A pesticide factory exists in Navoi Province which is owned by "Uzkimyosanoat" a state joint stock company (SJSC) with a limited portfolio of pesticides, mainly for cotton and wheat production.

There are 13 poisonous substance conservation facilities in Uzbekistan comprising a total of 60 hectares. Most of these facilities are filled with pesticides, primarily, persistent organic pollutants, covered with concrete blocks and soil. However, there are, also, partially filled open facilities such as Tuprakkaly

storage facility in Khorezm Province with potential profound adverse environmental impacts. Banned pesticides like nitrofen, dust and DNOC are still regarded as very efficient and might be still used illegally. AgLinks Uzbekistan should ensure these banned chemicals are not used in project activities in addition to other non-registered pesticides and pesticides without EPA registration. Moreover, banned products are likely finding their way into Uzbekistan by transborder traffic from Kyrgyzstan and Tajikistan, which have still less-guarded pesticide dumpsites.

If alternative pesticides recommended in this PERSUAP are used, an Uzbek registration is required. Moreover, any pesticide entering Uzbekistan should be controlled and an appropriate registration procedure undertaken in cooperation with the respective in-country-distributor of quality pesticides. Internationally accepted procedures should be followed including minimum two-year and multi-location field evaluations carried out. Otherwise, pesticide problems, which Uzbekistan faces in the area of storage, regulation, documentation and application, will be aggravated.

The current system of pest control and overall government policy in handling dangerous pesticides is sufficiently strong. After independence, there were still practices for using dangerous pesticides countrywide that were widely employed during the Soviet period. The post-1991 government has taken initiatives to reduce application of hazardous agricultural chemicals and pesticides and developed sound environmental practices to improve pest management during the late 1990's. The Government of Uzbekistan is trying to improve pesticide regulations in the country by including elements to the existing crop protection law such as certification of pesticide salesperson and regulations for pesticide users, including farmers. However, no deadline for implementing and enforcing these regulations has been determined. Based on experience in several countries within the region this might take two years. Other major points of improvements like registration, trial and data requirements; pesticide and residue analysis facilities; appropriate labeling (Annex 17); liaison with customs regarding import procedures and controls are not presently under review. Therefore, AgLinks Uzbekistan should highlight these concerns in government meetings and cooperation as a part of any policy activities. AgLinks should consistently and regularly monitor ongoing pesticide registrations and recommendations by using available documentation and close contact with decision makers in the state chemical committee, the crop protection institutes and the national crop protection service.

PESTICIDE IMPORT INCLUDING INFORMAL OR ILLICIT IMPORT

Pesticides found in shops are currently imported from Turkey, Russia, China, Iran and Germany with products from BASF, Bayer and Syngenta also sold in Uzbekistan. In future, many more countries and companies will likely join this list. There were few illicit pesticides found in the pesticide shops visited (ex., DDT) and none were detected in the visited on-farm storage. In general, all shops and storage sites visited will restock pesticides as the next growing season approaches. Subsequently, AgLinks is advised to make new visits to the respective targeted areas of AgLinks Uzbekistan crop production support activities.

The Uzbekistan Law: "Protection of agricultural crops from pests, disease and weeds" dated August 31, 2000, also deals with pesticide and agro-chemical import and export. An agro-chemical registration certificate must be obtained and other standard acts and regulations followed to acquire state registration. Purchase, sale and transportation contracts must provide the state registered pesticide and agro-chemical registration certificate clauses.

However, some pesticides arrive illegally from neighboring countries such as Tajikistan, Kyrgyzstan, China, Iran and even Russia. In the East of Uzbekistan there are more chemicals brought from Kyrgyzstan and in the central and Southern part from Tajikistan, China, Russia and Iran. Some of the chemicals like DDT have been phased out and are now banned for use in Uzbekistan. DNOC and Nitrofen are also banned in other countries like Russia and Kyrgyzstan.

Except for the "Uzkimyosanoat" SJSC, there are no other state-registered foreign companies in Uzbekistan for agrochemical production. Companies like IFODA and Euro-Team import pesticides and distribute BASF, Bayer, Syngenta, Chimona and DuPont products. The majority of imported pesticides are still used for cotton and wheat production. The certification of pesticide import occurs at the local (Hakimyat) level, where the business is registered. However, this is planned to be changed, giving the Tashkent State Protection Service the sole responsibility of licensing pesticide business. The import of plant protection chemical preparations follows decisions made by the Government of the Republic of Uzbekistan. The State Chemical Commission is responsible for licensing agrochemical imports and consists of crop protection experts, pathologists, entomologists, and representatives of the Health Ministry, Labor Ministry and the environmental unit within the Ministry of Agriculture. The Ministry of Agriculture carries out pesticide registration and field testing through its crop protection service.

PESTICIDE IN-COUNTRY PRODUCTION

Currently there is one factory in Navoi, part of the "Uzkimyosanoat" SJSC, producing fertilizer and pesticides, predominantly used for cotton and wheat production. Based on annual Uzbek state bidding procedures, they process state-purchased active ingredients (mostly generics) into Uzbek registered pesticide products.

PESTICIDE PACKAGING, REPACKAGING AND LABELING QUALITY

Pesticide retailers are present in all AgLinks Uzbekistan provinces including Tashkent, Fergana and Samarkand. The visited shops rarely demonstrated pesticide dust on shelves although strong pesticide odors were present. Most shops gave a good, clean impression and the shop salesmen demonstrated understanding of pesticide handling, application and safety precautions. Some pesticides were packed in plastic bags, bottles and tiny vials without proper labeling all of which are dangerous for any pesticide use. Many of the larger containers were subdivided and various packaging employed. Pesticides should not be stored and sold in bottles, which can be confused with soft drinks, especially by children. Most labels were in Uzbek and Russian (although some were in Chinese), readable and generally informative, but warning symbols, color-coding and help hotline information was often absent. Improvements in labeling are highly recommended along with farmer and salesmen training to introduce current and modern pesticide knowledge and safety measures. Pesticides are delivered in 1 liter and 5 liter plastic containers while powder preparations arrive in barrels. Pesticides are subdivided in the stores (i.e. to 100 ml or 0.5 kg or smaller units). Salesmen repack pesticides into the smaller units according to market demand. Repackaging might occur without proper protection and appropriate safety measures. Since pesticide packets are not sealed and airproof, chemical traces were occasionally seen on shop and storage surfaces, posing a permanent hazard.

PESTICIDE DISTRIBUTION/RETAILERS AND MAJOR DISTRIBUTION/RETAIL SUPPLY COMPANIES

Several entities import and distribute pesticides in Uzbekistan including two major distributors in Tashkent, IFODA and Euro-Team. Importer numbers are certainly higher due to Uzbek regulations that allow decentralized (Hakimyat level) registration of pesticide import and retail sales businesses. Distributors such as IFODA and Euro-Team market their Uzbek registered products through local level businesses. Major international pesticide producers have their regional offices in Almaty, Kazakhstan, if not further away. Pesticides are rarely stocked in large quantities between two cropping seasons but are generally available during the growing season mostly for cotton and wheat. Larger distributors promise to deliver any product in their portfolio of major stock within three days anywhere in Uzbekistan. Sufficient pesticides are ordered and stocked based upon the annually adjusted acreage sown to cotton and wheat but pesticide availability for fruit and vegetable production is clearly limited. In addition, in some areas of Samarkand and Fergana smallholders seemed to know only Folicur and Topas.

Some specialized agricultural input stores, including pesticides, are found in large provincial centers and have a consistent client base. Some customers buy larger quantities and resell at the village level in smaller quantities. Sales personnel provide toxic chemicals and sprayers but rarely the associated protective equipment (ex., respirators, safety goggles, gloves and uniforms). Reasons cited for unavailable protection equipment is salesman and customer lack of awareness of safe pesticide use and low willingness to pay. Informational flyers and posters providing basic advice on proper input use can occasionally be found in stores. Many salesmen lack sufficient knowledge on chemical classifications, pesticide rotation, calibration, safeguard measures and precautions. They provide very basic advice for the products available in their shops and are unaware of potential substitutes or alternatives.

PESTICIDE TYPES AND TOXICITIES AVAILABLE

Pesticides found in local shops were generally EPA Class III, with some Class II and Class I products plus several banned products. Triadimefon, Dimethoate and Mancozeb are in some Class I products under EPA registration. The most common pesticide products seen in shops were Ridomil, Bayleton, Pyrethroids (like Decis or Furi), as well as Karate and Bi58. Some of the active ingredients are used in restricted use products under EPA regulation and some have no active EPA registration. The assortment of pesticides in the stores is relatively poor, especially insecticides and remains this way even during the entire growing season. This is probably due to the lack of information regarding alternative pesticide and rotation requirements. None of the stores visited sold banned pesticides like DNOC (4,6-Dinitroorthocresol) and Nitrofen but DDT was occasionally available. These are very dangerous for the environment and human health and were banned for a long time (Annex 16). Salesmen are mostly aware of this, but several farmers still buy them based on previous use and experience with these products. Some pesticide distributors stock products like Sumi-Alpha, Omayt, Superkill and Vydate.

FUNGICIDES AND INSECTICIDES FOUND IN SHOPS AND STORES WITH GROWER'S HISTORICAL USE

Active ingredient	Product	Group	EPA issues
Fungicides			
Copper sulfate (basic)	Copper sulfate	inorganic coppers	Some RUPs
Mancozeb (a) + metalaxyl (b)	Ridomil gold	Dithiocarbamate, inorganic zinc + acylalanine (b)	(a)Some EPA Class I
Penconazole	Topaz	Triazole	No EPA registration
Triadimefon	Bayleton	Triazole	Some EPA Class I
Insecticides			
Cyhalothrin, lambda	Karate	Pyrethroids	Some RUPs
Cypermethrin	Superkill	Pyrethroid	No EPA registration
Cypermethrin, alpha	Fastak	Pyrethroids	No EPA registration
Cypermethrin, zeta	Fury	Pyrethroids	Some RUPs
Deltamethrin	Decis	Pyrethroids	Some RUPs and EPA Class I
Dimethoate	Bi 58	Organophosphorus	Some EPA Class I
DDT	Dust	Organochlorine	Banned
Esfenvalerate	Sumi Alpha	Pyrethroid	Some RUPs
Indoxacarb	Avaunt	Oxadiazine	
Naphthalene	Naphthalene		EPA cancelled products
Propargite	Omayt	unclassified	All EPA I
Nematicide			
Oxamyl	Vydate L	N-Methyl Carbamate	EPA I, RUP product
Herbicides			
Quizalofop-p-tefuryl	Pantera	Aryloxyphenoxy propionic acid	No EPA registration
Grower's historical use			
DDT	Dust	Organochlorine	Banned
2,4-dichlorophenyl 4-nitrophenyl ether	Nitrofen	Diphenyl ether	Banned
2-methyl-4,6-dinitrophenol	DNOC	Nitrophenols	Banned

The Uzbek State Chemical Commission issues a biannual pesticide book with permitted crops and holding periods. In alternate years, a smaller booklet provides updated information about newly registered pesticides. Both books are in Uzbek (Cyrillic letters) and Russian language. The currently registered pesticides in Uzbekistan do not contain banned products.

CURRENT PESTICIDE CONSUMPTION IN THE AGRICULTURE SECTOR IN GENERAL AND PROJECT CROPS IN SPECIFIC

As stated above, very few agrochemical inputs have been used in Uzbekistan outside the cotton and wheat sectors. More than ten years ago, 85,000 t of pesticides were used per year while only 50.000 t/year are presently used for all crops. Previous average pesticide delivery volume was reduced from 24 to 5.5 kg/ha between 1985 and 1995 (http://bpsp-neca.brim.ac.cn/books/actpln_uzbek/index.html). Cotton production

has historically been the major agrochemical consumer while other crops received little or no pesticides. In some regions, and depending upon cropping patterns pesticide use ranged from 20 to 90 kg/ha leading to deep ground water contamination with DDT and Lindane. With the partial economic recovery of post-independent Uzbekistan, increased pesticide use in strategic crops (cotton and wheat) is expected. Based on feedback from pesticide retailers visited, the use of pesticides in fruit and vegetable production has been growing over the past few years.

PESTICIDES RECOMMENDED BY LOCAL EXTENSION SERVICE FOR TARGETED CROPS AND STORED PRODUCTS

The pesticides requested for use by AgLinks Uzbekistan project activities are based on recommendations from the Crop Protection Service provincial offices in Tashkent, Fergana, Namangan and Samarkand. Their selection is further based on the active Uzbek registration and permitted crop use, as well as effectiveness and availability throughout the cropping season. An extension system does not yet exist in Uzbekistan that approaches the slowly developing system in neighboring Kyrgyzstan. This might be due to the dominance of intensive cotton and wheat production, sidelining efforts at fruit and vegetable production improvements. In most cases, use and dosage recommendations are made by pesticide shopkeepers or in a few cases by experts in the regional crop protection services. AgLinks Uzbekistan should assist improvements to this situation and seek support by experienced organizations from neighboring countries with a functional extension service and experienced crop protection advisors outside the domains of cotton and wheat.

COUNTRY'S PESTICIDE REGISTRATION AND REGULATION SYSTEM AND SPECIFIC REGISTRATION STATUS OF PROPOSED PESTICIDES

Until a few years ago, very few agricultural inputs were used in Uzbekistan outside of cotton and wheat production although this situation is rapidly changing. In 2007, there were 280 registered products with 86 added in 2008. Some of these products overlap due to crop use changes, product cancellations, or lack of previous registration. Pesticide registration usually takes 2 to 3 years, consisting of 2 years of field evaluations and approvals in the ministries of Health, Labor, Agriculture and the Nature Protection Committee. Most registered pesticides, especially for use on non-cotton and wheat crops, remain unavailable in Uzbekistan for most of the season. A number of pesticide products are newly registered each year based on producer marketing and local distributor business estimates. Uzbekistan's registration process is relatively progressive compared to neighboring countries like Kyrgyzstan and Tajikistan.

Uzbekistan has established a legal framework and adopted a series of legislative acts governing production, export, import and application of pesticides. A law was approved on August 31, 2000 (116-II) "About protection of agricultural plants from pests, diseases and weeds", that clarifies regulation of pest management in the country and forms the framework for laws on pesticide use and plant protection in Uzbekistan. In 1999, the Government established a special commission to control pesticide and chemical use entitled the State Chemical Commission of the Republic of Uzbekistan. The main role of the Commission is to register and rule (including banning) on chemicals and pesticides used in Uzbekistan. The Commission comprises representatives from various ministries and agencies, including the State Committee for Nature Protection (responsible for assessing the effects of pesticides on the environment, particularly soil, air and water), the Republican Center for Epidemiology (responsible for assessing the effects of pesticides on human and animal health), and a number of research institutes under the Ministry of Agriculture and Water Resources and scientific institutions (responsible for testing, screening and

identifying the methods for pesticide use and developing hand outs and manuals) and others. An amendment to the original structure of the organization was promulgated in 2005.

The Republican Center for Plant Protection and Agrochemicals was established in March 2004 under the Ministry of Agriculture and Water Resources in accordance with Presidential Decree (#148). The Center's role is to enhance the quality of services rendered to beneficiaries and improve safe use of agricultural pesticides. Currently this organization has branches in all districts; however, their activities are not well established due to a lack of material resources and general weakness in organizational capacity.

The Republican Center for Epidemiology produces various handbooks on the safe use of pesticides and chemicals. A number of handbooks under the Sanitary Rules and Normative (SanRAN) tag were developed including:

- Norms for hygienic pesticide impact on surrounding areas and consumption goods (SanRAN - 2001);
- Sanitary rules and hygienic norms during application, storage and transportation of agricultural pesticides in Uzbekistan (SanRAN – 2001); and
- Hygienic requirements for agrochemical safety (SanRAN - 2001).

In addition to the above-mentioned handbooks and manuals, the State Chemical Commission develops special, simple manuals for application and handling each registered pesticide. However, none of these documents were displayed or mentioned during the study tour.

The State Chemical Commission (SCC) annually produces a book on Uzbek registered pesticides, which provides directions (types of plants and norms) on product application. Any unregistered pesticides are forbidden for use and SCC is not responsible for misuse of registered pesticides. Moreover, SCC has forbidden the use of the internationally banned pesticides and chemicals that are highly hazardous and prohibited their use by any individual or organization in the country. SCC tries to generally follow international practices and requirements. The SCC working group receives latest updates on hazardous technical grade active ingredients in pesticides (categorized into four groups) released by World Health Organization via the Ministry of Health. Similarly, the SCC receives updates on relevant international environmental treaty or agreement pesticides, such as the Rotterdam and Stockholm conventions (see Section 4.2), from the State Committee on Nature Protection. Uzbekistan is not yet a member of these conventions but plans to become a member in the near future. The necessary documents have been prepared and are currently under review by the highest level of Government. In the meantime, the SCC follows the regulations of the conventions.

Following an initiative introduced by Uzbekistan's State Committee on Nature, plant protection chemicals covered by the 1998 Rotterdam Convention became a part of Uzbekistan's National "Registry of banned and limited application active and inactive ingredients for plant protection purposes" adopted on March 28, 2002 at a meeting of the SCC and under the auspices of Uzbekistan's Cabinet of Ministers. This registered list of dangerous chemical substances contains 22 pesticides in accordance with the Rotterdam Convention all of which are persistent chlorine-based pesticides. Many countries recognize these substances as harmful to the environment and public health and many are banned.

Based on the existing legal framework, pesticide and agro-chemical registration tests are conducted to develop specific recommendations for Uzbek farming. Regulations stipulate effective pesticide dosages and waiting periods, but do not contain information for safety on human health and the environment. Pesticide and agro-chemical registration tests are implemented by legal persons who have the necessary

scientific, material and technical basis and by specialists with the appropriate profile and qualifications to conduct such tests. Pesticide and agro-chemical registration tests include effectiveness, determination and respective application of regulation development, environmental and human health impact evaluation, sanitary and hygienic procedures development, ecological evaluation of regulation application, registration and results examination. A specially authorized public group conducts state registration of pesticides and agro-chemicals based on expert opinion of the results of pesticide registration tests. This entity works together with the SCC who is responsible for the organization of the registration tests and final state registration of pesticides and agro-chemicals. The state pesticide and agro-chemical registration certificate is given to physical and legal persons. The pesticides or agro-chemicals, permitted for application in the territory of the Republic of Uzbekistan are included in the biannually published list in the state catalog and succeeding amendments.

The Ministry of Public Health, together with the Ministry of Agriculture and Water Resources and the Nature Protection Committee, evaluate the chemical list and establish maximum permissible residue levels of those chemicals in food and non-food products. The Ministry of Public Health also authorizes new chemical substances, which can have direct or indirect impact on people's health. The application of toxic chemical preparations, which are persistent and actively influence the human organism and natural environment, is forbidden.

According to the Ministry of Labor, a regulation was adopted on December 12, 2008 regarding the use of personal protective equipment (PPE). It states that Industrial and agricultural companies must provide workers with free protective clothing and other safety equipment.

The Uzbek registration status of pesticides approved by this PERSUAP is listed in Annex 1.

COUNTRY'S ABILITY TO ENFORCE REGULATIONS ON DISTRIBUTION, STORAGE, USE, & DISPOSAL OF PESTICIDES

Laws exist in Uzbekistan regarding crop, environmental, health and worker protection with affiliated amendments and regulations. Required adjustments, including certification of pesticide applicators and the right to inspect farmers' pesticide use, are planned for the near future. It is unclear how quickly regulators will progress, complete legislation activities, seek ministerial approvals, obtain ratification by parliament and assure document accessibility to the public. Many environmentally hazardous pesticides still enter the country, as demonstrated during the shop site visits. It is crucial that AgLinks Uzbekistan activities address problems associated with unregistered and very hazardous pesticides among their targeted beneficiaries.

The following findings regarding Uzbek pesticide regulations were identified during the country study tour. The law of the Republic of Uzbekistan entitled "Protection of agricultural crops from pests, diseases and weeds" dated August 31, 2000, along with other normative legal acts and regulations, regulates distribution issues, storage, use and disposal of pesticides. According to Uzbek legislation pesticide storage is permitted in specialized depositories intended only for this purpose and storage of unpacked pesticides is forbidden. During pesticide storage Uzbek regulations require standards be met to prevent harmful effect on human health and the environment. The rules of pesticide storage are established by public organizations specially authorized in the safe handling of pesticides and agro-chemicals. Pesticide transport is only permitted by designated equipment.

The responsible Province personnel license physical and legal wholesale and retail traders. These traders have the right to acquire and distribute pesticides that have passed state registration and are included in the state catalog of pesticides permitted for use within the territory of the republic. In future, the State Crop Protection Service in Tashkent will certify these businesses. Accordingly, pesticide use will only be

done by individuals with a special professional education. Pesticides must be applied only with use of specific techniques and equipment. Special professional preparation in accordance with the legislation of the Uzbek republic is required of companies providing neutralization, disposal and burial of unsuitable or banned pesticides, other agro-chemicals, and their respective containers. Not all requirements are followed and it remains the responsibility of AgLinks Uzbekistan to assure any pesticide use by project beneficiaries follow both Uzbek and US EPA regulations. For example, most agrochemical sales are done by store salesmen and sometimes in veterinary product shops. Salesmen often do not have special application training and shops do not meet the required standards for pesticide handling and storage. With the planned licensing and monitoring of all pesticide users in Uzbekistan, this situation is expected to be professionalized and AgLinks can support this development at their project sites. In addition to salesmen limitations, farmers use the same pesticides for a long time, which promotes pesticide resistance to specific chemicals. This is due to lack of knowledge, limited resources to purchase quality pesticides and limited availability of modern pesticide products. Farmers require training for pesticide calibration, environmentally safe pesticide application and personal protection measures. Farmers often do not use the required efficient dosage and if no effect is observed non-permitted higher pesticide rates are applied.

Burial or combustion of unutilized toxic chemicals is done in the range burials in each province which have guarding systems in place. Responsibility for the burial sites is unclear between the provincial authorities and the “Uzkimyosanoat” SJSC. If products are not completely used during a season, large distributors accept original packages, thereby avoiding accumulation of pesticides at farm level. Empty pesticide containers are buried and burned and larger quantities collected and transported to the provincial burial sites. Empty containers are normally used for gasoline storage, but not for foodstuffs and drinking water. Under the new crop protection regulations authorities are considering addition of new rules regarding pesticide disposal and requiring pesticide shops to accept all empty pesticide packaging and deliver them safely to the appropriate destruction facilities.

COUNTRY’S ADOPTION OF FAO PRIOR INFORMED CONSENT (PIC) PROCEDURES

PRIOR INFORMED CONSENT (PIC) PROCEDURE

The growth in world trade in chemicals during the 1960’s and 1970’s led to increasing concern about the risks of using hazardous chemicals. These concerns, among others, led to the development of the International Code of Conduct on the Distribution and Use of Pesticides in 1985 by the Food and Agriculture Organization of the United Nations (FAO) and the London Guidelines for the Exchange of Information on Chemicals in International Trade in 1987 by the United Nations Environment Program (UNEP). The procedure known as Prior Informed Consent (PIC) was added in 1989 to help control imports of unwanted chemicals that were banned or severely restricted. The Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade was adopted at a Conference of Plenipotentiaries in Rotterdam on 10 September 1998. The Convention was open for signature at the signing ceremony in Rotterdam on 11 September 1998 and at UN Headquarters in New York from 12 September 1998 to 10 September 1999. To date the Convention has been signed by 72 States and one regional economic integration organization, and ratified by 9 States. Uzbekistan has not yet signed the convention but participates in PIC awareness raising workshops in the region. The Rotterdam convention will enter into force once 50 instruments of ratification are deposited. The Conference in Rotterdam adopted a resolution on interim arrangements related to the Convention. According to the resolution, the existing non-binding PIC procedure would undergo changes to bring it in

line with the provisions of the Convention and would continue to be operated jointly by FAO and UNEP in the interim period until the Convention enters into force.

The PIC procedure is a mechanism for formally obtaining and disseminating the decisions of importing Parties as to whether they wish to receive future shipments of those chemicals listed in Annex III of the Convention documentation and for ensuring compliance with these decisions by exporting Parties. A list of PIC chemicals is given in the first table of Annex 16.

For each chemical listed in Annex III and subject to the PIC procedure a decision guidance document (DGD) is prepared and sent to all Parties. The DGD is intended to help governments assess risks connected with the handling and use of the chemical and make more informed decisions about future import and use, taking into account local conditions.

All Parties are required to take a decision as to whether or not they will allow future import of each of the chemicals in Annex III of the Convention. These decisions, known as import responses, are sent to the Secretariat by the Designated National Authorities (DNA). A listing of the import responses given for each chemical subject to the PIC procedure is circulated by the Secretariat to all DNAs every six months via the PIC Circular. Import decisions taken by Parties must be trade neutral, that is, if the Party decides not to accept imports of a specific chemical, it must also stop domestic production of the chemical for domestic use and refuse imports from any source, including from non-parties. All exporting Parties are required to ensure export of chemicals subject to the PIC procedure do not occur contrary to the decision of each importing Party. They should ensure that import responses published in the PIC Circular are immediately communicated to their exporters, industry and any other relevant authorities, such as the Department of Customs.

The goals of the PIC procedure are to help participating countries learn more about the characteristics of potentially hazardous chemicals that may be shipped to them, to initiate a decision-making process on the future import of these chemicals by the countries themselves, and to facilitate the dissemination of this decision to other countries. The aim is to promote a shared responsibility between exporting and importing countries in protecting human health and the environment from the harmful effects of certain hazardous chemicals being traded internationally. The Plant Production and Protection Division of FAO is the lead agency for pesticides while UNEP Chemicals (IRPTC) is the lead agency for other chemicals. Uzbekistan is a member of FAO since 2001 and, therefore, accepts to work according to the Rotterdam and Stockholm conventions.

DEFINITION OF CONSENT TO IMPORT

If a country has given consent to import a chemical, that chemical can then be legally imported into the country. Often there are further restrictions on a chemical if it is imported. In many cases, it has been observed that countries do not give consent to import a particular chemical, but also do not explicitly ban or restrict that chemical. In most of these cases, the chemical is probably not registered for use, but since the documentation does not definitively state this, the registration status of the chemical is likely unavailable. All pesticide donations fall under provision of the PIC scheme and are supposed to follow the PIC procedures. AgLinks Uzbekistan can help implement and enforce these procedures by assuring project beneficiaries only use agrochemicals that conform to PIC.

CURRENT PESTICIDE STORAGE, HANDLING AND SAFETY PROCEDURES IN THE SECTOR BEING STUDIED

FARMERS AND SPRAYING SERVICE PROVIDERS

Agricultural production units are larger in Uzbekistan than in neighboring Tajikistan and Kyrgyzstan. In addition, pesticide distribution follows large scale government planning, making pesticides ideally available prior to the field season onset. Accordingly, farms do not stock large amount of pesticides during winter. Not many pesticides were found during the winter 2008 PERSUAP site inspections. On-farm pesticide storage was in concrete or brick storage rooms with basic fire control equipment present. In few cases, small quantities of pesticides were found along with residues and spilled remains of previous season pesticides.

Farmer or storage responsible personnel were aware of pesticide names and crop uses. However, detailed knowledge about specific pests and diseases is marginal. Limited knowledge regarding emergency response, pesticide specific measures for spills, flooding and fire events was demonstrated at the sites visited. Safety equipment was rarely found, is seldom used and usually far beyond its permitted life span. Application timing is infrequently based on threshold decisions and follows an antique spraying schedule from Soviet times. Farmers and crop protection personnel mentioned they have knowledge regarding mixture preparation and use functional spraying equipment. It is recommended to evaluate the knowledge of these people before the spraying season. Any weaknesses or deficiencies found must be addressed through repeated training sessions. Farmers officially stated they buried or burned empty pesticide packages, but additional awareness training is required. In addition to training on proper pesticide handling, preparation, application and cleaning of equipment, the importance of protective equipment and clothing and respective availability must be addressed. This could be provided free of charge starting at a certain level of pesticide purchase. Based upon the basic and rather old protection clothing and materials observed during site visits, active spraying at farms is likely accomplished in street clothes (long-sleeve shirts and pants) and boots, mostly without gloves, goggles, or masks. Most street clothes will probably not be washed after application.

STORAGE AND SHOPS

Sales personnel did not always have special education and knowledge about pesticide use and handling, as well as safety measures. Pesticide stores are sometimes in close proximity to stores where everyday goods and even food products are sold. Salesmen do not know how to handle pesticides correctly, cannot identify the respective diseases and pests, and cannot suggest or provide correct information on pesticide application techniques and quality. No protective clothing, goggles or masks were detected in the pesticide shops visited and it is not surprising farmers do not use protective equipment. It was argued that farmers will not pay the additional price for even basic protection equipment. Salesmen had some pesticides from COC (Chloro-Organic Compounds) and POC (Phosphorus Organic Compounds) groups. These pesticides and their active substances are part of the 1-group of persistence, remaining stable for at least 18 months. In almost all cases observed, there is room for improvement in the area of pesticide handling and safety. Reports circulate of former crop protection specialists now operating private spraying businesses who do not follow safety provisions correctly. Sprayers reportedly recommend drinking milk, kefir or vodka before and/or after pesticide application to overcome nausea.

HEALTH

The State sanitary control law was adopted in July 2, 1992, which regulates sanitary and epidemiological well-being of the population including radiation safety, and safeguarding man’s right to a favorable environment. The Ministry of Health conducts seminars in provinces and districts with the plant protection service to explain the importance of safety protection equipment and train people how to

provide medical service in case of pesticide poisoning. Safety regulations are enforced via the Hygienic-toxicological departments in agricultural districts. During spraying time, one nurse or medical staff is present in the districts to help in case of poisoning and the Sanitary and Epidemiological centers in the district are responsible for poison treatment.

Health issues related to potential pesticide exposure and accidents are not sufficiently addressed in Uzbekistan. Although a specialized hospital exists in Tashkent, accidents at the provincial level cannot likely be treated quickly and correctly. A local physician might still call the respective hospital for advice, but probably not the number displayed on some labels. Furthermore, the common treatment is usually based on symptoms and not based on the causal agent and type of poisoning. Therefore, a system mandating and permitting quick and professional response for all Uzbekistan should be established, starting with internationally common pesticide labeling, education of physicians and hospitals, how to respond to any pesticide poisoning and the re-establishment of the pesticide-accident-reporting system. This system could be established and operated under the supervision of the Department of Sanitary and Epidemiology of the Ministry of Health in Tashkent. Each product imported into the country should be accompanied with two copies of the Material Safety Data Sheet (MSDS) available via the internet (see Annex 12). This document provides information on active ingredient toxicity, safety measures, and information to physicians to how to treat poisonings. One copy can be sent to the specialized hospitals in each province. A 24-hour phone number should be available to provide help for poisoning victims through physicians nationwide. The phone number would be included on each pesticide label and a public awareness campaign carried out to advertise its existence is recommended. This document gives further information on safe storage and how to detoxify a spill or react to a fire in Annex 18.

GENERAL HISTORY OF IPM AND SAFETY TRAINING RECEIVED BY ALL PESTICIDE USERS IMPACTED BY THE PROJECT

None of the AgLinks staff has received training in IPM. Overall knowledge about IPM is very limited throughout Uzbekistan with the exception of a few, high-ranking staff in the crop protection institute, crop protection services and on some farms. Understanding of IPM rational is generally absent, not applied or lost at training, educational, management and farm levels. However, during the Soviet era, there was wide use of beneficial insects produced by bio-laboratories for pest control that Uzbekistan maintained, mainly for cotton and wheat, and this bio-laboratory system could be widened. Orchard farmers occasionally try introducing beneficial insects for their crops, but most use insecticide sprays afterwards, killing any previously introduced pest predators or parasites. A history of massive use of highly toxic pesticides resulted in extensive damage to beneficial insects, again most seriously in major cotton and wheat growing areas.

Pesticide distributors and shop owners continue to provide only very basic safety information. Improving farmer behavior will likely take several years and requires much repetition and energy to accomplish any progress. However, many farmers still remember the usefulness of beneficial insect rearing and introduction to field crops might help to establish IPM more quickly than in regions without any history of biocontrol. More training outside the biocontrol concept should be provided. Procurement and monitoring of the use of safety equipment must be established and intensified throughout the country. AgLinks Uzbekistan should support IPM trainings involving international experts with extensive pest management work experience, safety provision and appropriate training module know-how in cooperation with suitable and experienced personnel from Uzbekistan. All relevant extension personnel affiliated with AgLinks Uzbekistan and partner organizations should receive education regarding the project specific

crop production systems and pest control practices. Training should focus on utilizing internationally recognized pest control measures as well as existing, or traditional, pest management practices. The training should also consider modern technologies and solutions while determining potential threats from pesticide use within the structure of project activities.

AgLinks Uzbekistan project staff and partners qualified in crop production should identify national and international source of diverse IPM expertise, develop and strengthen linkages to Uzbek and international universities, integrate existing national research stations and join forces with NGOs and other donor agencies programs with crop protection components. Pest management strategies to control the most relevant diseases and pests must be developed, as well as close monitoring of crops to detect any new pests which might threaten cultivated crops. Appropriate training and extension materials should be readily available from international sources that can be adapted, updated and produced for local use. Where crop protection educational material is not available, outdated or inappropriate for the Uzbek experience AgLinks should undertake direct production of training content. AgLinks should also cooperate and communicate with pesticide importers and distributors plus other relevant USAID programs, such as Farmer-to-Farmer. The intended results of this improved network of crop protection contacts is more knowledgeable farmers and pesticide dealers, integration of international crop protection experience and best practices, plus strengthened cooperation between international and Uzbek researchers. If AgLinks does not directly purchase pesticides but utilizes the pesticide dealer system to support procurement, then the project must assure all relevant PERSUAP provisions are understood and followed.

PROVISIONS MADE FOR TRAINING OF USERS AND APPLICATORS

All AgLinks Uzbekistan personnel should receive training in safe use of pesticides plus IPM techniques and approaches in order to successfully promote these practices to project partners, clients and beneficiaries. Thorough training on key pest organisms and their respective biological control agents is required for all staff involved in extension education. These individuals can then train farmers about pesticide safety issues and IPM measures during field visits. A baseline study to determine pesticide user knowledge gaps is advised and can be based on samples provided in Annexes 6 and 7.

Farmers have difficulty understanding many pest problems, do not efficiently utilize common crop production techniques, and demonstrate deficiencies in recognizing and dealing with pests. They often choose the wrong application times and methods and are unfamiliar with threshold concepts. In all areas visited, spraying is timed by calendar and not by threshold determinations, favorable infection conditions and pest population development stages. Theoretical and practical training sessions should target all these listed weaknesses. Training can initially be done by experienced coaches from the region, or qualified crop protectionists via the Farmer-to-Farmer program of USAID, and later by AgLinks trained extensionists once their own training requirements have been completed. Field visits must be very frequent for the first years because message repetition is needed to modify farmer behavior. Frequent field visits also provide knowledge about the upcoming season and any new pest infestations. Safe pesticide use must be emphasized and enforced in any training and individually practiced during application and during farmer field days.

Training topics should include: pesticide hazards for applicators, consumers, children, farm animals, and wildlife; importance of protective clothing and equipment, drift avoidance, and waiting periods; prohibition to re-use plastic pesticide bottles and other storage and transport packages that might be employed for human or animal consumption, and correct disposal of empty pesticide containers. Essential

information on these topics is provided in Annexes 4, 8, 9, 10, 14 to 18. Additional information sources should be sought from experienced specialists, the internet and currently available standard literature. Periodic monitoring of farmer and applicator improvements should follow the trainings and reported accordingly. The existing agricultural organizational structures (restructured agricultural cooperatives, AgriFirms and the farmer-members that comprise Water User's Associations) are an ideal target group to ensure further distribution of knowledge, practical skills and safety precautions.

OBSOLETE PESTICIDES IN THE COUNTRY WITH WAYS TO AVOID MORE

Pesticide application policies in Uzbekistan have been substantially modified over the last decade. A new generation of pesticides was introduced to Uzbekistan's market for agricultural chemicals marked by high efficiency ratios, small dosing requirements to achieve maximum results and limited adverse side effects affecting people and the environment. Comprehensive control systems were established to provide oversight and registration of imported and locally produced dangerous chemical substances. Production and application of 22 types of persistent organic pollutants (POPs), including DDT and GCCG, was banned. Despite these actions, there are still significant quantities of outdated and unused pesticides subject to utilization or conservation in Uzbekistan.

Key POPs-related pollution sources include mineral fertilizer warehouses, long-term poisonous substance storage facilities, and former agricultural aviation airfields. Analytical identification of persistent organic pollutants in the environment is challenging and systematic monitoring is not conducted. Based on data compiled by the Central Asian branch of the Hydro Meteorology Scientific Research Institute, POPs were identified in all environmental components, including soils, air, water and seabed accumulations. Analytical control of POPs classified as byproducts is impossible because ecological analysis laboratories lack the appropriate equipment. Uzbekistan does not presently conduct monitoring and research related to these types of persistent organic pollutants.

The Republic of Uzbekistan, in technical cooperation with UNEP, developed an inventory of outdated, unused and prohibited pesticides in 2001. Compiled analytical data indicated that 1,432 tones of pesticides are classified as outdated or banned, including 118 tones classified as persistent organic pollutants. Poisonous substance conservation facilities contain more than 15,000 tones of banned or non-Uzbek registered pesticides. The identified outdated, unused and banned pesticides can be divided into the following categories based on their chemical content:

- 26.2% - chlorine organic substances
- 31.8% - phosphate organic substances
- 42.0% - other classes of chemical substances

There are 13 poisonous substances conservation facilities in Uzbekistan covering a total of 60 hectares. Most of the facilities are primarily filled with pesticides and persistent organic pollutants, which are covered with concrete blocks and soil. There are also partially filled open facilities such as Tuprakkaly storage facility in Khorezm Province with potentially profound adverse impacts on the environment. Poisonous substance storage facilities have contained outdated and prohibited pesticides since 1972 with the last deposits into the facilities registered in 1993. Currently available data suggests these facilities contain 15,000 tones of pesticides (20 to 1100 tones in each facility) in total. These figures include large quantities of persistent organic pesticides, such as DDT and GCCG (Gexa-Chlor-Cyclo-Gexan). (Source:

Persistent Organic Pollutants in Central Asian Countries, www.greenwomen.freenet.kz/pop_uzbekistan.htm)

Several storage facilities serve as POPs pollution sources for soils, underground water and adjacent territories. The Yanygar storage facility (Khorezm Province), located in the sands of Kyzylkum desert close to "Pitnyak" waste collector, poses significant danger to the environment. GCCG concentrations in soils are 17 times higher than maximum acceptable concentration limits and DDT concentrations are 30 times higher. DDT concentrations are 20 times greater than maximum acceptable concentration limits in soils adjacent to a storage facility in Djizak Province. (Source: Persistent Organic Pollutants in Central Asian Countries, www.greenwomen.freenet.kz/pop_uzbekistan.htm)

In Uzbekistan, there are more than 450 former agricultural aviation airfields. They serve as major sources of pollution by chlorine-based pesticides. Of these airfields, 434 have been evaluated leading to assessment of corresponding POPs pollution levels. In 149 cases, pollution levels are 20 times higher than acceptable parameters. (Source: Persistent Organic Pollutants in Central Asian Countries, www.greenwomen.freenet.kz/pop_uzbekistan.htm)

Uzbekistan has established the legal framework and adopted a series of legislative acts to govern production, export, import and application of pesticides classified POPs including:

- The Law "On agricultural plant protection" to ensure protection of the environment and public health from adverse influence of chemical plant protection activities.
- Decree N33 adopted by Uzbekistan's Cabinet of Ministers on January 20, 1999 "On issues related to organization and activities of the State Commission on the use of chemical substances and plants protection"
- Decree N 151 adopted by the Cabinet of Ministers on April 19, 2001 "On regulation of ecologically dangerous product and waste shipments to and from the territory of the Republic of Uzbekistan".

Following an initiative introduced by Uzbekistan's State Committee on Nature, chemical plant protection substances covered by the 1998 Rotterdam Convention became a part of Uzbekistan's National "Registry of banned and limited application active and inactive ingredients of plant protection activities" adopted on March 28, 2002 at a meeting of the State Chemicals Commission under the auspices of Uzbekistan's Cabinet of Ministers. In accordance with this international convention, the list of dangerous chemical substances, containing 22 pesticides, were all persistent chlorine-based compounds. Many countries recognize these substances as harmful for the environment and public health and many of them are banned. POPs regulation issues constitute a significant part of Uzbekistan's National environmental protection action plan. To protect public health and the environment from the impact of persistent organic pollutants special measures are undertaken to decrease the concentration of particular pollutants causing the greatest concerns. Conservation of dangerous chemical substances will require technical and financial support to be provided by international organizations. Sufficient support can be secured only if the country signs the Stockholm Convention.

There have been reports that pesticide trafficking happens across the Uzbek-Kyrgyz border, and that banned pesticides reach Uzbekistan from Kyrgyz pesticide burial sites. This indicates that occasional use of banned pesticides in Uzbekistan is probable. Smaller unidentified stockpiles of old and banned pesticides can be suspected to be present in Uzbekistan. It is mandatory that AgLinks Uzbekistan farmers do not use old and/or banned pesticides.

The following contribute to the accumulation of obsolete pesticides: banning of products, registration withdrawal, policy decisions, improper or prolonged storage, poor stock management, unsuitable products and packaging, donations or purchases in excess of requirements, inadequate coordination among and within aid agencies, commercial interests and hidden factors. FAO recommends the following preventive measures to avoid the accumulation of more obsolete pesticides:

- **Banned product:** Formulate a phasing-out clause when banning pesticides.
- **Inappropriate storage and poor stock management:** Invest in new stores or in upgrading old stores. Avoid procuring pesticide quantities that exceed the storage capacity, train staff in stock management, and provide them with copies of relevant guidelines, and train staff in the proper handling of pesticides during transport. Shorten transit periods as much as possible. Request repackaging material with each consignment and make arrangements with a laboratory, preferably inside the Country, to ensure pesticide product quality.
- **Donations or purchases in excess of requirements:** Use checklists to determine requirements. Keep stocks as low as possible. Do not stock more than a one-season requirement. Before each purchase, examine the correct and current label for the product to be ordered and respect all standard, national and EPA pesticide regulations. Purchase only when there is direct need. Do not establish stocks based on assumptions, but improve supply arrangements and systems instead. Do not stock large quantities of products with short shelf lives. Specify the desired product stability in tender documents or direct procurement orders in terms of the minimum storage period the product should last. Do not accept donations in excess of requirements. Aid agencies should not accept requests without satisfactory justification. Anticipate a drop in demand in planning requirements when subsidies are removed. Be aware that seasonal and yearly weather conditions can vary greatly, thereby resulting in very low pressure of certain pests and diseases and increasing amounts of unused pesticides.
- **Unsuitable products:** Carefully determine requirements. Spell out product specifications in the tender documents or direct procurement orders. Do not accept product donations considered unsuitable for the intended use or packaged inappropriately. Specify labeling requirements in the tender documents or direct procurement orders. Follow FAO guidelines on tender procedures for pesticide procurement.

Annex 4 at the end of this document provides guidelines for proper disposal of pesticides and pesticide containers.

PROVISIONS MADE FOR MONITORING THE USE AND EFFECTIVENESS OF THE PESTICIDE

A relatively reasonable pesticide registration, regulation and evaluation program exists in Uzbekistan. Improvements can be achieved via future activities in cooperation with the Ministry for Agriculture and Water Resources, the crop protection services and other relevant institutions. Information concerning the entire process of pesticide use, effectiveness and regulation are limited, not professionally documented and mostly available only by oral communication. As previously stated pesticide issues are handled partially by protocols and registered pesticide books and booklets are rarely available resulting in uncertainty and unawareness about pesticide alternatives and more environmentally sound solutions. AgLinks Uzbekistan should support improving this situation and work towards a modernized system of pesticide use, and monitoring pesticide effectiveness. AgLinks Uzbekistan should establish its own

appropriate monitoring and efficacy evaluation system and respond in a timely manner to any reduced efficacy or side effects of pesticides at project sites.

For pesticide efficiency improvements, crop loss data from different agro-ecological zones must be obtained and analyzed, and pesticide application thresholds established afterwards. In case non-chemical control alternatives are feasible, these have to be included for analysis and compared to standard chemical control measures. If non-chemical methods prove equally effective or even superior they should be promoted extensively.

INTERNATIONAL TRADE ISSUES

The AgLinks Uzbekistan project aim is to improve Uzbek crop productivity, increase farm income and provide better products for local and selected export markets.

REGIONAL OR INTERNATIONAL TRADE IN THE PROJECT COMMODITIES

Strengthening economic growth in Uzbekistan depends to a large extent on developing the country's foreign economic activity. Accelerating economic growth in 2004-05 was largely due to a significant increase in foreign trade with Uzbek exports increasing two-fold during 2003-07 from US$3.7 billion to US$7.6 billion. This expansion was a result of measures taken to liberalize foreign trade and currency policies, stimulate private sector development and favorable trends on world markets. By 2007, Uzbekistan's external debt was $3.927 billion compared to GDP of $26.6 billion (2008 estimate at official exchange rate).

Mineral and mining are integral to Uzbekistan's economy with gold as the second most important export and unofficially estimated at around 20% of foreign exchange earnings. Uzbekistan is the world's seventh-largest producer, mining about 80 tons per year, and holds the fourth-largest reserves in the world. Uzbekistan has an abundance of natural gas, used for both domestic consumption and export. It also produces oil for domestic consumption and has significant reserves of copper, lead, zinc, tungsten, and uranium.

Agriculture and the agro-industrial sector contribute about 30% to Uzbekistan's GDP. Cotton is Uzbekistan's dominant crop, accounting for roughly 14% of the country's exports in 2007. Significant amounts of silk, fruit, and vegetables are produced. With very few exception, all crop production uses irrigation. However, agricultural productivity is generally low, with many farming households focused on producing fruits and vegetables on small plots of land.

Uzbekistan's major trade partners are Russia, Ukraine, and Kazakhstan, which account for over 40% of exports and imports. The most active non-CIS trading partners are Turkey, China, Iran, South Korea, and the EU. As of 2006, Russia remained the main foreign trade partner for Uzbekistan.

Tax collection rates remain high, since the banking system is used by the government as a collection agency, and common banking services and credit availability remain problematic. Technical assistance from the World Bank and from the UN Development Program (UNDP) to promote market-oriented fiscal and monetary policy reform at the Central Bank and Ministry of Finance.

The Partnership and Cooperation Agreement (PCA) with Uzbekistan signed in April 1996 has been the basis for EU-Uzbek bilateral relations since it entered into force in 1999. Uzbekistan is supported by national-level programs in the amount of €32.8 million. The priority areas of future EC assistance are: promotion of human rights and democratization, strengthening of civil society, rule of law, legal reforms and good governance, rural and local development. In addition to the assistance under the Development

Cooperation Instrument (DCI), thematic programs provide grant support for relevant organizations in Uzbekistan.

This bilateral approach to assistance was changed in 2002 and the Technical Aid to the Commonwealth of Independent States (TACIS) Central Asia Action Programme became active during the 2002-06 period. Uzbekistan has received €41.95 million over the period 1992-2005, related particularly to governance (the modernization of parliament and customs, as well as improving land registration), education, addressing social issues in the Fergana valley, and improving living standards in Karakalpakstan.

In June 2007, the European Council adopted the EU and Central Asia Strategy for a new partnership that focuses on a regional approach to EU-Central Asia development assistance. It is supported by a multi-annual programme which allocates €314 million for regional and national-level programs over the first four year period (2007-2010).

The following information was obtained from Uzbekistan ministry of foreign affairs (http://mfa.uz/eng/inter_cooper/):

- **Uzbekistan-Russia:** Trade between Russia and Uzbekistan grew by 40% to reach US $4.2 billion in 2007. The main fields of cooperation included trade, energy, the food industry, finance, ferrous and non-ferrous metallurgy, the pharmaceutical industry, and others. Joint ventures set up in Uzbekistan with Russian investment number over 500. According to preliminary assessments, the 2006 trade turnover between Uzbekistan and Russia was US$ 2.6 billion with exports of fruit and vegetable products from Uzbekistan to Russia growing by almost fourfold and representing over a million tons.
- **Uzbekistan-China:** Several agreements have been signed between Uzbekistan and China. Beijing's trade turnover with Uzbekistan exceeded US$1 billion in 2007. Total direct Chinese investment is estimated at about US$500 million, with discussions continuing on several additional projects worth potentially US$1 billion. Uzbek export items to China include raw goods and cotton fiber, silk, yarn, fabrics, chemical strings, etc.
- **Uzbekistan-EU:** The European Union is one of the major trading partners of Uzbekistan with 2002 trade with EU states reaching US$833.1 million with imports (US$440.9 million) exceeding exports (US$392,1 million). Uzbek exports in 2002 were greatest to the UK (51,03 % from all export to the EU) and Italy (24,43%). These two countries were also the largest importers of Uzbek goods among EU countries in 2001. The structure of Uzbek exports to EU-countries for the last several years indicates a few commodities with a prevalence of raw goods. However, increased joint venture activity in the textile industry has resulted in increased volume of Uzbek textile exports to the EU.
- **Uzbekistan-Iran:** According to Iran's commercial attaché in Uzbekistan, bilateral Iranian-Uzbek trade is now worth US $650 million annually, and will increase to US $1 billion in the near future. Iran is Uzbekistan's sixth largest trading partner. In 2006, bilateral trade increased 42% from its 2005 level.
- **Uzbekistan-USA:** According to the US Census Bureau, trade with Uzbekistan reached US$ 291.2 million in imports and US$272.2 million in exports. Basic items of export are - services (24.3%), fiber (22.4%), inorganic chemical products (20.2 %), machines and equipment (18.1%), and other (16.3%). American companies are involved in a number of investment projects in the mining and petrol-oil sectors, technological development of agriculture, food-processing and transport infrastructure.
- **Uzbekistan-South Korea:** According to the State Committee of Statistics of Uzbekistan, trade turnover for 2002 with South Korea was US$325.9 million with imports (US$259.9 million) far

exceeding exports (US$67.0 million). Uzbek exports consist mainly of cotton fiber, services, yarn and tissue, silk, cotton, wool, felt, olives, fruit, colored metals, etc. According to South Korean statistical agencies, the total value of South Korean investment in Uzbekistan exceeds US$1billion.

- **Uzbekistan-Japan:** According to the State Statistics Committee of Uzbekistan, foreign trade for 2002 was US $31.9 million with imports (US$20.3 million) almost doubling exports (US$11.6 million). Exports consisted of silk, fabric, cotton yarn and services. State yen credits reached US $721.7 million (official aid for development programs) and commercial credits of JBIC totaled US $721.1 million.
- **Uzbekistan-United Arab Emirates:** The Abu Dhabi Fund for Development will invest US$278 million in irrigation in Uzbekistan in 2009 to increase water supply to irrigated lands in several regions of the country. The company will allocate US$150 million to rehabilitate the main collectors in Khorezm Province. The project targets soil-reclamation to improve irrigated lands. A US$70 million loan will also be issued to improve water resource management in Surkhandarya Province. This loan will be used to reconstruct the Khazarbag–Akkapchigay irrigation canal system. About US$58 million in loans will be directed to Bukhara Province with funds used to rehabilitate Khamza-1, the largest pumping station in this region.

On 8 October 2008, the World Bank and the Government of Uzbekistan signed a US$67.96 million (International Development Association (IDA)) credit for the second phase of the Uzbekistan Rural Enterprise Support Project (RESP-II). The Project will assist the newly independent farmers to increase productivity, financial and environmental sustainability of agriculture and the profitability of agribusiness. The proposed RESP-II follows and builds upon the experience and success of RESP-I which supported farmers in 5 pilot districts through the privatization and restructuring of farming and associated agribusiness activities. The RESP-II will scale up the support to about 90 districts in seven regions to increase yields and improve access to agricultural mechanization and business advisory services. It will also increase the farmers' access to non-government sources of finance.

Uzbekistan has signed bilateral investment or free trade agreements with a total of 47 countries, including China, the Czech Republic, Egypt, Finland, France, Georgia, Germany, India, Indonesia, Israel, Italy, Japan, the Republic of Korea, Kuwait, Malaysia, the Netherlands, Pakistan, Poland, Russia, Saudi Arabia, Slovakia, Switzerland, Turkey, the United Kingdom, and the United States. Several of these agreements have not yet entered into force, including those with India, Italy and the United States. In 2004, Uzbekistan and Russia signed a Strategic Framework Agreement that includes free trade and investment concessions. In November 2005, the Government of Uzbekistan signed an alliance agreement with Russia covering both security and economic cooperation. Uzbekistan and Ukraine also agreed in 2004 to remove all bilateral trade barriers. In 2006, Uzbekistan began the accession process to the Euro-Asian Economic Community (EURASEC), however, in October 2008, the Uzbek government decided to suspend its membership in the organization. In 2004, the Uzbeks signed the regional Trade Investment Framework Agreement (TIFA) with the U.S.

CODES OF CONDUCT, TREATIES AND INTERNATIONAL CONVENTIONS THAT APPLY TO TARGET COMMODITIES, CROP PROTECTION PRODUCTS AND SYSTEMS WITH RATES OF IMPLEMENTATION SUCCESS WHERE THEY DO APPLY

Public awareness of environmental and social issues in agricultural production and trade has been growing over the past twenty years. Several food safety crises, food supply limitations and animal disease epidemics have raised concerns over intensive agricultural practices. Farmers and consumers have now become more conscious of labor conditions, environment and low and unstable farmer income. For example, farmers are not benefiting from world market pricing of cotton and wheat. In addition, price increases of agricultural inputs, including pesticides and fertilizers, have further eroded the farmer's bottom line.

There are several codes of conduct based on international agreements and enterprise initiatives, which deal with production, processing, food safety etc. A number of certification and/or labeling initiatives are established or being developed. These target management improvements above the minimum level required by law, implement laws that are otherwise difficult to enforce, or suggest a framework where formal laws may not exist. International treaties and conventions can, therefore, be transferred into verifiable standards for direct implementation by producers, processors, traders and consumers. Voluntary certification programs are complementary to governmental regulatory frameworks and labor association actions.

There are three relevant conventions and codes of conduct on pesticides and pesticide use:

- International Code of Conduct on the Distribution and Use of Pesticides,
- Rotterdam Convention on Prior Informed Consent (PIC), and
- Stockholm Convention regarding persistent organic pollutants (POPs).

It is crucial, that all the regulations contained in these conventions be considered as dynamic and may very well incorporate new chemicals and rules during the lifetime of the AgLinks Uzbekistan project and therefore necessitate regular update monitoring once the PERSUAP is accepted.

International Code of Conduct on the Distribution and Use of Pesticides, of which the revised version was adopted by the United Nations FAO Council in November 2002. The International Code of Conduct on the Distribution and Use of Pesticides was one of the first voluntary Codes of Conduct in support of increased food security, while also protecting human health and the environment. It was adopted in 1985 by the FAO Conference at its 23rd Session, and was subsequently amended to include provisions for the Prior Informed Consent (PIC) procedure at the 25th Session of the FAO Conference in 1989. The Code established voluntary standards of conduct for all public and private entities engaged in, or associated with, the distribution and use of pesticides, and since its adoption has served as the globally accepted standard for pesticide management. After the adoption of the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade in September 1998 (see below), the provisions relating to the PIC procedure in the Code became redundant. Furthermore, the changing international policy framework and the persistence of certain pesticide management problems urged FAO to initiate the revision and update of the code. This process started in 1999, with a number of recommendations made by the FAO Panel of Experts on pesticide specifications, registration requirements, application standards and PIC. Government experts, NGOs, the pesticide

industry and other United Nations organizations participated in the revision process. A government consultation subsequently established the basic text for the present revised version of the code.

The Rotterdam Convention on the Prior Informed Consent (PIC) Procedures for Certain Hazardous Chemicals and Pesticides in International Trade. Under the PIC procedures (more extensively described under Section 3.10), the secretariat provides participating countries with detailed information on the risks chemicals pose, allowing them to decide whether to accept future imports or not. If any country does choose to ban or restrict substances on the PIC list, which presently contains 31 chemicals, exporting countries are advised and must immediately inform their exporters, industry and customs departments about their decision.

The Stockholm Convention is defined as a global treaty to protect human health and the environment from persistent organic pollutants (POPs). POPs are chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the fatty tissue of living organisms and are toxic to humans and wildlife. In implementing the convention, Governments should take measures to eliminate or reduce the release of POPs into the environment.

Uzbekistan is party to the following international environmental agreements: Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Environmental Modification, Hazardous Wastes, Ozone Layer Protection, and Wetlands. Uzbekistan is also a member of the following organizations, some of which are trade-focused : ADB, CIS, CSTO, EAEC, EAPC, EBRD, ECO, FAO, GCTU, IAEA, IBRD, ICAO, ICCt (signatory), ICRM, IDA, IDB, IFC, IFRCS, ILO, IMF, Interpol, IOC, ISO, ITSO, ITU, MIGA, NAM, OIC, OPCW, OSCE, PFP, SCO, UN, UNCTAD, UNESCO, UNIDO, UNWTO, UPU, WCO, WFTU, WHO, WIPO, WMO, and WTO (observer).

STATUS OF PESTICIDE REGULATIONS IN THE EUROPEAN UNION

The European Community (EC) has established a harmonized legal framework for the regulation of pesticides in all member countries of the EC. The Commission of the EC, in collaboration with its member countries, is responsible for the registration of pesticide active ingredients (also referred to as active substances) for use in all EC member countries. Individual member countries, called Member States, are responsible for the registration in their country of specific pesticide products containing active ingredients authorized for use by the Commission. This dual authority of the EC and its member states is granted by the Council of the European Community under Council Directive 91/414/EEC, adopted on July 15, 1991 and effective July 25, 1993 (1). Standards and regulations for the classifications, labeling, and packaging of pesticides are set by Council Directive 67/548/EEC of June 27, 1967 (2).

As of 1 September 2008, a new legislative framework (Regulation (EC) No 396/2005 of the European Parliament and of the Council) on pesticide residues is applicable. This regulation completes the harmonization and simplification of pesticide MRLs, whilst ensuring better consumer protection throughout the EU. With the new rules, MRLs undergo a common EU assessment to make sure that all classes of consumers, including vulnerable ones (ex., babies and children) are sufficiently protected.

Uzbekistan is not a member of the EU, nor does it have an associated state status.

EU REGISTRATION STATUS OF ACCEPTED PESTICIDE ACTIVE INGREDIENTS

As of December 12, 2008, there are 193 existing active substances with an EU-registered pesticide status including average daily intakes (ADI) and minimum residue levels (MRL). There are also currently 82 new active substances with an EU-registered pesticide status including ADI and MRL. Both categories have pending status for an additional 22 and 55 substances in the existing and new substances category, respectively, for which the evaluation is still on-going and can be authorized in the EU. These and new active substances along with MRL and ADI values can be located at the following 2 websites: http://europa.eu.int/comm/food/plant/protection/evaluation/index_en.htm and http://ec.europa.eu/food/plant/protection/evaluation/existactive/list1-28_en.pdf.

From the nine accepted or conditionally accepted Fungicides, one (Triadimefon) is not authorized in the EU, one (Carboxin) is voluntarily withdrawn and one (Copper sulfate (basic)) has pending status. From the 16 accepted or conditionally accepted insecticides, two (Buprofezin and Cypermethrin beta) are not registered in the EU, one (Hexythiazox) is voluntarily withdrawn, and two (Bifenthrin and Cyhalothrin Gamma) have EU pending status. From the additionally suggested pesticides, the fungicides Copper octanoate and Sulfur have an EU pending status, while Azadirachtin (insecticide) and Dazomet (nematicide) are voluntarily withdrawn. Information on pesticide toxicity and use restrictions of products from the EU can be found through the above mechanism.

EXPORT MARKET STANDARDS, AUDITING AND CERTIFICATION SCHEMES APPLICABLE TO THE PROJECT, CROPS, AND PESTICIDES

Uzbekistan has the potential to develop into a major food exporter to Central Asia, Russia, Eastern Europe and the Middle East. The government is currently developing legislation to bring standards and licensing in line with WTO requirements. Once completed, this should have a positive effect on the sector.

Agriculture is the backbone of Uzbekistan's state-run economy, accounting for approximately 30 percent of GDP and employing 29 percent of the labor force. Cotton, the principle crop, accounts for over 28 percent of Uzbekistan's export earnings. Uzbekistan is the world's fourth largest producer of cotton, and second largest exporter in the world. The government hopes to increase agricultural productivity through the adoption of new technologies. However, over the last decade Uzbekistan's cotton production dropped due to inefficient agricultural practices and low-quality seed. Uzbek farmers harvested 3.73 MMT of seed cotton in total in 2007, which is 3.6 percent more than official production targets. The Government hopes to develop the country's textile sector and to increase domestic consumption of the cotton harvest from the current 20-25% to 50%. Cotton exports still account for 75-80% of total cotton production. Through foreign and state investment, the government plans to dramatically increase the value of textile exports to over US$1.17 billion. Despite its many problems, the textile industry produced goods worth 655.9 billion Soums (US$ 1 = 1400 Soum in February 2009) and exports reached over US$401 million in 2007. Uzbekistan wheat production in MY 2007/08 is estimated at 6.3 million tons, nearly the same as the previous year's crop.

Uzbekistan continues to use an arbitrary set of technical standards based on outdated Soviet systems with more than 65,000 normative documents regulating national standards. According to Uzbek legislation, the following standard normative documents are applied in the country: International (interstate, regional)

standards; Uzbek National standards; Industrial standards; Technical specifications; Enterprise standards; National standards of foreign countries; and Administrative-territorial standards. The Uzbekistan Agency for Standardization, Metrology and Certification is responsible for certification and standardization policy in the country while industry standards are developed by industry regulating agencies. Testing and certifications are completed by the Center for Testing and Certification, together with territorial subdivisions and 73 accredited bodies. The Department for Conformance Acknowledgement and Technical Policy coordinates and provides general certification guidance. According to Uzbek legislation, the import of specific goods and services such as fertilizers and pesticides is subject to accreditation by the authorized ministries and agencies of the country. For example: The State Committee for Nature Protection accredits the import of substances with potential hazardous environmental implications.

Trade among Central Asian states, including Uzbekistan, continues to be hampered by numerous barriers: complex trade policies that are badly coordinated and lack transparency; high costs from poor transport and transit conditions; border crossings delays; and onerous administrative and clearance requirements. In Uzbekistan, 139 days are needed on average to import a standardized shipment of goods. Moreover, the overlapping trade agreements and rules in the region are confuse and create opportunities for corruption, thereby hindering rather than facilitating trade. As a result of all these factors, intra-regional trade has contracted to less than 10% of the total trade of Central Asia, with Russia remaining the region's foremost commercial partner. Ten percent of Uzbekistan external trade is currently conducted with the EU.

Import and export delays have a great impact on trade. An IFC and World Bank study (2006) found that each day of delay reduces a country's export volumes by about 1%. Particularly longhold-ups also make it impossible to export perishable agricultural products such as meat, fruit and vegetables. Lowering commercial barriers will help Uzbekistan to expand the currently low levels of trade flows and opportunities for business. In particular, WTO accession would represent a decisive step towards harmonizing and streamlining trade conditions, whilst benefits from the reduction in tariffs and cross-border costs would boost economic growth and employment. In practice, this means simplifying and harmonizing visa regimes, customs and border crossing rules and procedures, and improving professionalism at customs and border services.

A number of important weaknesses in governance and public finance management remain to be solved, including at decentralized levels. Audit and control functions are still immature, and public decision-making, budget allocations and spending are far from transparent. Overall, public finance management is still in the initial phase of reform, and further institution building and enhancement of capacity is required to improve decision-making and expenditure functions, and to restrain corruption. Broader sector-wide reform strategies and policies in the domains covered by EC FSP are in the early stages of development, particularly for the agriculture and rural sectors.

The Government of Uzbekistan intends to eliminate requirements that are in violation of certain WTO agreement provisions (such as TRIMS, the Agreement on Subsidies and Countervailing Measures, and the General Agreement on Tariffs and Trade) by the time Uzbekistan accedes to the WTO.

PARTNERSHIP & COOPERATION AGREEMENTS (PCAS)

PCAs and Economic Partnership Agreements (EPA) aim to establish new WTO-compatible trading arrangements by progressively removing barriers to trade between EU and certain groups of reconstructing or developing countries. The Partnership and Cooperation Agreement (PCA) with Uzbekistan signed in April 1996 has been the basis for EU-Uzbek bilateral relations since it entered into

force in 1999. The EU is already one of the major trading partners for Central Asia, but there is still much scope for further intensification of trade and economic ties. The EU supports, including through assistance programs, WTO membership of all Central Asian countries (currently Uzbekistan is an observer), as WTO membership is the main way for a country to achieve a better and deeper integration into the international trade and economic system.

The EU has over the past year continued to encourage Central Asian partners to make better use of the EU Generalized System of Preferences (GSP) and to increase and diversify their economic production and exports. The gradual approximation of the countries' legislation and practices to the main EU trade related acquis as foreseen in the Partnership and Cooperation Agreements should support this process and the EU is ready to continue providing partners with technical assistance in this regard. EU assistance programmes have put specific emphasis on supporting reform efforts in the area of improving the investment climate in Central Asia.

ORGANIC PRODUCTION

The Principles of Organic Agriculture were established by the International Federation of Organic Agriculture Movements (IFOAM) in September 2005. They embody a global vision for organic farming. According to the Codex definition, "organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfill any specific function within the system". The organic market is confronted with hundreds of private sector standards and governmental regulations, two international standards for organic agriculture (Codex Alimentarius and IFOAM) and a host of conformity assessment and accreditation systems. It is recommended that governments use Codex Alimentarius Guidelines and IFOAM Basic Standards as the basis on which organic certifiers base their standards.

It is unclear if Uzbekistan is developing national organic regulations and it does not seem to be an IFOAM member. Silk Road Organic Foods Company established in 2003 and based in Samarkand, seems to produce organic dried foods and organic nuts. According to the company profile, they follow Hazard Analysis and Critical Control Point (HACCP) principles but they do not mention following international standards for organic agriculture.

THE ORGANIC GUARANTEE SYSTEM AND THE IFOAM BASIC STANDARDS AND ACCREDITATION CRITERIA

IFOAM's Organic Guarantee System (OGS) is designed to a) facilitate the development of organic standards and third-party certification worldwide, and to b) provide an international guarantee of these standards and organic certification. The IFOAM Basic Standards and the Accreditation Criteria are two of the main components of the OGS. Visit the Organic Guarantee System Section on the respective website for further information.

OTHER GUARANTEE SYSTEMS OUTSIDE IFOAM

Certification has been developed to demonstrate and guarantee a product has been produced organically for organic farmers and traders operating in anonymous markets. Certification is the formal and

documented procedure by which a third party assures organic standards are followed. Certification leads to consumers' trust in the organic production system and products. Certification gives organic farming a distinct identity and credibility and makes market access easier. There are other methods of organic quality assurance for certain situations and markets other than formal and third party certification. Self-declaration, or participatory guarantee systems, are seen by IFOAM as suitable for local markets that are not as anonymous as standard "trade".

The Codex Alimentarius, or the food code, has become the global reference point for consumers, food producers and processors, national food control agencies and the international food trade. The code has had an enormous impact on the thinking of food producers and processors, as well as the awareness of end users – consumers. Its influence extends to every continent and its contribution to the protection of public health and fair practices in the food trade is immeasurable. The Codex Alimentarius system presents a unique opportunity for all countries to join the international community in formulating and harmonizing food standards and ensuring their global implementation. It also allows them a role in the development of codes governing hygienic processing practices and recommendations related to compliance with those standards. The significance of the food code for consumer health protection was underscored in 1985 by United Nations Resolution 39/248, whereby guidelines were adopted for use in the elaboration and reinforcement of consumer protection policies. The guidelines advise that "When formulating national policies and plans with regard to food, Governments should take into account the need of all consumers for food security and should support and, as far as possible, adopt standards from the Codex Alimentarius or, in their absence, other generally accepted international food standards".

The Codex Alimentarius has relevance to the international food trade because uniform food standards protect all market participants in an ever-increasing global market. Both the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) and the Agreement on Technical Barriers to Trade (TBT Agreement) encourage the international harmonization of food standards. These Agreements, products of the Uruguay Round of multinational trade negotiations, cite international standards, guidelines and recommendations as the preferred measures for facilitating international trade in food. As such, Codex standards have become the benchmarks against which national food measures and regulations are evaluated within the legal parameters of World Trade Organization (WTO) Agreements. The Codex Alimentarius Commission is the body responsible for compiling the standards, codes of practice, guidelines and recommendations that constitute the Codex Alimentarius. Uzbekistan is a member of this commission as it is cited among the countries eligible for the Codex Trust Fund. The main objective of the Codex Trust Fund is to help developing or transition country Codex members to enhance their level of effective participation in the development of global food safety and quality standards via the Codex Alimentarius Commission.

THE AARHUS CONVENTION

The UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters was adopted on 25th June 1998 in the Danish city of Aarhus at the Fourth Ministerial Conference on the 'Environment for Europe' process. All Central Asian countries joined or ratified the Aarhus convention except Uzbekistan. However, the Government has started to apply provisions of the Convention to increase public participation in regulatory development.

RAMSAR CONVENTION

The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an intergovernmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. There are presently 158 Contracting Parties to the Convention, with 1743 wetland sites, totaling 161 million hectares, designated for inclusion in the Ramsar List of Wetlands of International Importance. The Convention on Wetlands came into force for Uzbekistan on 8 February 2002. Uzbekistan presently has 2 sites designated as Wetlands of International Importance, with a surface area of 558,400 hectares.

CONVENTION ON BIOLOGICAL DIVERSITY

This convention recognizes the conservation of biological diversity as “a common concern of humankind” and is an integral part of the development process. The agreement includes all ecosystems, species, and genetic resources. It connects traditional conservation efforts with economics by using biological resources sustainably. It establishes rules for the fair and equitable sharing of the benefits arising from the use of genetic resources, notably those destined for commercial use. Uzbekistan has been a member since 1995.

FAIR TRADE INITIATIVES

Fair trade is a trading partnership, based on dialogue, transparency and respect, which seeks greater equity in international trade. It contributes to sustainable development by offering better trading conditions to, and securing the rights of, marginalized producers and workers - especially in the South. Fair trade organizations (backed by consumers) are engaged actively in supporting producers, awareness raising and in campaigning for changes in the rules and practice of conventional international trade. Fair trade is also an organized social movement and market-based approach to alleviating global poverty and promoting sustainability. The movement advocates the payment of a fair price as well as social and environmental standards in areas related to the production of a wide variety of goods. It focuses on exports from developing countries to developed countries, most notably handicrafts, coffee, cocoa, sugar, tea, bananas, honey, cotton, wine, fresh fruit, and so on.

Fair trade’s strategic intent is to deliberately work with marginalized producers and workers in order to help them move from a position of vulnerability to security and economic self-sufficiency. It also aims at empowering them to become stakeholders in their own organizations and actively play a wider role in the global arena to achieve greater equity in international trade. Fair trade proponents include a wide array of international religious, development aid, social and environmental organizations such as Oxfam, Amnesty International, and Caritas International. In 2001, a common definition of fair trade was developed by FINE, an informal association of four international fair trade networks (Fair-trade Labeling Organizations International, International Fair Trade Association, Network of European World shops and European Fair Trade Association).

Fair trade can promote small local entrepreneurs and help them get fair access to the international market. Through a number of international fair trade associations, networks and shops, small local producers have developed their activities on the international level by using the fair trade label. This label is distributed by the Fair Trade Labeling Organization (FLO) after a series of production procedures controls to ensure fair trade criteria are respected. No organization is yet working to ensure the promotion of fair trade criteria in Uzbekistan.

EXPORT CERTIFICATION AUTHORITIES/AUDITORS/COMPANIES PRESENT IN THE COUNTRY OR REGION

PHYTOSANITARY CERTIFICATION

A phytosanitary certificate is required by many countries for the import of non-processed, plant products. Export commodities (depending on the country) must meet certain standards or criteria outlined by the importing country. These plant health requirements pertain to storage pests, plant diseases, chemical treatments and weeds. Some countries require a growing season inspection of the field from which a plant product is harvested before a certificate may be issued, particularly if the product is seed to be used for propagation. However, usually inspection of the product before it is shipped is all that is necessary. The phytosanitary certification is issued by the main state inspection on quarantine of plants under the Ministry of Agricultural and Water Resources of the Republic of Uzbekistan.

SEED CERTIFICATION

Certification of seeds in Uzbekistan is carried out based on current standards by the State Center of Agricultural Plants Certification and Seed Quality Control of the Ministry of Agriculture and Water Resources and its affiliated divisions within the provinces. In Uzbekistan, new seed processing machines and laboratory seed testing equipment have been imported through the FAO TCP Project. However, proper operation and management of seed processing and laboratory facilities would be important to maximize the efficiency of cleaning operations, minimize operational costs and maintain seed quality and health standards before marketing.

PESTICIDE EVALUATION REPORT ANALYSES

This section contains information addressing the twelve evaluation criteria requested by USAID for a pesticide IEE, as outlined in the Agency's Pesticide Procedures [22CFR §216.3 (b)(l) (i) a-l]. It analyzes both the requested and additionally suggested pesticides.

PESTICIDE PROCEDURES ELEMENT A- USEPA REGISTRATION STATUS OF THE PROPOSED PESTICIDES

Pesticides are registered in the U.S. by active ingredients and by formulation. "Registration status" possibilities of the active ingredients and formulated products include registered, never registered, and cancelled registration. USAID and the US Government overseas are effectively limited to using pesticide active ingredients registered in the U.S. by the U.S. Environmental Protection Agency for the same or similar uses. Emphasis is placed on similar use because a number of pests found overseas are not present in the USA and, therefore, pesticides may not be registered for the exact same use, but often are registered for similar pests and pest situations in the same crop. In addition, host country pesticide registration procedures must also be identified and followed.

Annex 1, Column 1 has the EPA and Uzbekistan registration status of all of the AgLinks Uzbekistan requested and additionally recommended pesticides, along with EPA and WHO acute toxicity classes, presence of Restricted Use Pesticides (RUPs), and product name and its formulation. An overview of the toxicity classifications used by WHO and EPA is given in Annex 9.

PESTICIDES ACCEPTED FOR USE IN AGLINKS UZBEKISTAN PROJECT

The following active ingredients are registered by EPA and are not labeled as RUPs. They are generally acceptable for use on AgLinks Uzbekistan targeted crops, with appropriate training and personal protection equipment use. The additionally suggested pesticides all have an active EPA registration and do not contain RUPs except the fumigants. Some of the proposed alternatives are not registered by Uzbekistan. Therefore, a registration procedure should be followed after multi-season and multi-location field testing, by the respective authorities before they can be used by AgLinks Uzbekistan.

To control major weed problems mostly in cotton and wheat, but also in onions, three herbicides (Bentazon sodium salt, Fluazifop-P-butyl, and Pendimethalin) are suggested for use. These herbicides are all registered by USEPA and Uzbekistan. It is mandatory that AgLinks ascertain that no products similar to previously EPA registered RUPs of those permitted active ingredients are used.

Fungicides

Carboxin
Propamocarb hydrochloride
Propiconazole
Tebuconazole
Thiophanate-methyl

Thiram
Triadimefon
Triticonazole

Fungicides Additionally Suggested

Copper ammonium complex
Copper octanoate
Cymoxanil
Mancozeb
Sulfur

Insecticides

Buprofezin
Dimethoate
Etoxazole
Hexythiazox
Indoxacarb
Malathion
Pyriproxyfen
Thiacloprid

Insecticides Additionally Suggested

Azadirachtin
Bacillus thuringiensis (berliner), subsp. Kurstaki, Strain EG2371
Mineral oil, a petroleum derivative
Potash soap
Spinosad

Herbicides Additionally Suggested

Bentazon sodium salt
Fluazifop-P-butyl
Pendimethalin

Nematicide Additionally Suggested

Dazomet

PESTICIDES REJECTED FOR USE IN THE AGLINKS UZBEKISTAN PROJECT

The following active ingredients are not allowed to be used:

Fungicides

Bordeaux mixture	no active EPA registration
Bromuconazole	no active EPA registration for intended use
Bronopol	no active EPA registration for intended use
Calcium hydroxide	no active EPA registration for intended use

Copper sulfate (anhydrous)	no active EPA registration
Diniconazole	no active EPA registration
Epoxiconazole	no active EPA registration
Ferrous-sulfate	no active EPA registration
Flutriafol	no active EPA registration
Guazatine	no active EPA registration
Oxadixyl	no active EPA registration
Penconazole	no active EPA registration
Pencycuron	no active EPA registration
Triforine	no active EPA registration for intended use

Insecticides

Acephate	too toxic, banned in EU (qualified for PIC notification)
Amitraz	no active EPA registration for intended use
Bromopropylate	no active EPA registration
Carbosulfan	no active EPA registration
Cypermethrin	no active EPA registration
Cypermethrin, zeta	too toxic to be used, WHO 1b
Deltamethrin	too toxic to be used, all registered products in Uzbekistan are EPA toxicity Class I
Diazinon	too toxic, banned as plant protection product in EU
Fenpropathrin	too toxic, banned in EU, WHO Acute Hazard list
Fenvalerate	no active EPA registration for intended use
Fipronil	no active EPA registration for intended use
Flubenzimine	no active EPA registration
Hexylthiofos	no active EPA registration
Phosalone	no active EPA registration
Propargite	too toxic to be used, all EPA registered products are EPA toxicity Class I
Teflubenzuron	no active EPA registration
Triazophos	no active EPA registration

PESTICIDES CONDITIONALLY ACCEPTED FOR USE IN AGLINKS UZBEKISTAN PROJECT

The following active ingredients were requested by AgLinks Uzbekistan and are conditionally accepted, as well as the suggested fumigants:

Fungicides

Copper sulfate (basic)	**RUP** (Special Safety Training Required)

Insecticides

Acetamiprid	**RUP** (Special Safety Training Required)
Avermectin	**RUP** (Special Safety Training Required)
Bifenthrin	**RUP** (Special Safety Training Required)

Chlorpyrifos	**RUP** (Special Safety Training Required)
Cyhalothrin, gamma	**RUP** (Special Safety Training Required)
Cyhalothrin, lambda	**RUP** (Special Safety Training Required)
Cypermethrin, beta	**RUP** (Special Safety Training Required)
Imidacloprid	**RUP** (Special Safety Training Required)

Fumigants Additionally Suggested

Aluminum phosphide	**RUP** (Special Safety Training Required)
Magnesium phosphide	**RUP** (Special Safety Training Required)

These fumigants are suggested to control pests in AgLinks Uzbekistan raisin and other dried fruit products and fulfill import and export sanitary and quarantine requirements. All EPA and Uzbek registered products are EPA toxicity Class I (extremely toxic, DANGER) and RUPs, except Quick phlo-r granules (Aluminum Phosphide) and Degesch magtoxin granules (Magnesium Phosphide). For any Class I product and any potential RUP for raisin and dried fruit application ALL SPECIAL SAFETY TRAINING requirements must be fulfilled. These requirements are mandatory for any use (including field use) of RUPs which are described in the following paragraph and under RECOMMENDATIONS in this section.

These active ingredients are used in RUPs registered or formerly registered by the EPA. Since RUPs pose a higher risk for health and/or the environment, the special safety regulations must be applied. These regulations are included and monitored when pesticide user are certified in USA. To use these pesticides safely in AgLinks Uzbekistan project activities, all respective pesticide users must receive special training on how to use RUPs. This training should be repeated annually and skills examined at the end of each training. For the time being some of the requested pesticides containing RUPs could not be rejected, as this would result in seriously reduced yields and quality of AgLinks target crops. However they should be replaced by less toxic substances over time. Exceptions are the fumigants since there are no viable alternatives at present. These fumigants should only be used by licensed professional fumigators wearing full protective equipment and following the directions set in the appendix attached to this document. A transition period for those conditionally accepted pesticides is suggested to allow the development and purchase of alternative pesticides for farmers, importers and distributors. Products with active RUP ingredients should be phased out and replaced through 2012 by product groups free of RUPs. Ongoing changes in EPA regulations have to be monitored by qualified AgLinks Uzbekistan personnel or external experts. In addition, registration of modern and more environmentally sound products can be expected in Uzbekistan, especially in the growing area of fruit and vegetable production, which can be requested to be used in an amended PERSUAP.

RECOMMENDATIONS

1. Stop immediately any use of all non-EPA registered and EPA Acute Toxicity Class I pesticide products on AgLinks Uzbekistan project sites.

2. Phase-out through 2012 all EPA registered active ingredients used in RUP beginning in 2009. Any RUP containing product should only be used after appropriate safety training and if a) the less dangerous products could not be made available in advance by thoughtful planning or b) the immediate danger to product quality and yield has to be averted based only on unforeseen pest outbreaks.

3. Use only single active ingredient formulated products with the active ingredient approved by this PERSUAP.

4. In order to use the accepted pesticide products in the short term, AgLinks Uzbekistan should provide repeated training in safe pesticide and IPM techniques for all pesticide users before the end of the 2009 spraying season. Training farmers will be more challenging and requires repeated trainings and reminders, in addition to enforcement measures. Many IPM techniques that work well in the USA and Europe for the same or similar pests and diseases on the same crops are provided in Annex 2. Additional IPM techniques, including repellents and baits, are found in Annex 5, on the World-Wide Web and specific literature.

5. Begin immediately with extensive training for persons, who use or might use RUPs permitted by this PERSUAP. The training must address all safety measures required by USEPA regulations. Verify the specific knowledge of all respective pesticide users including import, storage, transport, spraying, environmental and personal safety regulations and consumer protection measures.

6. Help secure safety equipment, and personal protection equipment for farmers to use and enforce its use. A list of personal protection equipment is provided in Annex 8. Pesticide labels should provide information on which equipment to use for each pesticide. Labels should ideally, on a mid-term basis, follow EPA approved labeling and content (Annex 17).

7. Update changes to the list of crops and pesticides proposed for use and communicate these changes to USAID to amend this PERSUAP.

8. Begin a collection of pesticide company labels and material safety data sheets (MSDS) for each pesticide product used on AgLinks plots in Uzbekistan. Subsequently produce a quick reference guide for all pesticides used by project beneficiaries for each anticipated pest, with use rates, safety measures, environmental concerns, minimum re-entry periods (MRPs) and minimum waiting periods (MWPs) until harvest. Update this collection since EPA requires label changes based on recent research findings and new concerns.

9. Produce a quick, durable reference guide useful for pesticide applicators to refer to in the field as they make pesticide choice and use decisions.

10. “Third party” products from India, China, Russia and elsewhere of EPA actively registered formulations are only permitted for use if an official document of an internationally acknowledged analytical laboratory states the identical composition (quality and quantity of active ingredient and all inerts) of the formulation with active EPA approval and if they are correctly labeled (Annex 17).

PESTICIDE PROCEDURES ELEMENT B- BASIS FOR SELECTION OF PESTICIDES

This section refers to the economic and environmental rationale for choosing a particular pesticide. In general, the selection criteria is to promote the least toxic pesticide that remains effective. The overall pesticide selection is based on several factors including efficacy, price, availability, and producer reputation. Economic analyses are difficult to ascertain for the given project’s pesticides and crop losses, due to lack of good information within Uzbekistan.

Human and environmental safety concerns are rarely taken into account by farmers, importers and distributors. Therefore, AgLinks Uzbekistan should choose the pesticide active ingredients and formulations which present the least overall risk.

The AgLinks Uzbekistan-requested pesticides are based upon recommendations from the crop protection headquarters in Tashkent. The initial list was checked by the provincial crop protection services in Tashkent, Namangan, Fergana and Samarkand for regional specificity in pesticide availability and use. In addition, farmers commonly used pesticides and the general portfolio of pesticide shops and distributors were considered. Additional information concerning registration and permitted use on specific crops were obtained from the official list of Uzbek pesticides from the years 2005, 2006, 2007 and 2008. A new book of Uzbek registered pesticides will be published by spring 2009. Human safety and environmental safety are other factors that should begin to influence the choice of pesticides for AgLinks Uzbekistan in future project activities.

Except for the RUP listed active ingredients, most of the AgLinks Uzbekistan-requested fungicides are WHO Class III or "U" products, with some EPA Class II products. Most of the requested fungicides are available with products of EPA Class III for acute human toxicity. A considerable number of the AgLinks Uzbekistan requested insecticides are WHO Class II products and do not have an active EPA registration or contain RUPs. An additional set of insecticides have been recommended to support a quick phase out of RUPs. These insecticides are mostly EPA Class III, WHO Class III or "U", do not contain RUPs and have an active EPA registration.

Several of the fungicides, insecticides and herbicides have the potential to contaminate ground water and several have the potential to kill bees, fish, birds, aquatic organisms and other non-target organisms. Farmers need to be trained to mitigate the risks regarding each pesticide and specific formulation used.

RECOMMENDATIONS

1. Continue to choose and use least toxic pesticides, where practical (ex., do not use RUPs, EPA toxicity Class I products, use only EPA toxicity Class II products, if EPA toxicity Class III or IV products of the same permitted pesticide are not produced or, very rarely, do not have an active EPA registration).

2. Integrate and utilize IPM tactics with more use of biological and organic pesticides, if feasible.

3. Produce a pest control guide for each crop and pest combination found in AgLinks Uzbekistan project activities and use and build a reference database.

PESTICIDE PROCEDURES ELEMENT 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 (IPM) whenever possible. This section discusses and suggests the extent to which the proposed pesticide use is incorporated into an overall IPM strategy. The strongest cases for IPM compared to synthetic pesticide use, beyond the health and environmental benefits, are higher efficiency and durability, lower impact on soil health and nutrient cycling, generally lower capital investment and preventive approach to eliminate or minimize the need for "responsive" controls.

There is no national IPM policy in Uzbekistan, except for the use of beneficial insects in cotton and wheat. Occasionally, some traditional local IPM methods are being used. A few farmers have tried to use the predators and parasites raised to control cotton and wheat pests in orchards, but usually they spray after 15 days and kill all of the beneficial insects applied earlier. For almost all the major pests currently known in Uzbekistan, the same or similar pest exists in Europe and/or the USA. Searches of US university websites yielded a number of non-chemical pest and disease control measures to reduce overall pesticide use and represent valuable alternatives for Uzbekistan. After a thorough and critical review, these recommendations should be delivered to farmers, extension service members, agronomists working for other international organizations in Uzbekistan and possibly to pesticide salesmen, as well.

Annex 2 provides examples of IPM techniques used in the USA and Europe for the same or similar plant-pest systems that can be tried and integrated to current production systems in Uzbekistan, as well as expand pest control tactics beyond the current dominant role of pesticides. IPM measures are more efficient, if the general GAP is applied, but this is certainly not presently the case for many crops in Uzbekistan. Numerous pest problems occurring in Uzbekistan are due to poor crop management practices. Therefore, addressing the interaction between crop and pest management is critical in making IPM relevant for farmers. A deeper understanding of farmers' management strategies is required to frame meaningful specific IPM recommendations.

IPM utilizes the following approaches: cultural (use of resistant varieties, crop rotation, variation in time of planting or harvesting, crop refuse destruction, pruning, planting trap crops), mechanical (hand destruction, exclusion by barriers, trapping), physical (heat, cold, humidity, traps, sound), and biological (introduction and/or protection of imported or indigenous natural enemies of pests, propagation and dissemination of microbial control agents). IPM can also include use of: natural chemical methods (by using attractants, repellents, sterilants and growth inhibitors, but these were not requested nor approved in the framework of this PERSUAP), genetic methods (propagation and release of sterile or genetically incompatible pests), and regulatory means (plant and animal quarantines, suppression and eradication programs). The conscious integration of pesticides with the above-mentioned control measures and with farmers' traditional cropping and pest management systems is possible in AgLinks Uzbekistan project activities. Due to low toxicity (EPA III and IV) of PERSUAP approved pesticides a conscious integration of chemical control in the overall IPM approach per plant-pest system is possible and must be followed.

RECOMMENDATIONS

1. Enhance understanding of and emphasis on IPM approach and techniques through training, demonstration plots, farmer schools, etc. with pesticide use as a last resort.

2. Develop a technical manual summarizing IPM guidelines for the major crop-pest systems.

3. Adapt and translate the IPM manual into Uzbek (if Copyright permissions are obtained).

4. Annex 6 outlines a general approach to IPM program planning and design. (Reference: Environmental Guidelines for Small-Scale Activities in Africa, August 2006).

PESTICIDE PROCEDURES ELEMENT D- PROPOSED METHOD OR METHODS OF APPLICATION, INCLUDING THE AVAILABILITY OF APPLICATION AND SAFETY EQUIPMENT

This section examines how pesticides are to be applied and measures taken to ensure safer use.

For most field and greenhouse vegetable crops, spraying is done by plastic hand-pump backpack sprayers. Applicators use minimal or no safety equipment. For orchards, the use of motorized backpack sprayers to propel the spray covering the entire tree is rare. Old tractor-pulled spray booms are used, but the exact calibration of pesticide dosage is not possible due to the lack of good nozzles and good quality replacement parts. Many plastic hand-pump backpack sprayers, even after two or three years, begin to leak at several points at and on the tank, boom and pump handle. Motorized backpack sprayers and tractor driven spray booms have similar leak problems. Despite using more pesticides than required, the leak poses a higher risk for the applicator as clothes are contaminated. Moreover, if clothes exposed to pesticides are not washed after spraying they constitute a permanent source of contamination. Therefore, appropriate personal protection equipment, as well as regular maintenance and proactive repair, are of utmost importance.

In addition to providing protective clothing and equipment, as well as training for farmers, AgLinks Uzbekistan staff can monitor spraying operations (after obtaining appropriate knowledge) for leaking hand-pumps and motorized backpack sprayers. At the same time, spraying quality should be evaluated, for example using moisture sensitive technical indicator paper. Based on the number of deficiencies and shortcomings found, conducting of regular and repeated sprayer calibration and application trainings is required.

RECOMMENDATIONS

1. Record and solve leakage problems for all types of sprayers.

2. Provide multiple trainings in safe handling and use. Project staff who use or oversee pesticide use require training in safe handling and use of pesticides themselves. Almost no training was provided in the past in Uzbekistan or was not done appropriately. It is of utmost importance that training be performed by professionals.

3. Produce safe use training materials and posters. High quality training materials and safe use posters in the Uzbek language (and Cyrillic letters) and with pictograms are crucial. Please utilize existing materials and translate them into local language (taking into account any copyright issues). Do not waste time and resources developing new guidelines which appears a common practice in the region which produces erroneous information in most cases.

4. Distribute the Pesticide Use Checklist (PUC) for AgLinks Uzbekistan activities to NGOs and PVOs (Annex 7). Translate this into Uzbek language and distribute it to all participants. This will allow gathering baseline data for understanding safe use pesticide issues.

5. Ensure provision and use of protective clothing and safety equipment. These must be available to all pesticide handlers, mixers, users, applicators, and others present during application within the framework of AgLinks Uzbekistan and any USAID funded activity involving pesticide use. The protective clothing and equipment guide published in the Environmental Guidelines for Small-scale Activities in Africa is given in Annex 8.

6. During spraying and restricted entry intervals no person, especially children, should be allowed to enter the treated area. If people need to enter a treated area before this time has lapsed, they must wear protective equipment.

7. Respect the buffer zones requirements to surface water according to the USA EPA label information.

PESTICIDE PROCEDURES ELEMENT 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 PERSUAP examines the acute and chronic toxicological data associated with the proposed pesticides. In addition to hazards, this section also discusses measures designed to mitigate any identified toxicological hazards, such as training of applicators, use of protective clothing, and proper storage.

Acute and chronic human toxicity, as well as environmental toxicological hazards, are presented in Annex 1 for each AgLinks Uzbekistan-requested pesticide. The greatest risk in the entire pesticide system is exposure to concentrated pesticide product, when the pesticide package is transported, or opened and mixed with water. Different pesticide formulations pose different threats when the pesticide solution is prepared. Ideally, a water soluble bag should eliminate exposure during preparation when used correctly. The soluble concentrate and emulsifiable concentrate will require handling to measure and mix with both presenting a splash hazard. Liquid formulations may be absorbed if spilled or splashed onto skin. Wettable powders are messy and difficult to measure and mix. While both the dust and aerosol are ready-to-use, both produce fine particles which may be inhaled, requiring additional PPE. While liquid formulations are relatively easy to pour, measure and mix, they are more likely to be harmed by heat and cold than dry formulations. They are also more likely to penetrate exposed skin. Liquid formulations containing water are not packaged in water soluble packages (WSP) because they will dissolve the packaging. Since emulsifiable concentrations are not compatible with WSPs some materials are formulated into gel packs as an alternative.

Another serious risk is exposure while spraying, which concerns the applicator and anyone and anything which can be affected by pesticide drift. After application and until the end of the minimum re-entry period (MRP), any person or animal entering the treated areas and, potentially, the buffer zones is endangered. First aid actions for pesticide overexposure are laid out in Annex 10, while mitigation measures are given in Annexes 14 and 15. Besides exposure in the treated zones, farm and wild animals are exposed to pesticides when farmers clean their sprayers. Puddles filled with pesticide remains might attract animals. Rinsing spray equipment in or close to surface water or groundwater sensitive locations, including high proximity to wells and irrigation channels, presents hazards for humans, animals, fish and aquatic life, in general.

The minimum waiting time of last pesticide application before harvest must be respected as well. Principles of safe disposal of empty pesticide containers should be known by all farmers. Humans, farm animals, and wildlife are endangered and, temporarily or permanently, poisoned or killed if disposal is not appropriate. Therefore, safe disposal methodology (Annex 4) must be covered and repeated by AgLinks Uzbekistan staff or other contracted and experienced parties.

RECOMMENDATIONS

1. Train farmers, applicators, pesticide salesmen and extension service specialists (if available or being established) on risks and exposure problems for applicators, farm animals, and surface and groundwater.

All AgLinks Uzbekistan farmers and other respective pesticide users require training in pesticide risk management.

2. Develop or adapt posters on use of safety equipment correctly and efficiently as discussed above. For many projects using pesticides, posters exist to remind users of risk reduction measures and should be displayed and distributed in Uzbek language (and Cyrillic letters) and where pesticide users are present. This can also be done as part of a training program.

PESTICIDE PROCEDURES ELEMENT F- EFFECTIVENESS OF THE REQUESTED PESTICIDE FOR THE PROPOSED USE

This section of the PERSUAP requires information similar to that provided in Section 5.2, but more specific to the actual conditions of application. This section also considers the potential for the development of pest resistance to the proposed pesticide.

All of the pesticides chosen and requested by AgLinks Uzbekistan were selected based upon effectiveness, what local farmer's use (if environmentally safe), and what is currently available in Uzbekistan. Additional suggested pesticides, namely five insecticides, are recommended based on their efficient pest control under U.S. conditions. The same holds true for the additionally suggested five fungicides and three herbicides. However, based on extensive use of specific pesticides, a major concern to be addressed is the development of resistance of target pests towards respective pesticides, based on past and present pesticide use. To avoid pesticide resistance, rotation of pesticides from different classes, or types, having different mode of action and targeting different sites in the pest organism must be utilized in a coordinated and planned manner. For example, a registered organophosphate insecticide can be alternated with a synthetic pyrethroid, a chloro-nicotinyl or BT insecticide. This also applies for weed control, where a quick build-up of cross-resistance among herbicides in each type or class takes place. To avoid this, an aryloxyphenoxy propionic acid compound can be rotated with a bentazon-sodium salt herbicide. Annex 1 provides the resistance management action committee codes (FRAC, IRAC and HRAC). The website addresses of the respective committees are cited in Section 2.5 where the explanation of the acronyms can be obtained.

Adulteration of pesticide products by shopkeepers to increase perceived product volume with non-pesticide dusts, powders or water might exist in Uzbekistan. As long as no qualified and efficient laboratories exist this remains at the assumption level. Nevertheless, pesticide user concerns have to be addressed and in case of inefficient control the possibility of dilution must be considered. Many other factors can cause pesticide inefficiency including failures in spray solution preparation, old spraying equipment, incorrect spray timing, and wrong pest identification among others.

To determine pesticide efficacy outside the laboratory approach, the only reliable method remains the multi-location and multi-season field experimentation with artificial infection pressure. Ideally all available and environmentally sound pesticides representing different chemical classes should be frequently tested in research stations and monitored in farmers' fields. This requires a large coordinated effort that Uzbekistan should be able to provide in the near future based on a relatively well-established crop protection service and monitoring system. Development towards a standardized, coordinated and professional evaluation system can be supported during the lifetime of the AgLinks Uzbekistan project. It might be feasible, to establish small on-farm demonstrations with farmers as co-partners to familiarize all target groups with the concept of field studies, symptomatology, pest and disease dynamics, data collection and simple data analysis. As stated above, under developed agriculture, safe and transparent

pesticide registration requires multi-season and multi-location field experimentation by certified institutions, which will be a future requirement for Uzbekistan as well. The MAWR and its related facilities are encouraged and should be supported to develop this capability in the mid-term planning horizon.

RECOMMENDATIONS

1. AgLinks should recommend farmers rotate pesticides among pesticide classes to reduce the build-up of resistance.

2. AgLinks should recommend that pesticide salesmen provide advice for and offer pesticides suitable for pesticide rotation.

3. Monitor pest resistance to pesticides by observation, farmer feedback and other indications of efficacy reduction. Project staff should regularly monitor farmer's control rate for pesticides to note any reduction in efficacy. Close contact with neighboring farmers and MAWR specialist or potential extension agents is needed to determine essential pesticide rotation.

PESTICIDE PROCEDURES ELEMENT G: COMPATIBILITY OF THE PROPOSED PESTICIDE USE WITH TARGET AND NON-TARGET ECOSYSTEMS

This section examines the potential effect of the pesticides on organisms other than the target pests (ex., the effect on bee colonies in the spray area). Non-target species of concern also include birds, fish, other aquatic organisms and beneficial insects. The potential for negative impact on non-target species should be assessed and appropriate steps identified to mitigate adverse impacts.

The potential environmental impact of the AgLinks Uzbekistan-proposed pesticides on birds, bees, fish and other aquatic organisms when available is presented in Annex 1, Column 2. Uzbekistan is a country with an active apiculture. Reducing pesticide injury to honey bees requires communication and cooperation between beekeepers, farmers and applicators. It is important that beekeepers understand cropping practices and pest management practices used by farmers in the vicinity of their apiaries. Likewise, insecticide applicators should be sensitive to apiary locations, obtain a basic understanding of honeybee behavior, and learn which materials and application practices are most hazardous to bees. While it is unlikely all poisonings can be avoided, a balance must be struck between the effective use of insecticides, the preservation of pollinators and the rights of all—the beekeeper, farmer and applicator. In most cases, bee poisonings can be avoided by observing the following practices:

- Do not treat fields in bloom. Be especially careful when spraying pollinating crops. The label of certain insecticides expressly prohibits application to flowering crops.
- Examine fields and field margins before spraying to determine if bees are foraging on flowering weeds such as milkweeds, smartweed or dandelions. Where feasible, eliminate weeds by mowing or tillage.
- Choose short residual materials and low-hazard formulations if insecticides absolutely must be applied during the flowering period to save the crop. Notify local beekeepers as far in advance as possible.
- Avoid spray drift. Give careful attention to bee colonies positions relative to wind speed and direction. Changing spray nozzles or reducing pressure can increase droplet size and reduce spray drift.

- Apply insecticides when bees are not foraging. Some insecticides can be applied in late evening or early morning with relative safety.
- Adjust spray programs in relation to weather conditions. Reconsider the timing of insecticide application if unusually low temperatures are expected that night because residues can remain toxic to bees which enter the field the following day. Cease applications when temperatures rise and bees re-enter the field in early morning. Avoid treating during hot evenings if beehives are very close to the target field and honey bees are clustered on the outside of the hives.
- Read the pesticide label. Carefully follow listed precautions with regard to bee safety.

The following pesticides are requested by AgLinks Uzbekistan, accepted in this PERSUAP and are moderately to highly toxic for bees:

- **Fungicides:** Copper sulfate (basic); Triticonazole and Mancozeb (additionally suggested).
- **Insecticides:** Avermectin; Bifenthrin; Chlorpyriphos; Cyhalothrin gamma; Cyhalothrin lambda; Cypermethrin beta; Dimethoate; Imidacloprid; Indoxacarb; Malathion; Thiacloprid and Spinosad (additionally suggested).
- **Fumigants:** Aluminum phosphide.

Chemical and physical behavior of pesticides must be taken into account to maintain minimal non-target exposure, especially the fate processes of the pesticides. These processes can be grouped into those that affect persistence, including photodegradation, chemical degradation and microbial degradation, and those that affect mobility, including sorption, plant uptake, volatilization, wind erosion, runoff, and leaching. Pesticide persistence and mobility are influenced by the properties of the pesticide. The properties of a pesticide are, in turn, influenced by the soil environment, site conditions, weather, and application method. Some of the most important properties of a pesticide that can be used to predict environmental fate include half-life, soil sorption coefficient, water solubility, and vapor pressure. Temperature, light, moisture, bacteria, pH, etc. all affect pesticides in different ways and cause them to break down at varying rates. Some pesticides are more stable than others under the same conditions. When applying any pesticide, it is important to recognize that all the factors (light, temperature, moisture, pH, bacteria, etc.) will impact the active ingredient to a greater or lesser extent. The breakdown rate affects the time the pesticide is available for pest control, off target movement, groundwater, surface water and other possible environmental contamination.

Any pesticide will remain in the environment following application for some length of time and travel to some degree. To make sound pest management decisions, pesticide users, advisors, and resource managers should have an understanding of the fate of pesticides in the environment. Pesticide fate within the environment depends on the rate, timing, and method of application, as well as a variety of dynamic and interrelated physical, chemical, and biological processes. These processes are influenced by environmental conditions that are often site-specific. Careful consideration of these fate processes and their interaction is necessary to evaluate the risk to non-target ecosystems.

Please refer to Annex 1 where the potential impact of each pesticide on aquatic organisms, fish, birds, bees, beneficial insects, and ground water contamination is addressed.

RECOMMENDATIONS

1. Recommend the implementation of biological and cultural controls with use of pesticides as a last resort
2. Use only pesticides of EPA toxicity Class III and IV which are less hazardous.

3. Investigate the use of organic and botanical pesticides.

4. Recommend farmers follow the practices mentioned above to avoid bee poisonings by pesticides.

5. Apply pesticides at least 35 meters from open water to avoid killing fish and other aquatic organisms.

6. Monitor for any adverse effect on target and non-target environments and respond appropriately by utilizing mitigation measures including discontinuation of the respective pesticide.

PESTICIDE PROCEDURES ELEMENT H: CONDITIONS UNDER WHICH THE PESTICIDE IS TO BE USED, INCLUDING CLIMATE, FLORA, FAUNA, GEOGRAPHY, HYDROLOGY, AND SOILS

In general, this requirement attempts to protect sensitive ecosystems in the project area and superficial groundwater tables that might be particularly sensitive or subject to contamination from pesticide treatment operations. Based on information provided by AgLinks Uzbekistan there are currently no AgLinks Uzbekistan project activities with pesticide applications near protected areas or in proximity to endangered species.

The application of pesticides for pest control in rice-based cropping systems should be handled following GAP. Since pesticides are toxic by design and have the potential to adversely impact ecosystem health. Pesticides applied to rice fields are of some concern, as during the spraying season they are sometimes detected in drainage water discharged from rice farms. During this period, the chemical residues in rice fields can adversely affect the beneficial soil microorganisms on-site.

Pesticide use in rice cultivation under water holding regimes should be addressed separately. In the US, rice is assigned a 20 to 30 day water holding period after pesticide application. Currently, in California and other states, closed irrigation systems at field or farmer group level allow reduced water holding periods after pesticide application. This system requires additional technical investment and energy for water recycling. In Uzbekistan, the establishment of sophisticated rice irrigation systems is not yet feasible at a large scale; therefore, open irrigation systems have to follow the required 20 to 30 day water holding period after pesticide application. A long water holding period of 30 days several times during the season will result in increased salinity. Thus, environmentally sound pesticides should be applied which are characterized by short half-lives of active ingredients and low probability of ground water contamination. Herbicides and insecticides should be used with special care to reduce the probability of environmentally adverse effects. Good management practices in rice fields would mitigate the adverse effects on water quality. These should include establishing irrigation methods that control return flow (surface water flow back to rivers) and limit subsurface drainage discharge, choice of rice fields capable of degrading pesticides and retaining plant nutrients, and low sediment delivery from rice fields.

Pesticides are “formulated” in many ways, each with its own characteristics, to meet a wide array of pest control conditions, needs, application methods, applicator and environmental safety, handling and storage conditions, and actual pesticide characteristics. Pesticide behavior is important because all pesticides are

poisons, deliberately introduced into the environment. To maintain minimal non-target exposure, the chemical and physical behavior of pesticides must be taken into account.

Pesticide transfer is sometimes essential for pest control. However, too much movement can take a pesticide away from the target pest. This can lead to reduced pest control, injury of non-target species, including humans, and contamination of surface water and groundwater supplies. Pesticides can be transferred in five ways: volatilization, runoff, leaching, absorption, and crop removal.

Volatilization is the conversion of a solid or liquid into a gas. Once volatilized, a pesticide can move in air currents away from the treated surface. Vapor pressure is an important factor in determining whether a pesticide will volatilize: The higher the vapor pressure, the more volatile the pesticide. Environmental factors such as high temperature, low relative humidity and air movement tend to increase volatilization. A pesticide tightly adsorbed to soil particles is less likely to volatilize; therefore, soil conditions such as texture, organic matter content, and moisture can influence pesticide volatilization. Formulations can also help reduce volatilization. Granular, flowable, and wettable powders are less susceptible to volatilization than emulsifiable concentrates and soluble powders.

Runoff is the movement of water over a sloping surface. Runoff occurs when water is applied to the soil at a faster rate than it can enter the soil. Runoff water can carry pesticides in the water itself or bound to eroding soil particles. Vegetation and crop residue tend to slow the movement of runoff water. Certain physical and chemical properties of the pesticide are also important, such as how quickly it is absorbed by plants or how tightly it is bound to plant tissue or soil.

The severity of pesticide runoff is influenced by the slope or grade of an area, the erodibility, texture, and moisture content of the soil and the amount and timing of rainfall and irrigation. Pesticide runoff is usually greatest when a heavy or sustained rain follows soon after an application. Over-irrigation can lead to the accumulation of excess surface water and, especially with chemigation, pesticide runoff. Runoff can also occur if a pesticide is applied to saturated soil, resulting from previous rains or irrigation followed by a light rain or irrigation.

Practices used to reduce pesticide runoff include monitoring weather conditions, careful application of irrigation water, using a spray mix additive to enhance pesticide retention on foliage, and incorporating the pesticide into the soil. Reduced-tillage cropping systems and surface grading, in addition to contour planting and strip cropping, can also reduce pesticide runoff. Finally, dikes or a border of untreated vegetation can slow the movement of runoff water and help keep it out of wells, sinkholes, water bodies, and other sensitive areas.

Leaching is the movement of pesticides through the soil as opposed to movement over the surface. Pesticide leaching depends, in part, on the chemical and physical properties of the pesticide. For example, a pesticide held strongly to soil particles by adsorption is less likely to leach. Solubility is another factor because a pesticide that dissolves in water can move with water in the soil. Pesticide persistence, or longevity, also influences the likelihood of leaching. A pesticide that is rapidly broken down by a degradation process is less likely to leach because it may remain in the soil only a short time.

Soil factors that influence leaching include texture and organic matter, in part because of their effect on pesticide adsorption. Soil permeability, or how readily water moves through the soil, is also important. The more permeable a soil, the greater potential for pesticide leaching: A sandy soil is much more permeable than a clay soil. Pesticides can leach through the soil to groundwater from storage, mixing, equipment cleaning, and disposal areas. Under certain conditions, some pesticides can leach to groundwater from normal application. Pesticide leaching can also be influenced by the method and rate of

application, the use of tillage systems that modify soil conditions and the amount and timing of water a treated area receives after application. Typically, the closer the time of application to a heavy or sustained rainfall, the greater likelihood some pesticide leaching will occur.

Monitoring weather conditions and the amount and timing of irrigation can help minimize pesticide leaching. Careful pesticide selection is important because those that are highly water soluble, not readily adsorbed, and not rapidly degraded are the most likely to leach. Labels must be carefully inspected for application instructions such as rates, timing, and method. Labels may also contain statements that advise against the use of the pesticide when certain soil, geologic, or climatic conditions are present.

Absorption or **uptake** is the movement of pesticides into plants and animals. Pesticide absorption by target and non-target organisms is influenced by environmental conditions and by the chemical and physical properties of both the pesticide and the soil. Once absorbed by plants, pesticides may be broken down or remain inside the plant until the tissue decays or the crop is harvested.

Crop removal transfers pesticides and their breakdown products from the treatment site. Most harvested food commodities are subjected to washing and processing procedures that remove or degrade much of the remaining pesticide residue. Although harvesting is more typically associated with food and feed products, it is easy to forget that pesticides can be transferred during such operations as tree and shrub pruning and turfgrass mowing.

Relevant data for the pesticides proposed for use on the AgLinks Uzbekistan project can be found by checking each pesticide on the PAN website: http://www.pesticideinfo.org or http://extoxnet.orst.edu/pips/ghindex.html and other relevant websites. If available, water solubility, soil adsorption and natural breakdown rates are provided at the end of the webpage for each parent chemical. In general, pesticides with water solubility greater than 3 mg/liter have the potential to contaminate groundwater and pesticides with an adsorption coefficient of less than 1900 have the potential to contaminate groundwater. Pesticides with an aerobic soil half-life greater than 690 days, or an anaerobic soil half-life greater than 9 days, have the potential to contaminate groundwater. Pesticides with a hydrolysis half-life greater than 14 days have potential to contaminate groundwater as well.

Potential for surface and ground water contamination by each proposed and accepted pesticide is described in Annex 1. The impact potential on general soil health and mortality against echinoderms (worms) is also provided. Consult this table to determine contamination potential and use the respective pesticide with appropriate precautions. Additional mitigation measures are listed in Annex 14. Widely used furrow irrigation represents a potential risk for transport of pesticides applied prior to the irrigation. Therefore, it has to be ensured that no run-off water leaves the field or orchard by closing irrigation furrows 35 m before the end of the field at a minimum. Special attention has to be given to pesticides with high groundwater contamination potential, those posing risks to fish and other aquatic life, as well as to slowly degrading substances.

GROUNDWATER CONTAMINATION ISSUES AND DISCUSSION

AgLinks Uzbekistan requested and by this PERSUAP, approved pesticides that may potentially contaminate ground water due to their chemical nature, breakdown rates, and lower ability to bind to soil particles are:

- **Fungicides:** Carboxin; Propiconazole; Tebuconazole; Thiophanate-methyl; Triadimefon.
- **Insecticides:** Dimethoate; Imidacloprid; Malathion; Azadirachtin (additionally suggested)
- **Herbicides:** Bentazon sodium salt (additionally suggested).
- **Nematicide:** Dazomet (additionally suggested).

In addition to groundwater contamination, many pesticides are toxic to fish. Below is a list of all AgLinks Uzbekistan requested and PERSUAP approved pesticides that are either moderately, highly, or very highly toxic to fish.

- **Fungicides:** Carboxin; Copper sulfate (basic); Propiconazole; Tebuconazole; Thiram; Triticonazole; Copper ammonium complex (additionally suggested); Copper Octanoate (additionally suggested); and Mancozeb (additionally suggested).
- **Insecticides:** Avermectin; Bifenthrin; Buprofezin; Chlorpyrifos; Cyhalothrin gamma; Cyhalothrin lambda; Cypermethrin beta; Etoxazole; Hexythiazox; Indoxacarb; Malathion; Pyriproxyfen; Thiacloprid and Spinosad (additionally suggested).
- **Herbicides:** Bentazon sodium salt (additionally suggested); Fluazifop-P-butyl (additionally suggested); Pendimethalin (additionally suggested).

RECOMMENDATIONS

1. Use a Pesticide Only When Necessary

2. Use Less Toxic Pesticides

3. Use Safe/Sensible Application Methods:

- The first rule of responsible pesticide use is to read and then reread the pesticide label and follow the directions precisely.
- Pay particular attention to warning statements about environmental hazards on the label. Look for: “This product is toxic to fish.” If you see such a warning, consider another pesticide or an alternative control method.
- Ensure that your application equipment is in good working condition. Check for leaks, replace worn parts, and carefully calibrate your equipment.
- When preparing the pesticides for application, be certain that you are mixing them correctly.
- Never wash spray equipment in lakes, ponds, or rivers. If you use water from natural ponds, lakes, or streams, use an antisiphon device to prevent backflow.
- If you are applying pesticides near water, check the label to find the recommended buffer zone. Buffer strip widths between the water and the treatment areas vary. Leave a wide buffer zone to avoid contaminating fish and aquatic animals.
- Store and dispose of unused chemicals and their containers according to the label instructions.

- Avoid pesticide drift into non-target areas, or applications during wet, windy weather that might promote runoff to non-target streams, ponds, or lakes. Spray on calm days or early in the morning or evening when it is less windy.
- Subsurface drains are an effective mitigation measure for pesticide runoff losses from slowly permeable soils with frequent water logging.
- Constructed wetlands are promising tools for mitigating pesticide inputs via runoff/erosion and drift into surface waters

PESTICIDE PROCEDURES ELEMENT I: AVAILABILITY OF OTHER PESTICIDES OR NON-CHEMICAL CONTROL METHODS

This section identifies other options for pest control and their relative advantages and disadvantages. Non-chemical methods are documented for the various plant-pest systems in Annex 2. This PERSUAP document recommends some additional or replacement pesticides, some of which are not on the marketplace nor registered in Uzbekistan.

Each year several pesticides are considered for registration in Uzbekistan and a number of foreign enterprises are planning to introduce pesticide products. Registration will be done carefully so that no highly toxic products, no POPs chemicals and no PIC chemicals (Annex 16) are permitted. This will be done based on existing Uzbek regulations and later on improved regulatory protocols and laws of Uzbekistan, which could be influenced by AgLinks Uzbekistan policy and potential regulation recommendations based on EPA procedures. FAO's code of conduct will be followed. Uzbekistan has the capability to test the pesticides appropriately under field conditions but not at the laboratory level. This should be utilized and supported by AgLinks project activities to further improve pesticide quality.

A common strategy to approve active ingredients, which are registered in neighboring countries, is not applicable, since these countries might not follow internationally established standards. Pesticide registration should be based on successful multi-season and multi-location field testing, thorough environmental and human health evaluation, as well as a transparent process. Simply transferring a neighboring country's approval might open a backdoor for repeating, widening and prolonging mistakes most probably begun in other countries with problematic registration systems. Therefore, an independent, objective and transparent Uzbek registration process is crucial for environmental, consumer and farm safety.

Development of a modern extension service to do field experiments and on-farm trials for pesticide evaluation, spray timing and plant toxicity should be supported. For dosage and use, farmers currently rely on the recommendations of pesticide sellers and, if available, label information. Spraying follows traditional schedules and is rarely based on threshold decisions and regular monitoring. An independent and transparent third party would be the best source of dosage and usage information, but such a system does not exist and might still take several years to establish and function efficiently.

A major issue encountered during the study tour is the marketing of pesticides for use on additional crops than the ones already permitted by the Uzbek pesticide registry. This is practiced at pesticide enterprise and pesticide shop level. AgLinks Uzbekistan must address and work against these habits wherever possible and feasible. Since the unconscious use of many readily available pesticides seems to be a wide spread problem, AgLinks Uzbekistan should advocate, monitor and report these practices. Farmers implementing project activities must follow Uzbek pesticide regulations only for the registered crop use.

Another problem, as addressed elsewhere in the report, remains the use of similar sounding product names of long established and successful products from competing pesticide producers. This should be addressed by AgLinks Uzbekistan staff for participating farmers to reduce confusion and secure the use of intended products. It should be noted, that major international pesticide manufacturers prefer to market older pesticide products in Uzbekistan. More modern and environmentally sound products will only be marketed if alternative old products are not available, show inefficiency in controlling target organisms, are banned or not registered by the Uzbek authorities. AgLinks Uzbekistan should raise the awareness of respective institutions in the country to address these problems. It was noted during the site visits that most pesticides distributed by Euro-Team do not target, or provide additional benefits for, AgLinks Uzbekistan targeted crops.

Genetic resistance is an economically and environmentally sound control method to prevent pest epidemics. Uzbekistan needs to foster close relationships with the various CGIAR centers to ensure the latest genetic material is being introduced and tested. Cultural controls (ex., crop rotation, sanitation, selective planting dates to avoid pests) and mechanical control (ex., uprooting, weed harvesting, cultivation, and use of insect traps) also play a vital role.

Fertility management can also support a crop's ability to tolerate infestations. More biologically based pest control measures will complement other control methods and can be combined with organic and inorganic sources.

Biological 'pesticides' are available commercially from several international companies, and some national facilities of the Bio-Laboratory system in Uzbekistan and other Central Asian countries. Predators of and parasites against spider mites, beetles, leaf miners, mealy bugs, thrips, aphids, whiteflies, and moth and butterfly larvae are available. All internationally established standards regarding introduction of non-indigenous species should be followed when introducing biocontrol agents from outside the region. Therefore, it is highly advisable to only use organisms which are already readily produced in Uzbekistan. Botanical pesticides registered by USEPA are presented in Annex 5, some of which may be used as practical alternatives once registered for use in Uzbekistan.

RECOMMENDATIONS

1. Research and try 'biological pesticides' and 'botanical pesticides' as practical.

2. If practical, research and try pheromone mating disruption techniques for several moth pests.

3. Implement IPM measures specific for each crop-pest system.

4. Combine these approaches with good sanitation and fertilization.

5. Develop links to national, regional and international institutions and persons with IPM expertise.

PESTICIDE PROCEDURES ELEMENT J: 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 pesticides. If the host country's ability to regulate pesticides is inadequate, the proposed action could result in greater harm to the environment.

Uzbekistan's environmental and human safety systems are structurally between the previous Soviet and modern approaches. Further improvements are hindered by poverty, corruption, inefficient controls, inefficient monitoring and the existing, sometimes inconsistent, legislation on pesticide use. Some improvements and adjustments have been undertaken while others are underway but all require further encouragement. Large international organizations like FAO and UNDP, as well as bilateral donors like GTZ and USAID, have supported modernization efforts. Hopefully, these efforts will eventually lead to further improvement of pesticide relevant legislation, monitoring and the response situation. AgLinks Uzbekistan should be supportive within the framework of their policy analysis initiatives.

A number of pesticides are being considered for registration in Uzbekistan and there are several international companies attempting to introduce more pesticide products, but not necessarily the most advanced and environmentally sound material. Registration should be done carefully so that no highly toxic products, no POP or PIC chemicals are permitted. FAO's code of conduct should be followed. However, there is no modern analytical capability to test pesticides and there is currently only a rudimentary extension service within the crop protection service structure. Therefore, determining pesticide efficiency, safety and elucidating pesticide failures is not presently possible for crops other than cotton and wheat. For dosage and use, farmers currently rely on the recommendations of pesticide sellers and/or labels. A truly neutral third party (independent institutes or laboratories, maybe universities) would be the best source of dosage, usage and monitoring information, but such a system does not exist and is unlikely to develop during the next few years. Visited shops selling pesticides and other agricultural inputs had varying levels of pesticide qualities, packaging and labeling, as well as safety provisions knowledge. The general order is good, but can be improved. Subdividing liquids and powders into smaller quantities and poorly or non labeled packages are very common. Complete and appropriate labeling following internationally established standards is a must. AgLinks Uzbekistan has the task to ensure pesticide users within the project framework carefully follow these unaltered standards. This should include receiving all information provided on the current EPA label of the exact or similar product. Storage of pesticides in food container or soft drink bottles was not detected. However, accidents have happened in the past in Uzbekistan with wrongly packaged pesticides and should, therefore, be addressed appropriately and repeatedly. At present, specific knowledge of almost all pesticide users is very poor and requires immediate and durable improvements. Annex 4 provides general on-farm pesticide disposal options and rules.

In each province, there are sites with large quantities of obsolete pesticides left over from the Soviet era. They are guarded and fenced, but it remains unclear if they are under "Uzkimyosanoat" SJSC responsibility, the state crop protection service or the environmental unit within the MAWR. These sites might be partially open and exposed to the local environment, including soil and water. Proper monitoring and follow up is required for these sites and can accompanied AgLinks Uzbekistan activities, at least at the level of clarification of responsibility, safety improvements and establishment/widening of obsolete pesticides and improvements in pesticide packaging and storage.

RECOMMENDATIONS

1. Continue to work with the MAWR and the environmental unit within this Ministry as they implement environmental compliance of pesticide use legislation.

2. AgLinks Uzbekistan staff should continue to work closely with the MAWR and contribute to the required development of pesticide regulation and registration.

3. Train Uzbek pesticide shopkeepers in proper storage, handling and labeling of pesticides.

PESTICIDE PROCEDURES ELEMENT K: 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.

Training in IPM and Safe Use are of paramount importance for Uzbek pesticide users. Many farmers might be generally inexperienced due to several factors. They might have started their farming profession without ever receiving crop protection education, started new cropping systems to seek better opportunities, might be unfamiliar with basic agronomic practices or simply a victim of recently introduced pest problems or outbreaks of epidemics in their village, region, or in proximity to their fields or orchards by neighboring farmers mismanagement. Recently the Uzbek government restructured the farming sector and placed less successful farmers under the supervision of more skilled farmers, who might lack knowledge in modern crop protection. It is difficult to provide efficient IPM training, if major and key knowledge is deficient. Logically, training should first address basic principles of plant-pest systems, plant vigor, pest dynamics and then introduce farmers to environmental sound production, GAP, IPM techniques and procedures. AgLinks Uzbekistan personnel should improve its own agriculture and crop protection knowledge base to be able to assist farmers in their required professional development. As part of this PERSUAP activity, 2 – 3 days of stakeholder training could be given to facilitate message building, “train the trainer” activities, and comply with PERSUAP requirements. At the end of each session, trainees are provided with training materials and safety slide print-outs. All trainees should also be made aware, that additional support is available from electronic data collected by AgLinks Uzbekistan, after translation into Russian or Uzbek. This includes IPM tactics and other pesticide issues.

Since restricted use products pose a higher risk for health and/or the environment, special safety regulations have to be applied. These regulations are included and monitored when pesticide users are certified in USA. To use these pesticides safely in AgLinks Uzbekistan project activities, all respective and potential pesticide users have to receive special training how to use RUPs safely. This training should be repeated annually and skills tested at the end of each training. Until 2012, products with active ingredients of Restricted Use Products must be phased out and replaced by product groups free of RUPs. Those active ingredients are listed in Section 2.6, which are not followed by the terms “REJECTED” or “Special Safety Training Required”. Pesticide users have to be made aware of pesticide alternatives free of restricted use products and participate actively in phasing out restricted use products.

PERSUAP approved pesticides will not have significant adverse environmental impact nor significant adverse impact on human health if users follow all pesticide safe use regulations and RUP pesticide users receive Special Safety Training. Appropriate mitigation measures are recommended and discussed elsewhere in this document.

RECOMMENDATIONS

1. Implement repeated pesticide safe use training for MAWR, AgLinks Uzbekistan and farmers involved in project activities. Training can occur via a “Training of Trainers” format, whereby supervisors are trained for 2-3 days, followed by training for applicators and laborer staff on the subsequent 2-3 days.

2. Develop, apply and repeat Special Safety Training and verify training success for all potential users of restricted use products (RUPs) in AgLinks Uzbekistan activities.

PESTICIDE PROCEDURES ELEMENT L: PROVISION MADE FOR MONITORING THE USE AND EFFECTIVENESS OF EACH PESTICIDE

Evaluating the risks and benefits of pesticide use should be an ongoing, dynamic process. AgLinks Uzbekistan project staff or skilled local or international experts will monitor pesticide efficacy and effects to crops and the environment on a frequent basis and utilize alternative pesticides as recommended, required and available. Regional managers will monitor for efficacy against pests and impact on beneficial organisms in their respective areas of project activity.

RECOMMENDATIONS

1. Simple monitoring plans will be drafted by the responsible AgLinks Uzbekistan agronomist in cooperation with site managers. Site managers will be responsible for collecting data on efficacy and any other relevant environmental impacts requiring alternative pesticides. This will be reported to USAID during the normal project reporting processes.

2. Update the PERSUAP to take into account new information obtained, received and any new pesticide requests.

SAFE USE ACTION PLAN

For each of the 12 elements of the PER, and for each pesticide listed in Annex 1, there are recommended mitigation procedures or actions that will need to be completed in order to increase the safety of pesticide use to both the environment and human health. The planned content and timeline to implement the safe use action plan within the AgLinks Uzbekistan framework is described below. The project shall report to USAID in quarterly reports on the required mitigation measures and trainings.

IMMEDIATE ACTIONS

1. Do not use non-EPA registered or EPA Acute Toxicity Class I pesticide products on AgLinks Uzbekistan project activities (except for raisin and dried fruit fumigation of AgLinks Uzbekistan target crops).

2. Begin phase out in 2009 through 2012 of all EPA registered active ingredients used in Restricted Use Products.

3. Develop Crop protection training manuals and training sessions (including accurate pest diagnostics, pest scouting and assessment, economic threshold, IPM measures, spray mixture preparation, spraying equipment, etc.) and safety training (including personal protection, environmental protection, health issues, first aid measures and consumer protection) for:

- Pesticide use of all general use products.
- Specifically addressing any issues related to the use of restricted use products.
- Fumigation and other post harvest pesticide use on raisins and dried fruits of AgLinks Uzbekistan target crops.

4. Use only single active ingredient products.

5. From PERSUAP approved active ingredients always use EPA Class III and IV products and train farmers and all other users accordingly.

6. Use EPA Class II products from PERSUAP approved active ingredients only if Classes III and IV are not produced and have no active EPA registration.

7. PERSUAP approved active ingredients with EPA II toxicity will only be used by trained farmers and other trained users.

8. For AgLinks Uzbekistan to use the accepted pesticide products in the short term, users require immediate and repeated training (before the 2009 spraying season ends) in pesticide safe use (including risks to open water, farm animals, users and consumers) and IPM techniques.

9. Help secure safety equipment, or personal protection equipment, for farmer use and enforce its use.

10. Begin a collection of Pesticide Company Labels and Material Safety Data Sheets (MSDS) for each pesticide product used on AgLinks Uzbekistan plots in Uzbekistan. Produce a quick reference guide for all project use pesticides for each anticipated pest, with use rates, safety measures, environmental

concerns, and minimum reentry periods (MRPs). Update the collection repeatedly as EPA initiated label changes are common especially regarding safety measures, environmental precautions and permitted crop use as new scientific data, concerns and incidences are addressed.

11. Continue to choose and use the least toxic pesticides practical.

12. Intend to integrate and use more non-chemical tactics, such as those used in the USA or in Europe.

13. Produce a pest control guide, including IPM tactics, for each crop and pest combination found in AgLinks Uzbekistan project activities and use and build an electronic database collection as a reference.

14. Develop training manuals and videos, stressing effective sprayer usage, calibration, and pesticide safety, and focusing on the assembly, use and maintenance of the sprayers itself.

15. Provide maintenance facilities to repair sprayers, foster local repair shops in each community, hold sprayer inspection, and calibration sessions where farmers bring their sprayers to test by filling with water to find leaks and calibrate them by checking the nozzles and spray patterns.

16. Additional information provided, or obtained in electronic form, can be translated and distributed (i.e. IPM methods for AgLinks Uzbekistan targeted crops, always respecting copyrights).

17. AgLinks Uzbekistan shall only work with farmer and farmer groups who agree to use only PERSUAP approved pesticides within an IPM program for their target crops.

18. For PERSUAP approved pesticides without an Uzbek registration, the registration process should be initiated and, ideally, a temporary permission to use those already on project sites should be obtained, where possible.

19. If the EPA permitted use of a specific product on AgLinks Uzbekistan target crops is not specifically listed in the respective Uzbek registration documents then seeks official Uzbek permission to use it on the AgLinks Uzbekistan target crops, where practicable.

20. AgLinks Uzbekistan might also initiate cancellation of some highly toxic and non-EPA approved pesticides with Uzbek registration bodies to improve environmental and human safety.

21. Clarify for all AgLinks Uzbekistan partners receiving USAID funds, or other donor funds in joint activities, that only PERSUAP approved pesticides are permitted. Cooperation by AgLinks Uzbekistan in joint activities using non-PERSUAP approved pesticides in a given location or group of farmers is not permitted.

CONTINUOUS ACTIONS

1. Make note of leaking backpack sprayers and assist farmers to remedy this issue, as practical.

2. Continue to educate farmers on the need for pesticide safety, wearing of protective clothing and emphasize the proper disposal of empty pesticide bottles.

3. Advise everybody, with special focus on children, to be away from the field while spraying and do not enter fields where such products have been recently applied (until the EPA approved re-entry time limit has passed).

4. Closely monitor planned and factual use of RUPs and conduct frequent training prior to any use of RUPs. Moreover, design feedback protocols into training programs, undertake training needs assessments, and carry out short adoption surveys.

5. Monitor and train on fumigation of raisins and other dry fruits and ensure any product users follows all safety regulations regarding fumigated product processing and consumption.

6. Educate farmers on rotating pesticide families to reduce the resistance build-up.

7. Monitor pest resistance to pesticides by noting efficacy reduction of each product.

8. Recommend farmers apply pesticides early in the morning or early in the evening when bees are not active.

9. In areas with sandy soil, utilize pesticides with low ground water contamination potential.

10. AgLinks Uzbekistan staff should ensure farmers apply buffer zones requirements for surface water according to the USA EPA label information.

11. Research and try 'biological pesticides' and 'botanical pesticides', as practical, and seek registration, thereafter, if MAWR decision makers are positive about the results.

12. If practical, research and try pheromone mating disruption techniques for moth related pests combined with good orchard sanitation and fertilization.

13. Continue to work with the MAWR and the department for environmental protection as they implement environmental compliance legislation and encourage them to establish IPM as a national policy, develop standards for pesticide packaging and repacking in country, enforce standards for pesticide labels in terms of quality and disseminate information.

14. Monitor the EPA pesticide registration changes, including expiring registrations, ineligibility for re-registration, changes in EPA toxicity classifications, crop use permissions of products and the suitability of new products.

15. Monitor for any adverse effect on target and non-target environments and respond by appropriately utilizing mitigation measures up to discontinuing use of the respective pesticide.

16. The use of appropriate personal protection equipment is absolutely mandatory for any pesticides labeled as suspected and proven carcinogens, reproductive and developmental toxins, and endocrine disruptors (see Annex 1 and current EPA approved product label).

BY JUNE 30, 2009 ACTIONS

1. Train Uzbek pesticide shopkeepers in proper storage, handling and labeling of pesticides.

2. Update the PERSUAP to take into account new information received and new pesticides requested, and amend the PERSUAP to reflect these changes.

ANNUAL ACTIONS

Write pesticide and GAP/IPM issues and mitigation actions into all work plans, especially annual work plans, including intentions to monitor progress of the project in implementing their specific SUAP, any

outstanding pesticide risk issues, use of IPM tactics, farm certification issues, and other risk mitigation measures taken. Submit semiannual and annual reports to USAID that include project progress implementing the specific AgLinks SUAPs, outstanding pesticide risk issues, use of IPM tactics, farm certification issues, and other risk mitigation measures taken.

BY END OF PROJECT ACTIONS

Update any changes to the list of crops, pests and proposed pesticides for use and communicate these changes to USAID to amend this PERSUAP as needed.

LITERATURE

ADS Chapter 204. Environmental Procedures. 2007.

Compendium of Stone Fruit Disease. 2000. J.M. Ogawa, E.I. Zehr, G.W. Bird, D.F. Ritchie, K. Uriu, and J.K. Uyemoto (eds) APS Publication, St. Paul, Mn, USA.

Crop Protection Compendium 2007.

Crop Protection Reference, Labels and Product Listings 2009. Vance Publishing Corporation.

Demiri, Hiqmet 2007. Pesticide Evaluation Report and Safe Use Action Plan for the Kyrgyz Agri-Input Enterprise Development (KAED) Project.

Environmental guidelines for small-scale activities in Africa: Environmentally sound design for planning and implementing humanitarian and development activities. 1996. USAID; Knausenberger, Walter I.; Booth, Gregory A.; Bingham, Charlotte S.; Gaudet, John J. 201p.

Environmental guidelines for small-scale activities in Africa: Environmentally sound design for planning and implementing development activities 2007. USAID, Africa Bureau.

Gaertners Pflanzenarzt (16) 2005. Landwirtschaftsverlag Muenster-Hiltrup, Germany, 2006.

Peljito, Amela, Nedzad Karic and Benjamin Toric 2005. Pesticide Evaluation Report and Safe Use Action Plan for the project: Linking Agricultural Markets to Producers (LAMP), Bosnia-Herzegovina.

Pesticide Chemistry: Crop Protection, Public Health, Environmental Safety, 2007. H. Ohkawa, H. Miyagawa and PW Lee eds. Wiley-VCH Verlag.

The UK Pesticide Guide, 2009. MA Lainsbury eds. CABI and PCPC Publications

The Pesticide Manual. C.D.S. Tomlin; BCPC Publications, Berkshire, UK, 2008.

Scholz, Uwe 2008. Pesticide Evaluation Report and Safe Use Action Plan for the AgLinks Project in Tajikistan.

Sound Management of Pesticides and Diagnosis and treatment of Pesticide Poisoning. WHO, 2006.

Taschenbuch des Pflanzenarztes (54). Landwirtschaftsverlag Muenster-Hiltrup, Germany, 2006.

USAID Environmental Procedures. Training Manual for USAID Environmental Officers and USAID Mission Partners. Fisher, W. and Stoughton, M. (eds.) ANE Edition 2002.

USAID Environmental procedures, Title 22, Code of Federal Regulations, Part 16, Washington, USA, 1980.

The WHO recommended classification of pesticides by hazard and guidelines to classification : 2005.

ANNEX 1

SYNOPSIS OF AGLINKS UZBEKISTAN REQUESTED PESTICIDES AND ADDITIONALLY SUGGESTED PESTICIDES ANALYZED FOR EPA (AS OF MARCH 6, 2009) AND UZBEKISTAN REGISTRATION, EPA AND WHO ACUTE TOXICITY CLASSIFICATIONS, PRODUCT NAME, ACUTE AND CHRONIC HUMAN HEALTH IMPACTS, AND ENVIRONMENTAL IMPACTS

Please note: The use of the appropriate personal protection equipment is absolutely mandatory for any pesticides labeled as a suspected and proven carcinogen, reproductive and developmental toxin, and endocrine disruptor (see Annex 1 and current EPA approved product label).

Generic name of Pesticide Active Ingredient, Classification, Type, RAC code **EPA and Uzbekistan Registration Status,** **EPA and WHO Acute Toxicity Classification,** **RUP and Product name (potential products)** **Formulation** **RED if scheduled**	**Human Acute and Chronic Health Toxicology and Environmental Hazards**
FUNGICIDES	
AgLinks requested **Bordeaux mixture** ➔ **REJECTED** **No EPA registration**	
AgLinks requested **Bromuconazole** a triazole fungicide ➔ **REJECTED** Registered by USEPA and by Uzbekistan EPA toxicity class II (technical) and III (Bromuconazole), highly and moderately toxic, CAUTION and WARNING; WHO **II**, moderately hazardous.	**Health:** Acute: Low dermal and inhalation toxicity. May cause effects on the nervous system, if ingested, resulting in depression. Chronic: May have effects on the liver, resulting in tissue lesions and impaired functions.

fungicide (EPA III).

Formulation EC GR SC

No EPA permission for intended use

Environment: MT to aquatic organisms, NT to Bees. Possible ground water contaminant. Bromuconazole exhibits medium to low mobility in soil. It is essentially stable to hydrolysis and photolysis is not expected to be a significant process in the breakdown of bromuconazole in natural aquatic systems.

AgLinks requested

Bronopol, a fungicide and microbiocide ➔ **REJECTED**

Registered by USEPA and by Uzbekistan

EPA toxicity class I (Myacide s15) and III (Bbj maintain c-1 for floors and walls-antimicrobial), extremely and moderately toxic, Danger and Warning, WHO rating **II**, moderately hazardous, **PAN bad actor**

No RUPs. Sold in Uzbekistan as Dabron and Emissar as seed treatments, I, e, Myacide s15 (EPA I).

Formulation DS SP WP

No EPA permission for intended use

Health: Acute: bronopol can cause skin irritation, partially breaks down to formaldehyde, and is a severe eye irritant in its concentrated form

Chronic: No issues

Environment: ST to avian species and freshwater fish; MT to freshwater invertebrates; and MT to HT to marine invertebrates.

AgLinks requested indirectly

Calcium hydroxide (as a.i. in bordeaux mixture)
REJECTED

a inorganic fungicide, microbiocide (a.i. in bordeaux mixture)

Registered by USEPA

EPA toxicity class I (Hydrated lime manufacturing use product) and III (Hydrated lime), extremely and moderately toxic, Danger and Warning, WHO rating not listed.

No RUPs.

Formulation Dust and SC

No EPA permission for intended use

AgLinks requested indirectly

Carboxin (as a.i. in Vitavax)

a carboxamide fungicide FRAC 7

Health: Acute: Severe eye irritation. Slightly skin irritation

Chronic: known developmental or reproductive toxin

EPA toxicity Class I (Flo pro v seed protectant), II (Vitavax - 30c) and III (Vitavax flowable fungicide), extremely, highly and moderately toxic, DANGER, WARNING, CAUTION, WHO rating U, unlikely to be hazardous, **PAN bad actor**

No RUPs. Sold in Uzbekistan in Vitavax (2. a.i. Thiram)

Formulation FS, SC, WP, WS

AgLinks requested indirectly

Copper sulfate (anhydrous) (Cu_2SO_4)(Сульфат меди)

(as a.i. in Bordeaux mixture) ➔ **REJECTED**

an inorganic copper fungicide

Registered by Uzbekistan

EPA toxicity class I (Aqua maid permanent algaecide, Spring clear), extremely toxic, DANGER, WHO rating II, moderately hazardous

Sold in Uzbekistan as Sulfat medi (EPA I).

No EPA registration

AgLinks requested indirectly

➔ **accepted with conditions**

Copper sulfate (basic) [$3Cu(OH)_2CuSO_4$]

an inorganic copper fungicide

Registered by USEPA, **clarify registration in Uzbekistan, as Cu_2SO_4 = Copper sulfate (anhydrous) is registered, see cell above**

EPA toxicity class I (Acme bordeaux mixture), II (Basic copper 50 hb) and III (Cuprofix 40 disperss df**, RUP**), extremely, highly and moderately toxic, DANGER, CAUTION and WARNING, WHO rating **II**, moderately hazardous, PAN bad actor

RUPs.

Formulation AI SC WP

Health: Acute: Corrosive to mucous membranes and the cornea. Irritation of skin, eyes, and respiratory tract. If ingested has a metallic taste, causes nausea, vomiting and stomach pain.

Chronic: cause jaundice and enlarged liver. Blood cells rupture resulting in circulatory collapse and shock.

Environment: HT to earthworms. MT to fish and bees. Strongly adsorbed by the soil.

AgLinks requested **Diniconazole** **No EPA registration**	➔ **REJECTED**	
AgLinks requested **Epoxiconazole** **No EPA registration**	➔ **REJECTED**	
AgLinks requested **Ferrous-sulfate (FeSO4)** **(Сульфат Железа)** **NO EPA Registration**	➔ **REJECTED**	
AgLinks requested **Flutriafol** **No EPA registration**	➔ **REJECTED**	
AgLinks requested **Guazatine** **NO EPA Registration**	➔ **REJECTED**	
AgLinks requested **Oxadixyl** **NO EPA Registration**	➔ **REJECTED**	
AgLinks requested **Penconazole** **No EPA registration**	➔ **REJECTED**	
AgLinks requested **Pencycuron** **No EPA registration**	➔ **REJECTED**	
AgLinks requested **Propamocarb hydrochloride,** a carbamate fungicide	FRAC 28	**Health:** Acute: May be harmful if swallowed, inhaled or absorbed through the skin.

EPA toxicity class III, moderately toxic, Caution, WHO rating U, unlikely to be hazardous.

No RUPs. Sold in Uzbekistan as Previcur, i.e. Previcur flex FC 60% (EPA III).

Formulations SC and SL.

(2011 RED)

Environment: PNT to birds, bees, fish, & worms. Rapidly degraded in soil by microbial processes, following a brief lag phase, retained in the upper soil layer (up to 20 cm) and little is found in leachate.

AgLinks requested

Propiconazole, a triazole fungicide FRAC 3

Registered by USEPA and Uzbekistan

EPA toxicity class I (Wocosen 150 ec), II (Bumper 14.3 ec) and III (Orbit 45W), extremely, highly and moderately toxic, Danger, Warning, Caution, WHO II, moderately hazardous, **PAN bad actor. One product (Orbit 45wp agpak, 2. a.i. fentin hydroxide) has an RUP.**

Sold in Uzbekistan as Bumper (EPA II), Titu and Krest

Formulations EC GL and SC.

(2017 RED) **Do not use EPA Class I products**

Health: Acute: May cause eye irritation and/or corneal injury and skin irritation.

Chronic: Possible carcinogen, suspected endocrine disruptor and known developmental or disruptive toxin

Environment: PNT to birds and bees, ST to crustaceans, MT to fish and mollusks, MT to HT to insects and zooplanktons. Potential ground water contaminant.

AgLinks requested

Tebuconazole a triazole fungicide FRAC 3

Registered by USEPA and by Uzbekistan.

EPA toxicity class I (Ord-x450, ready to use) to III (Sativa WP 28), (EC, WG = II), extremely, highly and moderately toxic, Danger, Warning, Caution, WHO rating III, slightly hazardous.

One product (Orius 20ew used on peanuts has an RUP).

Sold in Uzbekistan as Kollosal and Pilarcur (EPA III), Elite 45 WP (EPA II registered for grapes).

Formulations DS; EC; ES; EW; FS; GF; SC; SE; WG; WP; WS.

(2016 RED) **Do not use EPA class I products**

Health: Acute: may cause mild eye and skin irritation, harmful, if absorbed through skin, inhaled or swallowed.

Chronic: Potential carcinogenic, suspected endocrine disruptor.

Environment: RNT to bees, birds, & earthworms, MT to fish, HT to zooplankton. Potential ground water contaminant.

AgLinks requested

Thiophanate-methyl, a benzimidazole fungicide FRAC 1

Registered by USEPA and by Uzbekistan.

EPA toxicity class I (more than 1 a.i.) to III, extremely, highly and moderately toxic, Danger , Warning, Caution, WHO rating U, unlikely to be hazardous, **PAN bad actor**

One product as FC and one product with 4 a.i. are RUPs.

Sold in Uzbekistan as Topsin M 70 WP (EPA III).

Formulations DP; PA; SC; WP.

Do not use EPA class I products

Health: Acute: Mild skin and eye irritant, dermatitis, itching, redness, swelling, dryness and sometimes sensitized dermatitis, congested ocular mucosa.

Chronic: Likely carcinogenic and developmental or reproductive toxin.

Environment: RNT to bees, NAT to amphibians & crustaceans, ST to fish & zooplankton. Soil persistence is c. 3-4 weeks. In soil, in aqueous solution, and under the influence of u.v. light, cyclisation occurs, leading to the formation of carbendazim. Potential ground water contaminant.

AgLinks requested

Thiram, a dithiocarbamate fungicide FRAC M3

Registered by USEPA and by Uzbekistan

EPA toxicity class I, II and III, extremely, highly and moderately toxic, Danger, Warning, Caution, WHO rating III, slightly hazardous, **PAN bad actor**

Some products with more than one a.i. are RUPs.

Sold in Uzbekistan as Vitavax (2. a.i. is carboxin), Ready-to-Use with 17% of both a.i. is EPA I, but same conc. FC is EPA III.

Formulations DP, FS, LS, SC, WG, WP, WS

Do not use EPA class I products

Health: Acute: Irritation and burning of skin, eyes, respiratory tract and mucous membranes. Contact dermatitis and sensitization. At high doses, hyperactivity, ataxia, loss of muscle tone, dyspnea, and convulsions.

Chronic: Possible carcinogen, known developmental or reproductive toxin and suspected endocrine disruptor

Environment: RNT to bees, VHT to amphibians & fish, HT to earthworms, aquatic insects, worms & zooplankton, NAT to crustaceans.

AgLinks requested

Triadimefon, a triazole fungicide FRAC 3

Registered by USEPA and by Uzbekistan.

EPA toxicity Class I (Bayleton 216 zinc, woodace pellets), II (Bayleton technical) and III (Bayleton 50WP), extremely, highly and moderately toxic, Danger, Warning and Caution. WHO rating III. **PAN bad actor.**

No RUPs. Sold in Uzbekistan as Bayleton 25WP (cancelled EPA products) and Bayleton 50WP (both EPA III)

Health: Acute: Eye irritation and hyperactivity followed by

sedation.

Chronic: Possible human carcinogen. Suspected endocrine disruption. Known reproductive or developmental toxicant.

Environment: ST to amphibians & fish. PNT to birds. NAT to crustaceans & bees. In soil, the

(2015 RED)	**Do not use EPA class I products**	water contaminant.

AgLinks requested

Triforine, a piperazine fungicide Registered by USEPA and Uzbekistan. EPA toxicity class I, II III (Triforine technical as EC), extremely, highly and moderately toxic, Danger, Warning, Caution, WHO rating U (IV) **PAN bad actor** Sold in Uzbekistan as Saprol, only non food in US, **1995 data extoxnet RUP with EPA class I, at present only for roses and other flowers registered.** Formulation DC and EC. **No EPA permission for intended use**	➔ **REJECTED**	**Health:** Acute: May cause irritation to mouth, throat, stomach and to the eyes, with effects including: tearing, pain, stinging and blurred vision. May cause irritation to the skin, with effects including redness and itchiness and to the nose, throat and respiratory system with effects including dizziness, headache and possible confusion. Chronic: Potential carcinogen, known developmental and reproductive toxin. **Environment:** NT to bees and birds, NAT to fish. In soil, a range of non-fungitoxic metabolic end-products is formed, presumably including piperazine, does not accumulate in the environment.

AgLinks requested

Triticonazole, an azole fungicide Registered by USEPA and Uzbekistan. EPA toxicity class II (Charter pb fungicide seed treatment, 2. a.i. Thiram) III (Charter fungicide seed treatment, 2.5%, FC), highly and moderately toxic, WARNING and CAUTION, WHO rating U, unlikely to be hazardous No RUPs. Sold in Uzbekistan as Premis (2.5%) **ONLY SEED TREATMENT OF WHEAT PERMITTED!** Formulation FS. (RED 2015)	FRAC 3	**Health:** Acute: May irritate the eyes and the skin. Facial skin contact may cause temporary numbness. Chronic: developmental toxicity at high doses in animal studies **Environment:** PNT to worms and non-target arthropods, HT to fish, aquatic invertebrates, VHT to bees. Not readily biodegradable.

FUNGICIDE ALTERNATIVES

Additionally suggested

Copper ammonium complex An inorganic copper fungicide M1	FRAC	**Health:** Acute: Contact with the eyes will cause mild to moderate irritation and pain. Skin overexposures will cause reddening, discomfort

EPA Toxicity Class III (Liqui-cop, Kop am), moderately toxic, WHO rating not listed.

No RUPs

Formulations EC, SC

headache, diarrhea, and dizziness.

Chronic: Can lead to dermatitis and skin sensitization reactions. Liver and kidney disorders and adverse effects on the lungs.

Environment: HT to fish & invertebrates, PNT to birds

Additionally suggested

Copper octanoate, an inorganic copper fungicide FRAC M1

Registered by USEPA. **Seek registration in Uzbekistan.**

EPA Toxicity Class III (Neu1140f copper soap), moderately toxic, WHO rating not listed.

No RUPs

Formulations SC

Health: Acute: May cause slight irritation to the eyes. Inhalation of dust may result in respiratory irritation
Chronic: Can lead to skin sensitization reactions.
Environment: MT to fish, PNT to bees and earthworms. Degrades to free copper and octanoic acid; the latter is expected to degrade further microbially.

Additionally suggested

Cymoxanil, an unclassified fungicide FRAC 27

Registered by USEPA and Uzbekistan (from 2009).

EPA toxicity class II (Curzate 60df, wdg), III (Dupont tanos), highly and moderately toxic, WARNING and CAUTION, WHO rating III, slightly hazardous

No RUPs. Formulation WG, WP.

Health: Acute: May cause temporary reversible skin and eye irritation. Causes skin itching, redness, swelling or rash and eye

tearing, pain or blurred vision. If ingested it may cause temporary central nervous system depression with dizziness, confusion, incoordination, drowsiness or unconsciousness, changes in hematology measurements, pathological changes in the liver, and weight loss. If inhaled it may cause irritation of the respiratory tract with sneezing or runny nose.

Chronic: No issues

Environment: ST to fish, birds, worms and zooplankton, PNT to bees

---

Additionally suggested

Mancozeb, a dithiocarbamate, fungicide FRAC M3

Registered by USEPA, **check if Mancozeb is registered in Uzbekistan**

EPA Toxicity Class II (Potato seed treater 6%), and III (Dithane

Health: Acute: poisoning may lead to cough, sore throat, redness and pain of skin and eyes, diarrhea, nausea, and vomiting.

Chronic: Known carcinogen and reproductive or developmental toxin. Suspected endocrine

No RUPs. Sold in Tajikistan and Kyrgyzstan as Dithane M-45 80WP, Dithane F-45 37F, Penncozeb 75DF (all EPA III).

Formulation DP DS OD SC WG WP.

Environment: HT to amphibians; MT to fish, bees, and aquatic organisms; ST to birds; NAT to zooplankton. Domestic/wild mammals not to be grazed in treated areas. Mancozeb breaks down rapidly in soil, sediment and water; Rapidly degraded in the environment by hydrolysis, oxidation, photolysis, and metabolism.

Additionally suggested

Sulfur, an inorganic fungicide/insecticide FRAC M2

Registered by USEPA and Uzbekistan.

EPA toxicity class I (Checkout 40/60), and III (Kolodust), extremely and moderately toxic, Danger, Caution, WHO U, unlikely to be hazardous.

No RUPs. Sold in Uzbekistan as sera kolloidnaja 80% WP

Formulation DP; MG; SC; WG; WP

Do not use EPA class I products

Health: Acute: Moderate irritation of the skin and associated with dermatitis, airborne dust irritates the eyes and respiratory tract. Acute exposure inhalation of large amounts of the dust may cause catarrhal inflammation of the nasal mucosa which may lead to hyperplasia with abundant nasal secretions. Trachiobronchitis is a frequent occurrence, with dyspnea, persistent cough and expectoration

Chronic: Eye and respiratory disturbances, chronic bronchitis and chronic sinus effects.

Environment: NAT to amphibians, bees, birds, fish and zooplankton. Insoluble in water.

INSECTICIDES

AgLinks requested ➔ **REJECTED**

Acephate, an organophosphorus insecticide IRAC 1B

Registered by USEPA and by Uzbekistan

EPA Toxicity Class I (Cheminova acephate 90sp, RUP) II (Orthene 85 concentrate) and III (Hi-yield (r) acephate), extremely, highly and moderately toxic, Danger, Warning and Caution, WHO rating III, slightly hazardous, **PAN bad actor RUPs.**

Sold in Uzbekistan as Lancer, i.e. Hi-yield (r) acephate (WSP 75%, EPA III).

Formulations AE; CG; GR; SG; SP; WP.

(2009 RED)

Health: Acute: can cause: cardiac responses (bradycardic/ tachycardia, heart block), central nervous system impairment, eye problems (miosis/mydriasis, loss of accommodation, ocular pain, sensation of retrobulbar pressure, tearing, dark or blurred vision, conjunctiva hyperemia, cataracts), gastrointestinal problems (abdominal cramps, heart burn, hyperperistalsis), respiratory effects (apnea, dyspnea, hypopnea, atelectasis, bronchoconstriction, bronchopharyngeal secretion, chest tightness, productive cough, wheezing, pulmonary edema, laryngeal spasms, rhino rhea, or nasal frothing) and death due to respiratory failure

notification by EU.		cholinesterase inhibitor, suspected endocrine disruptor **Environment:** NAT to amphibians, crustaceans and fish. ST to insects and zooplankton. HT to bees, beneficial arthropods. MT to birds. Readily biodegraded and non-persistent. Potential ground water contaminant.
AgLinks requested	**➔ accepted with conditions**	
Acetamiprid, a chloro-nicotinyl insecticide	IRAC 4A	**Health:** Acute: Mild irritation to the eye and skin. Chronic: Inhalation of product may aggravate existing chronic respiratory problems such as asthma, emphysema or bronchitis. Skin contact may aggravate existing skin disease. **Environment:** MT to birds, PNT to fish and aquatic invertebrates, ST to bees and worms.
Registered by USEPA and Uzbekistan		
EPA toxicity class III (Tristar 30sg), moderately toxic, Caution, WHO rating: not listed, **RUP** in Assail 30 sg**.**		
RUPs.		
Sold in Uzbekistan as Mospilan, i.e. Tristar 30sg (EPA III).		
Formulation: FU, GR, EC, SP, WP		
AgLinks requested	**➔ REJECTED**	
Amitraz, a formamidine insecticide	IRAC 19	**Health:** Acute: Corrosive to the eye, causes irreversible eye damage. Causes mild irritation to the skin, and mucous membranes. If inhaled or ingested, can cause nausea, vomiting dizziness and central nervous system depression. Chronic: Possible carcinogen, known developmental or reproductive toxin, suspected endocrine disruptor **Environment:** ST to amphibians, birds, and zooplankton, MT to fish, NAT to crustaceans, RNT to bees.
Registered by USEPA and Uzbekistan		
EPA toxicity class I (Tactic ec), II (Mitac ec, cancelled) and III (Amitraz solid, technical), extremely, highly and moderately toxic, Danger, Warning, Caution, WHO rating III, slightly hazardous, **PAN bad actor. RUPs.**		
Sold in Uzbekistan as Mitak, i.e. Mitak ec (20%) (EPA II).		
All Mitac products have cancelled EPA registration.		
Formulation: EC, PO, WP		
No EPA permission for intended use		
AgLinks requested	**➔ accepted with conditions**	
Avermectin, a botanical insecticide	IRAC 6	**Health:** Acute: Very toxic if swallowed. Harmful if inhaled. Causes substantial but temporary eye injury and mild skin irritation. Chronic: Known developmental or reproductive toxin, suspected endocrine disruptor
Registered by USEPA and Uzbekistan		
EPA toxicity class I (Avicta 400 fs – RUP, used as nematicide), II (Abba 0.15 ec – RUP) and III (Abamectin 0.15 ec 25 – RUP), extremely, highly and moderately toxic, Danger,		

Sold in Uzbekistan as Vertimec and Pilarmektin.

Formulations EC, Ready-to-use, Pelleted

and worms.

AgLinks requested ➔ **accepted with conditions**

Bifenthrin, a pyrethroid insecticide IRAC 3

Registered by USEPA and by Uzbekistan.

EPA Toxicity Class I (Bifenthrin mc insecticide/miticide), II (Bifen 25ec, **RUP**) and III (Talstar 0.069 gcgu granular insecticide, **RUP**), extremely, highly and moderately toxic, Danger, Caution and Warning; WHO rating II, moderately hazardous. **PAN bad actor**, **RUPs.**

Sold in Uzbekistan as Talstar 10% (Talstar 10bt (EPA II),

Formulation EC; GR; SC; UL; WP.

(RED 2010)

Health: Acute: Irritation of skin and eyes, moderately toxic when ingested. Large doses may cause incoordination, tremor, salivation, vomiting, diarrhea, and irritability to sound and touch, - In severe cases: fluid in the lungs and muscle twitching may develop. Seizures may occur and are more common with more toxic cyano-pyrethroids.

Chronic: possible carcinogenic, suspected endocrine disruptor and known developmental or reproductive toxin

Environment: HT to bees, VHT to fish, crustaceans, zooplankton, and aquatic animals, MT to birds Low solubility in water and high affinity for soil contribute to produce little impact in aquatic systems under field conditions.

AgLinks requested

Bromopropylate ➔ **REJECTED**

No EPA registration

AgLinks requested

Buprofezin, an unclassified insecticide IRAC 16

Registered by USEPA and by Uzbekistan.

EPA Toxicity Classes II (Buprofezin 40sc) and III (Applaud 70df), highly and moderately toxic, Caution and Warning; WHO rating U, unlikely to be hazardous.

No RUPs. Sold in Uzbekistan as Applaud 25wp

Formulation DP, GR, SC, WP.

Health: Acute: Causes moderate eye irritation. Harmful if swallowed, inhaled, or absorbed through the skin. Excessive ingestion may include subdued mood, slight muscular incoordination, and a slightly enlarged abdomen.

Chronic: possible carcinogenic

Environment: NAT to amphibians, MT to fish and crustaceans, RNT to bees & birds.

AgLinks requested

Carbosulfan ➔ **REJECTED**

No EPA registration

AgLinks requested ➔ **accepted with conditions**

Chlorpyrifos, an organophosphate insecticide IRAC 1B

Registered by USEPA and by Uzbekistan.

EPA Toxicity Classes I (Dursban 50w in water soluble packets, **RUP**), II (Pyrinex 4 ec, **RUP**) and III (Nufos 15g), extremely, highly and moderately toxic, DANGER, CAUTION, WARNING; WHO rating II, Moderately hazardous. **PAN bad actor. RUPs.**

Sold in Uzbekistan as Pirinex 40% by Makhteschim Agan.

Formulation CS; DP; EC; GR; UL; WG; WP.

(RED 2009)

Health: Acute: Symptoms of poisoning by organophosphate pesticides may include: Excessive salivation, sweating, rhinorrhea and tearing. Muscle twitching, weakness, tremor, uncoordination. Headache, dizziness, nausea, vomiting, abdominal cramps, diarrhea. Respiratory depression, tightness in chest, wheezing, productive cough, fluid in lungs. Pin-point pupils, sometimes with blurred or dark vision. Severe cases: seizures, incontinence, respiratory depression, loss of consciousness..

Chronic: Known cholinesterase inhibitor, suspected endocrine disruptor.

Environment: VHT crustaceans. HT to fish, aquatic insects, birds & bees. MT to amphibians, mollusks, nematodes, & zooplankton. PNT to earthworms. In soil, chlorpyrifos is degraded at a moderate rate

---

AgLinks requested ➔ **accepted with conditions**

Cyhalothrin, gamma, a pyrethroid insecticide IRAC 3

Registered by USEPA and by Uzbekistan.

EPA Toxicity Classes I (Gf-1580) and III (Proaxis, **RUP**), extremely, and moderately toxic, DANGER and WARNING; WHO rating not listed. **PAN bad actor. RUPs.**

Sold in Uzbekistan as Vantex

Formulation CS; DP; EC; GR; UL; WG; WP.

(RED 2011)

Health: Acute: Causes moderate eye irritation and slight skin irritation with local redness, drying, or flaking, or an allergic reaction. Prolonged or excessive inhalation may cause adverse effects to the central nervous system.

Chronic: suspected endocrine disruptor.

Environment: VHT to fish and aquatic organisms, HT to bees, PNT to birds. Leaching of Cyhalothrin and its degradation products through a range of soil types is negligible.

AgLinks requested ➔ **accepted with conditions**

Cyhalothrin, lambda, a pyrethroid insecticide IRAC 3

Registered by USEPA and by Uzbekistan.

EPA Toxicity Classes I (Karate insecticide, **RUP)**, II (Upi-2005 exp-06 rup insecticide, **RUP**) and III (Lambda 0.5% concentrate), extremely, highly and moderately toxic, DANGER, WARNING and CAUTION, WHO rating II, Moderately hazardous**. RUPs.**

Sold in Uzbekistan as 'Karate 50g/L', Kurash, Atilla.

Formulation: CS, EC, EW, UL, WG and WP

(RED 2011)

Health: Acute: Inhalation may lead to burning sensation. Convulsions. Cough. Labored breathing. Shortness of breath. Sore throat. Ingestion may lead to Abdominal pain.

Cough. Skin contact may lead to redness and pain.

Chronic: Suspected endocrine disruptor. Carcinogenicity tests are inconclusive, but suggest that lambda-cyhalothrin is probably not carcinogenic.

Environment: VHT to fish and aquatic insects. HT to bees. PNT to birds, Leaching of cyhalothrin and its degradation products through a range of soil types is negligible.

AgLinks requested

Cypermethrin ➔ **REJECTED**

No EPA registration

AgLinks requested ➔ **accepted with conditions**

Cypermethrin, beta, a pyrethroid insecticide IRAC 3

Registered by USEPA and Uzbekistan

EPA toxicity class I (Ammo 2.5 miscible insecticide), II (Bionide cyperactive) and III (Cypermethrin 2.5ec **RUP**), extremely, highly and moderately toxic, Danger, Warning, and Caution, WHO rating: II, moderately hazardous. **RUPs.**

Sold in Uzbekistan as Chinmix.

Formulation: CS, EC, GL, ME, SC, UL

Health: Acute: causes slight skin and eye irritation and may cause allergic skin reactions. Moderately toxic by dermal absorption or ingestion. Symptoms of high dermal exposure include numbness, tingling, itching, burning sensation, loss of bladder control, incoordination, seizures, and possible death. May adversely affect the central nervous system Symptoms of high-dose ingestion include nausea, prolonged vomiting, stomach pains, and diarrhea which progresses to convulsions, unconsciousness, and coma.

Chronic: Possible carcinogen, suspected endocrine disruptor

Environment: VHT to insects, fish and aquatic invertebrates, PNT to birds, HT to bees.

AgLinks requested ➔ **REJECTED**

Cypermethrin, zeta, a pyrethroid insecticide IRAC 3

Registered by USEPA and by Uzbekistan,

EPA Toxicity Class II (Fury 1.5ec, **RUP**) and III (Zeta-cype 0.8ec, **RUP**), highly and moderately toxic, Caution and Warning; WHO rating **Ib**, highly hazardous, **PAN bad actor. RUPs.**.

Sold in Uzbekistan as Fury 10%

Formulation EC; EO; EW; WP.

Too toxic to be used

Health: Acute: irritation of skin and eyes, irritability to sound or touch, abnormal facial sensation, sensation of prickling, tingling or creeping on skin, numbness. Headache, dizziness, nausea, vomiting, diarrhea, excessive salivation, fatigue. In severe cases: fluid in the lungs and muscle twitching may develop. Seizures may occur and are more common with more toxic cyano-pyrethroids.

Chronic: Possible carcinogenic, suspected endocrine disruptor.

Environment: VHT to insects, fish and aquatic invertebrates, PNT to birds, HT to bees.

AgLinks requested ➔ **REJECTED**

Deltamethrin, a pyrethroid insecticide IRAC 3

Registered by USEPA and by Uzbekistan.

EPA Toxicity Class I (Decis 1.5ec, **RUP,** Decis 0.2ec, **RUP)**, II (Delta-tech), and III (Delta 5%wp), extremely, highly and moderately toxic, DANGER, WARNING and CAUTION; WHO rating **II,** Moderately hazardous. **RUPs.**

Sold in Uzbekistan as Decis 2.5%

Formulations DP; EC; EG; EW; GR; HN; OD; PO; SC; SL; TB; UL; WG; WP.

All Decis EPA registered products are EPA Toxicity Class I.

Health: Acute: Inhalation may lead to burning sensation, cough, dizziness, headache and nausea. Skin contact may lead to redness, burning sensation, numbness, tingling and itching. Eyes may become red with pain. Ingestion may lead to abdominal pain, convulsions, unconsciousness and vomiting.

Chronic: No issues

Environment: PNT to birds, VHT to amphibians, aquatic insects and zooplankton. HT to fish. MT to bees, NAT to mollusks. In soil, undergoes microbial degradation within 1–2 weeks, confirms strong adsorption by soil colloids and no risk of leaching, soil photolysis 9 d, no incidence on soil microflora and nitrogen cycle.

AgLinks requested ➔ **REJECTED**

Diazinon, an organophosphorus insecticide IRAC 1B

Registered by USEPA and by Uzbekistan.

EPA Toxicity Class II (technical and impregnated materials) and III (Diazol ag50, **RUP**), highly and moderately toxic, CAUTION and WARNING; WHO rating **II**, moderately hazardous. **PAN Bad Actor.**

Sold in Uzbekistan as Diazinon, All Diazinon EPA registered products are RUPs

Health: Acute: If inhaled, it causes convulsions, dizziness, labored breathing, nausea, unconsciousness, vomiting, pupillary constriction, muscle cramp, excessive salivation. Ingestion may lead to abdominal cramps, diarrhea, labored breathing, nausea, unconsciousness, vomiting, pupillary constriction, muscle cramps. Exposure of eyes and skin may lead to redness, pain and pupillary constriction.

Aerosol, Coating agent **Too toxic. Diazinon is banned as plant protection product in EU**	endocrine disruptor. **Environment:** MT to amphibians, annelids (worms), fish, mollusks, nematodes/flatworms, and zooplankton. VHT to birds. HT to crustaceans, aquatic insects, & bees. Potential ground water pollutant, Diazinon is fairly strongly adsorbed onto soil.
AgLinks requested **Dimethoate**, an organophosphorus insecticide IRAC 1B Registered by USEPA and by Uzbekistan. EPA Toxicity Class I (5 lb dimethoate systemic insecticide, SC 57%), II (Dimethoate 400 EC), III (Dimethoate 25WP), extremely, highly and moderately toxic, DANGER, WARNING; CAUTION, WHO rating **II**, moderately hazardous. **Pan Bad Actor** No RUPs. Sold in Uzbekistan as 'Bi58 400g/L, Danadim and Nugor, suggested use Dimethoate 25 WP (EPA III)! Formulations SC, EC; GR; UL; WP (2009 RED) **Do not use EPA class I products**	**Health:** Acute: Exposure to dimethoate by inhalation may lead to: Dizziness, sweating, labored breathing, nausea, weakness, papillary constriction, muscle cramp, excessive salivation; by eyes may lead to: redness, pain; by ingestion may lead to: Abdominal cramps, convulsions, diarrhea, unconsciousness, vomiting. Chronic: Possible human carcinogen. Known reproductive or developmental toxin and cholinesterase inhibitor, suspected endocrine disruptor. **Environment:** VHT to aquatic insects, birds & bees. MT to amphibians, annelids (worms), crustaceans mollusks & zooplankton. ST to fish. Potential ground water pollutant.
AgLinks requested **Etoxazole,** an unclassified insecticide IRAC 10B Registered by USEPA and by Uzbekistan. EPA Toxicity Class III moderately toxic, CAUTION, WHO rating not listed One product (V-10141 2.8 ec insecticide, 2. a.i.: Etoxazole +Fenpropathrin, is a **RUP**), Sold in Uzbekistan as 'Sum 10%" for cotton Formulation: SC, WG	**Health:** Acute: may cause brief and/or minor eye and skin irritation including redness and possible swelling. Exposure to high concentrations of dust may result in nasal discharge, sore throat, coughing and difficulty in breathing. Chronic: No issues. **Environment:** PNT to birds and bees, VHT to aquatic invertebrates and HT to fish.
AgLinks requested ➔ **REJECTED** **Fenpropathrin**, a pyrethroid insecticide IRAC 3 Registered by USEPA and by Uzbekistan.	**Health:** Acute: Corrosive causes irreversible eye damage and possibly blindness. Cause moderate skin irritation including redness and swelling. Ingestion may cause gastrointestinal irritation,

RUP), III (V-10141 2.8 ec insecticide, **RUP,** 2 a.i.), extremely, highly and moderately toxic, DANGER, WARNING, CAUTION, WHO rating **II**, moderately hazardous. **Pan Bad Actor**

RUPs. Sold in Uzbekistan as 'Danitol 10%

Formulations SC, EC; GR; UL; WP

Too toxic. Fenpropathrin is banned in EU.

discharge, sore throat, coughing and difficulty in breathing.

Chronic: No issues.

Environment: VHT to amphibians, crustaceans, fish, aquatic insects and zooplanktons, ST to birds.

AgLinks requested ➔ **REJECTED**

Fenvalerate, a pyrethroid insecticide IRAC 3

Registered by USEPA and by Uzbekistan.

EPA Toxicity Class I (Evercide concentrate 2403), II (Pydrin insecticide 2.4, **RUP**), and III (Total release fogger), extremely, highly and moderately toxic, DANGER, WARNING, CAUTION, WHO rating II, moderately hazardous

RUPs. Sold in Uzbekistan as 'FenKill 10%

Formulation: EC, SC, UL, WP

No EPA permission for intended use.

Fenvalerate is banned in EU.

AgLinks requested ➔ **REJECTED**

Fipronil, a pyrazole insecticide IRAC 2B

Registered by USEPA and by Uzbekistan.

EPA Toxicity Class II (Regent 4sc, **RUP**) and III (Regent 1.5g, **RUP**), highly and moderately toxic, WARNING and CAUTION, WHO rating not listed

RUPs. Sold in Uzbekistan as Regent for cotton

Formulation: EC, FS, GR, SC, UL, WG

No EPA permission for intended use

AgLinks requested

Flubenzimine ➔ **REJECTED**

No EPA registration

AgLinks requested

Hexylthiofos ➔ **REJECTED**

No EPA registration

AgLinks requested

Hexythiazox, an unclassified insecticide IRAC 10A

Registered by USEPA and by Uzbekistan.

EPA Toxicity Class III, moderately toxic, CAUTION, WHO rating **U**, unlikely to be hazardous

No RUPs. Sold in Uzbekistan as 'Nissoran 5%, Nissoran 10%"

Formulation: EC, FU, WP

Permitted only for spidermites on cotton and apple in Uzbekistan

Health: Acute: May irritate eyes, nose, throat, and skin.

Chronic: Possible carcinogen.

Environment: MT to fish and aquatic invertebrates, NT to bees.

AgLinks requested ➔ **accepted with conditions**

Imidacloprid, a chloro-nicotinyl insecticide IRAC 4A

Registered by USEPA and by Uzbekistan.

EPA Toxicity Class II (Et-024) and III (Eti 105 12 I, **RUP**), highly and moderately toxic, WARNING and CAUTION, WHO rating II, moderately hazardous. **RUPs**

Sold in Uzbekistan as 'Konfidor', could use i.e. Admire 2 flowable insecticide (21%, EC, EPA III), Gaucho 500 SC (42%, FC, EPA III) if permitted in Uzbekistan.

Formulation DP; EC; FS; GR; OD; SC; SL; WG; WP; WS.

(2009 RED)

Health: Acute: May lead to Skin and eye irritation; Fatigue, twitching, cramps, and muscle weakness including the muscles necessary for breathing.

Chronic: May be weakly mutagenic.

Environment: NAT to fish, VHT to aquatic invertebrates and zooplankton, HT to birds, bees, beneficial arthropods, Imidacloprid shows a medium adsorption to soil. Potential ground water contaminant.

AgLinks requested

Indoxacarb, an oxadiazine insecticide IRAC 22A

Registered by USEPA and by Uzbekistan.

EPA Toxicity Classes II (technical) and III (Avaunt), highly and moderately toxic, WARNING and CAUTION; WHO rating not listed. **RUPs in products for non-agricultural crop use.**

Sold in Uzbekistan as 'Avaunt' (EPA III)

Formulation: EC, SC, WG

Health: Acute: may cause mild eye irritation with tearing, pain or blurred vision. May cause slight skin irritation with itching, burning, redness, swelling or rash. It is a skin sensitizer. If ingested, it may cause nasal and ocular discharge, altered righting reflex, incoordination, tremors and convulsions. Ingestion of large amounts may cause alteration in blood cell counts and/or anemia. Inhalation may cause irritation of the

	Chronic: No issues. **Environment:** HT to fish, arthropods, and bees, ST to birds, PNT to worms. Indoxacarb is considered to be moderately persistent.
AgLinks requested **Malathion,** an organophosphorus insecticide IRAC 1B Registered by USEPA and Uzbekistan. EPA Toxicity Classes II (≥50% EC), III (Fyfanon 25wp**)**, highly and moderately toxic, WARNING and CAUTION, WHO rating III, slightly hazardous, **PAN bad actor.** No RUPs, sold in Uzbekistan as Fufanon and Carbophos, i.e. Fyfanon 8lb EC (EPA III), Fyfanon 25 WP 25% (EPA III) Formulation DP; EC; EW; UL; WP. (2009 RED)	**Health:** Acute: Can cause slight to substantial but temporary eye irritation, May cause allergic contact dermatitis, numbness, tingling sensations, incoordination, headache, dizziness, tremor, nausea, abdominal cramps, sweating, blurred vision, difficulty breathing or respiratory depression, and slow heartbeat. High doses may result in unconsciousness, and convulsions or fatality. Chronic: possibly affecting mammalian reproduction, being mutagenic, carcinogenic, known cholinesterase inhibitor, suspected endocrine disruptor. May affect the central nervous system, immune system, adrenal glands, liver, and blood. **Environment:** HT to bees, amphibians, aquatic invertebrates, beneficial arthropods, earthworms, MT to fish, birds, and crustaceans, ST to mollusks, nematodes, flatworms and zooplankton. Potential ground water contaminant.
AgLinks requested **Phozalone** ➔ **REJECTED** **NO EPA registration**	
AgLinks requested ➔ **REJECTED** **Propargite**, an unclassified insecticide IRAC 12C Registered by USEPA and by Uzbekistan. EPA toxicity Class I, extremely toxic, Danger, WHO rating **III**, slightly hazardous. **PAN bad actor** **RUPs**, Sold in Uzbekistan as 'Omite' (EPA I). Formulation EC; EW; WP. **Too toxic, all EPA registered products are EPA I**	**Health:** Acute: Eye and skin irritation. Skin sensitization. Chronic: Probable human carcinogen. Known reproductive or developmental toxicant. **Environment:** HT to amphibians, fish, & zooplankton. NAT to crustaceans. PNT to bees, no leaching in aged column study or in field dissipation studies.

Pyriproxyfen, an unclassified insecticide IRAC 7C

Registered by USEPA and by Uzbekistan.

EPA Toxicity Class II (Esteem insect growth regulator), and III (Esteem 35 WP insect growth regulator, and Knack insect growth regulator), highly and moderately toxic, Warning, CAUTION, WHO rating U, unlikely to be hazardous.

No RUPs. Sold in Uzbekistan as 'Admiral' 10%.

Only few US registered products are for agricultural use.

Health: Acute: may cause brief and/or minor eye and skin irritation. Exposure to high concentrations of dust may result in respiratory irritation. Signs and symptoms may include, but not be limited to, nasal discharge, sore throat, coughing and difficulty in breathing.

Chronic: No issues.

Environment: PNT to birds and bees, MT to fish, VHT to insects and zooplankton

---

AgLinks requested

Teflubenzuron ➔ **REJECTED**

No EPA registration

AgLinks requested

Thiacloprid, a Chloro-nicotinyl insecticide IRAC 4A

Registered by USEPA and by Uzbekistan.

EPA Toxicity Class II (Calypso 4f, Calypso 70wg), moderately toxic, WARNING, WHO II, moderately hazardous. **Pan bad actor**.

No RUPs. Sold in Uzbekistan as 'Calypso 48% (EPA II)

Formulation: GR, OD, SC, SE, WG

Health: Acute: Harmful if swallowed or ingested. Skin sensitizer

Chronic: Carcinogenic potential and a possible risk of harm to the unborn child.

Environment: VHT to aquatic invertebrates and fish, ST to birds and earthworms, MT to bees. It has low to medium soil mobility.

AgLinks requested

Triazophos ➔ **REJECTED**

No EPA registration

INSECTICIDE ALTERNATIVES

Additionally suggested

Azadirachtin, a botanical insecticide and nematicide IRAC18B

Registered by USEPA, **seek registration in Uzbekistan**

EPA Toxicity Classes II (Amvac aza 3% ec) and III (Neemazal 0.3 ec), highly and moderately toxic, Warning and Caution, WHO rating not listed

Health: Acute: Severe skin and gastrointestinal irritation. Central nervous system stimulation and depression have been observed.

Chronic: suspected endocrine disruptor

Environment: ST to fish, MT to aquatic invertebrates, PNT to bees, beneficial arthropods

Formulations EC	formulations contain stabilizers to retard hydrolytic and photodegradation.
Additionally suggested	
***Bacillus thuringiensis* (berliner) subsp. *Kurstaki* Strain EG2371,** a microbial insecticide Registered by USEPA, **seek registration in Uzbekistan** EPA Toxicity Class II (technical) and III, highly and moderately toxic, Warning, Caution, WHO rating U, unlikely to be hazardous. No RUPs, (one strain of subsp. Kurstaki, U56, already registered in Uzbekistan) Formulations SC and WG	**Health:** Acute: Irritation of the eyes and respiratory tract. May cause infection or corneal ulcers in the eyes, If ingested, may cause bacterial gastroenteritis: abdominal cramps, vomiting and diarrhea. Chronic: No issues. **Environment:** RNT to bees, fish, birds, mammals, aquatic invertebrates, and beneficial arthropods. As a natural part of the ecosystem, it decays to complex and non-toxic organic compounds.
Additionally suggested	
Mineral oil, a petroleum derivative FRAC NC Registered by USEPA and Uzbekistan EPA Toxicity Class III (Purespray spray oil 10e), moderately toxic, Caution, WHO rating not listed No RUPs, sold in Uzbekistan as Preparation No. 30 (76%), could use Pcpm spray oil 13e (EPA III). Formulation EC, Oil Clarify, if Uzbek product is comparable to Mineral Oil (EPA registered), and not to Mineral oils, untreated and mildly treated (no active EPA registration)	**Health:** Acute: The major findings in a laxative abuse patient include chronic diarrhea, vomiting, abdominal pain, lassitude, thirst, weakness (15 %), edema, bone pain resulting from osteomalacia, and weight loss. Chronic: No issues. **Environment:** NAT to fish.
Additionally suggested	
Potash soap, an insecticidal soap Registered by USEPA, **seek registration in Uzbekistan** EPA Toxicity Class III (Bon-neem insecticidal soap ready to use), moderately toxic, WHO rating not listed. No RUPs	**Health:** Acute: May cause moderate reddening and swelling of the skin. Liquid and mists may cause corneal damage to eyes. Vapors and mist may be irritating to mucous membranes in the nose, throat, and lungs. Excessive exposures may cause headache, nausea, abdominal pain, vomiting, and diarrhea.

	Environment: RNT to birds, ST to fish, HT to aquatic invertebrates.
Additionally suggested **Spinosad,** a microbial insecticide IRAC 5 Registered by USEPA. **Seek registration in Uzbekistan** EPA Toxicity Class III and IV (Success), moderately and slightly toxic, CAUTION, WHO rating U, unlikely to be hazardous. **RUPs in products with 2 a.i.** **Seek registration in Uzbekistan** i.e. Succes (EPA IV) Formulation SC and WG. (2011 RED)	**Health:** Acute: May cause slight temporary eye irritation and slight skin irritation with local redness Chronic: No issues. **Environment:** HT to aquatic invertebrates and bees, RNT to birds, MT to fish and zooplankton. Rapidly degraded by u.v. light and soil microbes to naturally occurring substances.
HERBICIDES	
Additionally suggested **Bentazon sodium salt,** an unclassified herbicide HRAC C3 Registered by USEPA and by Uzbekistan. EPA Toxicity Class I (soluble concentrate ≥53%, technical) and III (44%, SC), extremely and moderately toxic, Danger and Caution, WHO rating not listed. **PAN bad actor** No RUPs. Sold in Uzbekistan as Basagran Liquid 480g/L in wheat, Formulations (Bentazone) SL and WP (2010 RED Bentazon) **Do not use EPA class I products**	**Health:** Acute: Moderately irritating to the skin, eyes, and respiratory tract. Skin sensitizer. Human ingestion of high doses has caused vomiting, diarrhea, trembling, weakness, and irregular or difficult breathing. Chronic: May cause dermatitis or conjunctivitis. **Environment:** PNT to bees, MT to fish and aquatic invertebrates, ST to birds. Weed resistance to this type of herbicide may develop with repeated usage. Rotate herbicides. Not easily biodegradable. Potential ground water contaminant.
Additionally suggested **Fluazifop-P-butyl** HRAC A an aryloxyphenoxy propionic acid herbicide, against monocots, Registered by USEPA and by Uzbekistan. EPA Toxicity Class II (EC 44%), III (EC 25%, ready-to-use with 0.17%), highly and moderately toxic, Warning and Caution, WHO rating III, slightly hazardous	**Health:** Acute: Harmful if absorbed through skin or inhaled. Causes eye irritation. Mild skin sensitizer. Chronic: No issues. **Environment:** PNT to bees, ST to birds, MT to fish and aquatic invertebrates. In moist soils rapid degradation of fluazifop-P-butyl occurs, the major degradation product is fluazifop-P, which is

‘Fusilade Super’ (12%). Fusilade DX 25% EC, EPA III Formulation EC and EW.	(4-hydroxyphenoxy) propionic acid, both of which are further degraded, ultimately to CO2. Persistence in soil is lengthened by cold and dry conditions.
Additionally suggested **Pendimethalin,** a 2,6-Dinitroaniline herbicide HRAC K1 Registered by USEPA and by Uzbekistan. EPA Toxicity Class II (Prowl herbicide, cancelled EPA), and III (Prowl 3.3 ec). Extremely and moderately toxic, Warning and Caution, WHO rating III, slightly hazardous. One cancelled product with 2 a.i. had an **RUP**. Sold in Uzbekistan as Stomp 33%, Estamp KE 330g/l, i.e. Prowl 3.3 EC 38% EPA III. Formulation EC; GR; SC; WG. (2012 RED)	**Health:** Acute: Harmful if swallowed or absorbed through skin, causes moderate eye irritation. Inhalation of dusts or fumes may be mildly to moderately irritating to the linings of the mouth, nose, throat, and lungs Chronic: Possibly carcinogenic and suspected endocrine disruptor. **Environment:** VT to fish and aquatic invertebrates, RNT to bees, ST to birds, acutely harmful to terrestrial organisms. In soil, the 4-methyl group on the benzene ring is oxidized to the carboxylic acid via the alcohol; the amino nitrogen is also oxidized.
NEMATICIDE	
Additionally suggested **Dazomet** HRAC Z an unclassified chemical compound with nematicidal and fungicidal action Registered by USEPA. Seek registration in Uzbekistan EPA Toxicity Class I (ready-to-use, 21%), II (crystalline, 98%, granular 99%, pelleted 99%) and III (technical 98%), extremely, highly and moderately toxic, Danger, Warning and Caution, WHO rating III, slightly hazardous. No RUPs. Request registration in Uzbekistan, Sold in neighboring countries as ‘Basaid’. i.e. Basamid 99% granular (EPA II). Formulation MG (2017 RED) **Do not use EPA class I products**	**Health:** Acute: May cause eye redness and pain. Prolonged exposure may cause irritation to skin, eyes, and mucous membranes. Chronic: Possible human carcinogen. **Environment:** HT to crustaceans and zooplankton, MT to earthworms, ST to amphibians, fish, and birds. PNT to bees. Potential ground water contaminant. This substance may be hazardous to the environment; special attention should be given to plants. In soil, in the presence of moisture, degrades to methyl isocyanate, formaldehyde, hydrogen sulfide and methylamine.

FUMIGANTS

Additionally suggested

Aluminum phosphide, an inorganic fumigant

Registered by USEPA and Uzbekistan.

EPA Toxicity Class I only!, extremely toxic, DANGER, WHO rating Fumigant, not classified, b

RUPs. Sold in Uzbekistan as Quickphos (56%) and Phostoksin (560g/kg) and Alphos (560g/kg). i.e. Degesch phostoxin tablets-r (560g/kg, EPA I and **RUP**) or Quick phlo-r granules (77%, EPA I, no RUP!).

Formulation: GE, fumigant, pelleted/tabletted, granular

Clarify, if permitted for Raisin/other dried fruit fumigation in Uzbekistan

Health: Acute: highly toxic through ingestion and inhalation. Symptoms of mild to moderate acute toxicity include nausea, abdominal pain, tightness in chest, excitement, restlessness, agitation and chills. Symptoms of more severe toxicity include diarrhea, cyanosis, difficulty breathing, pulmonary edema, respiratory failure, tachycardia and hypotension, dizziness and/or death. Severe exposure may also result in kidney and liver damage and jaundice.

Chronic: No issues.

Environment: HT to birds, bees and fish. Aluminum phosphide will breakdown spontaneously in the presence of water to form a gaseous product, and so it is non-persistent and non-mobile in the soil environment, and poses no risk to groundwater.

Additionally suggested

Magnesium phosphide, an inorganic fumigant

Registered by USEPA and Uzbekistan.

EPA Toxicity Class I only!, extremely toxic, DANGER, WHO rating Fumigant, not classified, b

RUPs. Sold in Uzbekistan as Magtoksin (560g/kg) and Magtoksin tabl. (560g/kg). i.e. Degesch magtoxin granules (EPA I and no RUP) and Degesch magtoxin prepac spot fumigant (EPA I and **RUP**)

Formulation: GE, fumigant, pelleted/tabletted, granular

Clarify, if permitted for Raisin/other dried fruit fumigation in Uzbekistan

Health: Acute: Primary routes of exposure are inhalation and ingestion. Mild exposure by inhalation causes malaise, headache, ringing in the ears, fatigue, nausea and pressure in the chest. Moderate poisoning causes weakness, vomiting, stomach pain, chest pain, diarrhea and dyspnea. Symptoms of severe poisoning may occur within a few hours to several days resulting in pulmonary edema and may lead to dizziness, cyanosis, unconsciousness, and death.

Chronic: No issues.

Environment: Possibly hazardous short-term degradation products are not likely. However, long-term degradation products may arise. The products of degradation are as toxic as the original product.

http://www.beyondpesticides.org/gateway/index.htm and no active problematic RED, IRED or TRED was found (January 26, 2009), in addition all were as well checked at: http://www.epa.gov/oppsrrd1/reregistration/status.htm again no issues determined (January 26, 2009), see also relevant documents in data collection.

For periodic checks on pesticide status go to http://ppis.ceris.purdue.edu/htbin/ppisprod.com

For monthly EPA information's for, i.e. "notice of intend to a) cancel or b) suspend" for PERSUAP approved pesticides: http://www.epa.gov/fedrgstr/EPA-PEST/

ABBREVIATIONS

General

RUP = Restricted Use Products, in the USA requires a specialized degree of training and understanding

For Environment

VHT = Very Highly Toxic

HT = Highly Toxic

MT = Moderately Toxic

ST = Slightly Toxic

PNT = Practically Non-Toxic

NAT = Not Acutely Toxic

For Formulations

The following standard two-letter codes are used. For further details, see Catalogue of Pesticide Formulation Types and International Coding System, Technical monograph No. 2, 5th Edition, March 2002; CropLife International, Brussels, Belgium.

AE = Aerosol dispenser

CG = Encapsulated granule

DP = Dustable powder

DS = Powder for dry seed treatment

EC = Emulsifiable concentrate

EG = Emulsifiable granule

EO = Emulsion, water in oil

ES = Emulsion for seed treatment

EW = Emulsion, oil in water

FP = Smoke cartridge

FS = Flowable concentrate for seed treatment

FT = Smoke tablet

GF = Gel for Seed Treatment

GR = Granule

HN = Hot fogging concentrate

KN = Cold fogging concentrate

MG = Microgranule

OD = Oil dispersion

OF = Oil miscible flowable concentrate (oil miscible suspension)

PA = Paste

PO = Pour-on

SC = Suspension concentrate (= **F**lowable **C**oncentrate)

SE = Suspo-emulsion

SG = Water soluble granule

SL = Soluble concentrate

SP = Water soluble powder

ST = Water soluble tablet

UL = Ultra-low volume (ULV) liquid

WG = Water dispersible granule

WP = Wettable powder

WS = Water dispersible powder for slurry seed treatment

ANNEX 2

VIABLE AND PRACTICAL IPM OPTIONS TO TRY IN UZBEKISTAN TO BE POTENTIALLY INTEGRATED INTO AN IPM SYSTEM APPROACH TO PEST MANAGEMENT

In general, orchards and even fields in Uzbekistan are not well maintained. Many problems are directly linked to bad orchard, tree and vegetable management. Therefore, the establishment of well managed fruit and vegetable production is of utmost importance, then the re-establishment of natural occurring predators and microbial antagonists, accompanied by environmentally sound non-chemical control methods in the IPM framework and, finally, applying chemical control agents during dormancy and vegetation periods if no other strategies control the biotic stresses in a reasonable, cost effective and reliable way. Furthermore, for fruit production, intercropping and correct weed management and field crop production, correct rotational partner crops are required and the selection of available resistant and tolerant varieties has to be considered. Exact pathogen or pest identification, intensive and frequent monitoring, establishment of economic thresholds of relevant population levels and factors contributing to favor infection conditions should be determined for appropriate and effective control measure selection. The biological development specifics of each relevant disease and pest must be taken into account. Very often, chemical control is applied with wrong timing for the first and succeeding treatments. For example, aphids are controlled starting with a certain population pressure (except virus vector control for certain viruses) and numerous insect pests must be treated, when the pests are in the mobile stage of their life cycle (chemical control against pupae very rarely shows any effect).

Please note that recommendations given below are based on knowledge and strategies common in the USA and Europe and based on disease and pests found there. Since not all pathogens and pests found in Uzbekistan are identical, the closest related species was chosen for feasible IPM measures. Further, during the next few years IPM strategies have to be established and adapted to the local Uzbek conditions found in orchards, field and green house production. In addition, in the Western hemisphere a continued and even strengthening trend can be observed to reduce pesticide use further. The decline of suitable active ingredients having an active EPA registration, lower numbers of re-registrations due to various reasons ranging from environmental concerns, pesticide resistance management and marketing considerations, as well as strong push for environmentally sound pesticide alternatives in the US and Europe lead to drastically reduced number of available and potential pesticides allowed in the framework of USAID regulations. On the other hand, large numbers of pests and diseases can be managed without chemical control. In addition, for many biotic stresses, control measures appropriate in organic farming exist and are being improved and might be applicable for problems foreseen in AgLinks Uzbekistan crop production activities. Again, several biotic stresses listed below are not presently or were never treated chemically in the past.

COMMON PESTS AND DISEASES IN APRICOT, PEACH, PLUM, AND CHERRY

San Jose scale: *Quadraspidiotus (Diaspidiotus) perniciosus*

Cutting the heavily infested parts of the trees and cleaning the bark from infestation can help to increase the efficiency of chemical treatments. Biological control against *D. perniciosus* using *Encarsia perniciosi* is successful. Such control can give substantially good results only after a relatively long time, and only in the absence of toxic insecticides. The additional release of different predators and conserving the local natural enemies can increase the efficiency of control. Annual sprays of oil during the dormant or delayed dormant period are recommended. Control heavy populations of San Jose scale by applying an insecticide (i.e. Pyriproxyfen) with the oil spray during the delayed dormant period. In these orchards, the introduced and local natural enemies could reach a high density and reduce the density of pests. The scale is monitored as part of the pruned wood sample during the dormant season and with pheromone traps in spring.

European fruit lecaneum, European fruit scale: *Parthenolecanium corni*

Parasitic wasps play an important role in controlling this scale. The most important of these parasites are *Coccophagus*, *Encyrtus,* and *Metaphycus* spp. Predators including *lady beetles* and *lacewings* are also effective. If treatment is needed, oil applied during dormancy or delayed dormancy is the most effective way to reduce populations of this pest and the least disruptive to biological control. Crawlers will die in hot weather (over 38°C).

Plum scale: *Sphaerolecanium prunastri*

Several lady beetle larvae specialize in feeding on scales, but tiny parasitic wasps are the most effective at control of these soft scales. Insecticidal soaps and oils are fairly effective against the crawlers and recently settled crawlers. True dormant oils can be applied during dormancy or delayed dormancy.

Brown peach aphid: *Pterochloroides persicae*

Good sanitation, such as removing discarded plant material and eliminating weed around plant production areas. Weed host plants often serve as reservoirs for migrating or ant carried aphids. Avoid excessive amounts of nitrogen fertilizer. Use physical control methods if appropriate. These include screens or other barriers. A complex of predators and parasitoids are effective in controlling the aphids. Predators of aphids sold commercially include ladybird beetles, lacewings, flower flies, and predaceous midges. Parasites of aphids include various braconid wasps.

Mealy plum aphid: *Hyalopterus arundinis*

Several natural enemies are important in the control of aphids in the orchard, but aphid populations may require treatment. Generally, small pockets of infestations appear in an orchard before any significant damage occurs on the fruit, allowing time to treat the orchard during the following dormant period. Spring treatments may also be made.

Important predators include lady beetles (especially the multicolored Asiatic lady beetle, *Harmonia axyridis),* green and brown lacewings, syrphid flies, and soldier beetles. However, these predators do not adequately control high populations. Biological control and sprays of neem oil are acceptable for use on organically grown apricots.

If aphids are a chronic problem, a treatment in late fall/early dormancy is a very effective way to manage these pests. If leaves are still on trees at this time, aphids and parasites can be present. Oil treatments are not recommended at this time because they are very damaging to parasite populations and not effective for aphid control. If the early dormancy treatment is not applied, be sure to monitor during dormancy. If dormant monitoring indicates treatment is necessary, two applications of oil at bloom can be used in orchards where a dormant/ delayed dormant treatment is not required to manage scale problem. Parasites are not active at bloom, and they are not affected by the bloom oil sprays. If aphids have been a problem in the past or if a dormant or delayed dormant application was not applied, monitor leaf curl plum aphid in spring along with mealy plum aphid. Use the following pesticides: Imidaclorpid, for delayed dormant treatment, Neem oil, Narrow range oil or Imidacloprid, in the spring.

Shot hole disease: *Clasterosporium carpophilum, Stigmina carpophila, Wilsonomyces carpohilus*

Infected tissue should be removed upon appearance. Infected buds and lesioned twigs should be pruned as well. Again, maintaining vigorous plants reduce the problems. Decent sanitation and reasonable water management can provide adequate control where the incidence of shot hole is low. Buds can be protected from shot hole during the dormant season (mid-November to mid-December) by a fungicide application (copper-based products, Thiophanate-methyl, Sulfur) before the long winter rains begin. One application should be sufficient. Fungicide applications in spring are justified only with heavy attacks.

COMMON PESTS IN APRICOT, PEACH, AND PLUM

Codling moth, walnut worm: *Carpocapsa* (*Cydia*) *pomonella*

Remove infected host trees in nearby abandoned orchards (apple, pear, and walnut); remove props, picking bins, and fruit piles from the orchard. Proper pruning and orchard sprayer calibration will improve spray coverage. An option for small orchards is hand thinning to remove all infested fruit during each generation, before worms leave fruit, and removal of dropped fruit. Control of codling moth include cultural control in conjunction with mating disruption and sprays of approved oils, codling moth granulovirus (Cyd-X), the Entrust formulations of spinosad, and kaolin clay (Surround).

In orchards with moderate-to-high populations of codling moth, supplement the mating disruption with an insecticide spray of Acetamiprid, Lambda Cyhalothrin and Thiacloprid.

Plum moth, red plum maggot: *Laspeyresia* (*Grapholita*) *funebrana*

Remove all infected debris and fruits from the orchard. The adult population should be monitored using pheromone traps during the late spring and through the summer. Mating disrupting pheromones showed satisfying results. Forecasting models are available and should be used, in conjunction with pheromone traps, to determine the right time for insecticide sprays. Where more than one generation occurs, treatment strategies may need to be adjusted. The use of selective insecticides such as insect growth regulators or *Bacillus thuringiensis* var. *kurstaki* is preferred. Main insecticides to be used: *Bacillus thuringiensis* var. *kurstaki*, bifenthrin, lambda-cyhalothrin, and thiacloprid.

SPECIFIC PESTS AND DISEAESES FOR

APRICOT (*Prunus americana*)

Apricot weevil: *Rhynchites auratus ssp ferghanensis*

Sound agricultural practices, such as fertilizing at the right time with the right dose, soil management, and irrigation, ensure trees are healthy and able to resist the onslaught of pests. To prevent infestation apply a 3- to 4-inch band of sticky material on the trunk of young trees to trap crawling adults in May when the first adult feeding is observed. Apply Stickem or Tanglefoot over a special tape or painted areas of the trunk of young trees to prevent bark damage. Reapply the sticky material when it becomes dirty or loses its effectiveness.

Spur canker, brown rot: *Monilinia* spp.

Prompt removal and destruction of diseased plant parts prevents the build-up of brown rot inoculum and helps keep rot below damaging levels. Prune trees to allow good ventilation. Furrow irrigates or uses low-angle sprinklers to avoid wetting blossoms, foliage, and fruit. Manuring can have some influence on disease incidence; applications of potassium reduce disease incidence while high doses of nitrogen fertilizer increase the disease incidence. Control of insects that serve as vectors and/or provide wounds for infection is essential for effective brown rot control. Injuries may also result from adverse weather conditions such as hail and it is useful to apply a protectant fungicide (i.e. Propiconazole, Thiophanate-methyl) without delay when such injury occurs. Care during picking and handling is also essential: fruit should be picked with its stalk intact.

PEACH (*Prunus persica*)

Peach leaf curl: *Taphrine (Exoascus) deformans*

If trees are severely affected, thin fruit later in the season. Pruning in fall prior to applying any fungicides can reduce spore numbers overwintering on the tree and reduce the amount of fungicide needed. This disease is usually kept under control with a dormant fungicide application. One application of Copper compounds or Thiram in fall after leaf fall is sufficient except in areas of high rainfall or where leaf curl has become an increasing problem. In such cases, an added application in late winter before bud swell is recommended.

PLUM (*Prunus domestica*)

Plum pockets: *Exoascus (Taphrina) pruni*

Removal of affected branches, or in severe cases, of affected trees is recommended. Fungicide sprays (Copper compounds or Thiram) at leaf fall and at before bud break in the spring can reduce disease incidence.

Powdery mildew: *Podosphaera tridactyla*

Mildew-susceptible varieties should be widely spaced in open, sunny areas. To improve air circulation and sunlight penetration, pruning overhanging trees will help slow the spread of disease. Pruning affected shoots, removing of infected young fruits, limiting irrigation and avoiding overfertilization with nitrogen may help reduce the inoculum potential. If there are roses infected with powdery mildew near the orchard, these bushes are potential sources of inoculum, and it may be beneficial to control the disease on the roses

or to remove them. Control of powdery mildew can be achieved by fungicides and by the use of resistant cultivars. Knowledge of the disease pressure, and of the susceptibility of cultivars grown in the area, is essential for an effective strategy of fungicide use. Where the disease occurs every year on susceptible cultivars, some preventive fungicide sprays at the end of flowering and fruit set are recommended. The fruit is thought to be resistant to infection after pit hardening. In all other cases, fungicides can be applied curatively soon after the occurrence of first symptoms. Timing of fungicide application is critical to slow disease progress. It is important to alternate fungicides of a different chemistry to prevent the development of resistance. Fungicides recommended are: propiconazole, sulfur, and thiophanate-methyl.

CHERRY (*Prunus avium and P. cerasus*)

Black cherry aphid: *Myzus cerasi*

A number of natural enemies, including lady beetles, lacewings, and several species of parasitic wasps, help keep aphid populations controlled. The banding of tree bases with glue prevents the ants that attend *M. cerasi* from climbing up the trees. These ants act to deter natural enemies, which are more prevalent in banded trees than unbanded trees. Limiting nitrogen fertilization and pruning green twigs in spring in order to reduce vegetation reduce aphid infestation. Insecticide sprays should be applied as soon as first infestations occur because the severe leaf-curl limits the effectiveness of many insecticides. Following the IPM strategy, insecticide sprays should be applied when 10% of leaves, shoots or fruits are infested. For most active substances, use is limited to one or two applications per year, with the aim of preventing resistance. The best time to control black cherry aphid is during the dormant or delayed dormant period with Narrow range oil, or Chlorpyrifos. In addition, if control has not been achieved during the dormant period and natural enemies are not adequately controlling the population, apply a treatment shortly after petal fall, when the aphids first appear with Imidacloprid.

Cherry weevil: *Rhynchites auratus*

Sound agricultural practices, such as fertilizing at the right time with the right dose, soil management, and irrigation, ensure that the trees are healthy and able to resist the onslaught of pests. To prevent infestation apply a 3- to 4-inch band of sticky material on the trunk of young trees to trap crawling adults in May when the first adult feeding is observed. Apply Stickem or Tanglefoot over a special tape or painted areas of the trunk of young trees to prevent bark damage. Reapply the sticky material when it becomes dirty or loses its effectiveness.

Shot whole disease of sweet cherry: *Mycosphaerella cerasella Aderhold*

Remove and destroy infected twigs, buds, blossoms and fruit as soon as symptoms appear. If your trees are not seriously infected, sanitation may be good enough to prevent serious losses the next season. However, where shot hole has been a serious problem, it is difficult to find and remove all infected buds and twigs in the fall. In such cases you may need to apply a protectant fungicide in order to prevent the disease. Apply copper-based products after leaf fall. It is a good idea to apply the fungicide before mid-December, especially if your trees were seriously infected last spring. This treatment also controls peach leaf curl under average rainfall conditions. Additional treatments may be necessary during very wet spring weather.

GRAPE (*Vitis vinifera*)

Grape erineum (gall) mite: *Eriophyes (Colomerus) vitis*

A combination of chemical, cultural and biological control measures should be used. Predatory mites and beetles are suitable and effective for biological control. Between rows, maintain resident vegetation or ground cover, thereby achieving an additional effect on mite reduction. Dormant-season oils and insecticides used for other pests, as well as sulfur applications during the season for disease control, usually control this pest. Other controls are usually unnecessary. Wettable sulfur appears more effective than flowable sulfur formulations.

Grape berry moth: *Polychrosis (Lobesia) botrana*

Use pheromone traps to detect lifecycle onset for potential chemical control. Confusion methods for mating disruption might be an option too, using the correct pheromones. Even more advanced is the sterile male method. As for many pests, keep phytosanitary measures appropriately and remove potential refuge of old wood or non-proficient vine stocks. Cultural methods include pruning the vine canopy, leaf stripping, irrigation, earthing-up, weeding and especially harvesting date. Some recent studies with the egg parasitoid species of Trichogramma ssp. show encouraging results. Insect growth regulators and bacterial insecticides prepared from some *Bacillus thuringiensis* subspecies are effective.

Grapevine moth: *Clysia (Eupoecilia) ambiguella.*

Same as for Grape berry moth

Grape mealybugs: Pseudococcus (Planococcus) maritimus

Species identification is crucial for choosing the exact control strategy. Mealybugs are transported by equipment; therefore cleaning equipment before using elsewhere is crucial. Detecting and marking mealybug infestations during harvest is a key to monitoring populations the following season. Once established, parasites and predators can help keep populations down, but an infestation may slowly spread unless controlled with insecticides. Leaving untreated areas in the vineyard is effective in increasing predator and parasite populations, however, under heavy population pressure, this may not be feasible. Known predators for mealybugs are several parasitic wasps and a lady beetle species. When treating mealybugs, leave at least one out of every 10 acres untreated to provide a refuge for natural enemies, or treat with an insecticide that is not toxic to parasites. Honeydew-seeking ants must be controlled in order to allow natural enemies of mealybugs to aid in mealybug control. Ant control is best accomplished either with tillage, cover crops of common vetch, or with sprays of chlorpyrifos directed at the soil surface. Chlorpyrifos may only be used for either mealybug control in grapes in a given year or for ant control but not both. Grape mealybug infestations can also be reduced by training vines so that clusters hang freely and do not touch the wood.

Aphid spp.

Good production practices result in grapevines that are of sufficient vigor to tolerate some attack by aphids. Aphids are attacked by predators like ladybird beetle adults and larvae, and lacewing larvae that regulate their population.

Powdery mildew: *Uncinula (Erysiphe) necator*

Methods for the control of *E. necator* integrate the use of fungicides, cultural practices and natural parasites. Canopy management and row orientation are important factors that alter the microclimate within the grape canopy. Conditions that increase direct sunlight and air movement within the canopy reduce disease development. An open canopy also allows for better coverage by fungicide sprays. Grape varieties show some variability towards powdery mildew susceptibility. Season-long control depends on the effective reduction of early-season inoculum and subsequent infection. Treatment must begin promptly and be repeated at appropriate intervals. Timing of the first treatment depends on fungicide used and growth stage. Frequency of treatment thereafter depends on fungicide choice and weather conditions. All powdery mildew fungicides, with the exception of oil, are best used as protectants. Discontinue the use of soft chemistry products (sulfurs, biologicals, systemic acquired resistance products, and contact materials) when disease pressure is high because by themselves they will not provide adequate control. If eradication is necessary, a light summer oil may be used anytime in the season if there is no sulfur residue present (i.e. at least 2 weeks after a sulfur treatment). Basal leaf removal can improve coverage and efficacy of powdery mildew fungicides on clusters.

Downy mildew: *Plasmopara viticola*

Effective soil drainage and reduction of sources of overwintering inoculum are key preventive measures to reduce infections. Most cultivars are susceptible to the pathogen. Wet conditions favor the disease development. Cultural practices alone are unlikely to give sufficient control, especially under conditions favorable to downy mildew. However, cultural methods can influence disease development. Techniques to promote air circulation and minimize surface wetness may reduce disease development. Pruning and trellising methods, which reduce canopy density, decrease downy mildew levels. Ploughing to bury oospores in leaf litter, and avoidance of irrigating soil for long periods in order to prevent oospore germination might reduce the primary infection pressure. Fungicides for use against downy mildew can be categorized as either preventive or curative. The preventive fungicides (mancozeb, maneb, and copper compounds) must be applied before an infection period begins. New growth following application will not be protected. Include a spreader/sticker agent to prevent the material from washing off with rain. In vineyards with a history of downy mildew, apply early season copper sprays as part of a preventive program, especially during wet springs.

Grape anthracnose: *Gloeosporium ampelophagum (Elsinoë ampelina)*

Anthracnose disease management programmes depend entirely on reducing overwintering lesions, preventing the build-up of disease, starting from bud dormancy to active vine growth of leaves, shoots and fruit berries, and protecting them with regular application of fungicides under the prevailing favorable weather conditions for disease development.

Management of anthracnose involves the removal of primary sources of potential inoculum and the protection of grapevine foliage during its active growth phases. Mummified fruits, clusters, tendrils and canes carrying canker should be removed or destroyed/burned. Reduction of the amount of primary inoculum in spring by removal or neutralizing overwintered lesion on canes. The use of nitrate of soda, lime or potash fertilizers when applied about 3 weeks before bud burst promoted healthy development of vines. Diseased wood and shoots likely to trail near the ground should be removed and properly trained. The vineyard should be ploughed in spring to turn all the disease bearing leaves and mummified fruits. It is difficult to grow grapes without annual sprays of pesticides against this fungus. It is necessary to give one dormant bud spray usually early in the spring, before bud burst, to inhibit sclerotial germination, and

thereafter to spray continuously to protect the active vine growth, and then to reduce the interval of spraying when weather is favorable for disease development in the rainy season.

A combination or alternate application of effective fungicides is recommended for better management of the disease. The most effective fungicides were thiophanate-methyl, and mancozeb.

Botrytis bunch rot: *Botrytis cinerea*

Disease can be controlled utilizing cultural methods, resistant varieties and appropriate chemical control. Canopy management and leaf removal in particular results in good control of the disease. Incidence and severity of disease is reduced by removal of basal leaves or basal lateral shoots at or immediately after berry set. In warmer growing areas, excessive removal can result in sunburned fruit. This condition is made worse when leaves are removed later in the season. If leaves are removed at cluster set, the berries acclimate readily to the sunlight and develop a thick cuticle that helps prevent sunburn as well as Botrytis infection.

Mycotoxins: *Aspergillus and Penicillium ssp.*

These fungi are either present in the soil, on plants or in storage buildings and can infect grapes and lead to the production of mycotoxins in grapes and dried raisins.

Since the vast majority of black raisins originate from grape productions system, which do not use fences to keep grape berries in distance to soil and high humidity zone above ground level, the possibilities to reduce the source of mycotoxin contamination are very low. Mycotoxins like ochratoxin A and B are produced by *Aspergillus* and *Penicillium* species. Infection with those fungi occurs via soil contamination, injuries and warm and humid conditions, especially found during the days after furrow irrigation, commonly used in Uzbek grape production. Other sources of fungal contamination might be problematic during drying and storage issues. Assuming, that drying and storage follows GAP recommendations, AgLinks Uzbekistan should use raisins of fenced grape production sites. Further, it is recommended to monitor Mycotoxin contamination over location and time to identify the sources of lowest mycotoxin levels, thereby reducing the risk of rejection at destination country level. Application of additional fungicides will not efficiently control most Mycotoxin producing fungi.

The following are control measures to avoid the contamination by these fungi:

- Avoid the soils of too fertile areas, with high crops and tight bunches and big berries that brings the risk of breaking the skin.
- Favor grape establishment in fences, in well-aerated areas while avoiding as possible humid areas.
- Draw up plots of land with adequate planting disposition, and vegetation architecture (trellising system) to facilitate planting operations, correctly position grape bunches, ensure good pest and disease control and favour the uniform ripening of the grape.
- Choose clones or biotypes within a variety which are better adapted to climatic and soil conditions in specific cultivation area and less sensitive to mould and rot development, which are oftentimes characterized by less compact grape bunches.
- Lay out homogeneous plots of land (varieties, clones) to facilitate growing operations and to ensure better crop and disease control and to obtain uniform ripening of the grapes.

- Favour a correct grape bunches exposure, avoiding leaf excess in the cluster area. Clusters should be in a vertical positioning to facilitate pesticide application.
- In irrigated vineyards, irrigation should be applied to maintain quality and not as a way to increase the yields. The irrigation has to be regular and avoid the risk of berry breaking after a excessive water application.
- Carry out leaf removal in the grape cluster zone. This operation can increase the exposure of clusters, is specially necessary in warm and humid climatic conditions during grape ripening whilst recognizing the need to limit the risk of sun burn.
- Avoid injuries on the berries and skin damage caused by diseases, insects, phytotoxicity and sun burn.
- Apply vine protection plans in order to control dangerous fungal diseases affecting grape quality.
- Prevent attacks of grape berry moths and other insects which favour mould development on damaged berries; pest control need to be carried out according to biological and epidemic risk; under high risk conditions preventive treatments must be applied by using specific products.
- Preventive control of *Botrytis* or grey mould. In conditions with risk of production of ochratoxins, it is recommended anti botrytis treatments which are actives against *Aspergillus*
- Protection strategies have to cover all ripening process respecting the safety period. This aspect is important in case of searching maximum ripening.
- Ensure the hygiene of containers to be used for the harvest and/or the drying of grapes.
- Use only grapes not damaged by insects and not contaminated by mould; or select the grapes by eliminating damaged or contaminated grapes.
- Place grapes to be dried or raisined in just one layer to avoid over stacking.
- Favour progressive and uniform drying of all parts of the grape bunch.
- Take the necessary measures to avoid development of fruit fly infestation.
- For particular conditions of drying in open air, it is recommended to dry in well ventilated conditions and to cover the grapes at night to prevent condensation and humidity.

POMEGRANATE (*Punica granatum*)

Pomegranate moth: *Euzophera punicaeella*

Pest biology requires additional studies. In case the first generation positions eggs on weeds, then weed control might be an appropriate measure. The second generation might be controlled by *Bacillus thuringiensis* insecticides. Simple traps might be used to monitor the onset of the second generation.

Aphids: *no species given*

Biological control is effective. In most years, parasites (*Aphidiidae*) and lady beetles (*Coccinellidae*) quickly control spring populations. Lady beetles and lacewings (Chrysopidae) mid to late season. Flies (*Syrphidae*, *Cecidomyiidae*), and other predators also contribute to control. Additional control might be

efficient from naturally occurring fungal pathogens of aphids. Weak crops are more prone to aphid infection than vigorous crops.

Spider mites: *no species given*

Spider mites have many natural enemies that often limit populations. Adequate irrigation is important because water-stressed plants are most likely to be damaged. Broad-spectrum insecticide treatments for other pests frequently cause mite outbreaks, so avoid these when possible. Sprays of water, insecticidal oils, or soaps can be used for management. Always monitor before treatment.

Comstock mealybug: *Pseudococcus comstocki*

Mealybugs are primarily managed by conserving their natural enemies and reducing ant populations and dust problems. Treatment is rarely required. Conservation and augmentation of native beneficials significantly helps to keep the Comstock mealybug population below economic threshold levels. Several parasitoids are effective. Of these, *Pseudaphycus malinus, Allotropa burrelli, A. convexifrons* and *Zarhopalus corvinus* achieved the highest percentage control of the pest.

White flies: *Dialeurodes citri*

Chemical treatment of whiteflies is generally not necessary; exceptions are usually limited to where biocontrol has been severely disrupted. Enhance biocontrol by avoiding nonselective insecticides for other pests and by controlling sugar-feeding ants. *Encarsia* ssp. are reported parasitoids of white flies. Other important parasitoids are from the genus *Eretmocerus*. In each region one or more species of each of these two genera cause heavy mortality.

Pomegranate spot anthracnose: *Sphaceloma punicae*

Control anthracnose primarily with good cultural practices in the grove and proper preharvest and postharvest fruit handling. Prune out dead limbs and twigs where fungi sporulate. If many dead leaves are entwined in the canopy, knock them out of the tree. Prune low limbs to at least 60 cm off the ground to reduce humidity within canopies by improving air circulation. Dispose of dead wood and old fruit away from pomegranate trees before bloom. Prune and harvest only during dry conditions and minimize fruit contamination and injury. Postharvest treatments should not be needed if fruit is properly handled. Keep fruit dry and cool until sold. Avoid storage temperatures below 5°C because chilling injury may occur. Market fruit rapidly. Copper compounds thoroughly sprayed on healthy tissue can prevent infection.

CUCURBITS: Water Melon (*Citrullus lanatus*), Sweet Melon (*Cucumis melo*) and Cucumber (*Cucumis sativus*)

Melon ladybird beetle: *Epilachna chrysomelina (Henosepilachna elaterii)*

The adult of the beetle overwinters in crop debris. Accordingly, destroy crop residues after harvest and reduce overwintering sites by tilling. The larvae and adults are light colored and highly visible. They can be collected in small parcels. Use of wood ash and neem extracts application are effective.

Baluchistan Melon fly: *Carpomya (Myiopardalis) pardalina*

Cataglyphis bicolor, Cataglyphis megalocola and *Pheidole pallidila* (Hymenoptera: Formicidae) have been determined as larval predators of the pest. Some cultural methods may reduce pest damage. *C. pardalina* adults hide in shadowy places, down the sides of leaves and at the base of the plants during the hottest parts of the day. In weedy and closely-planted fields, damage is much greater than in fields that are

open to the wind and weed-free. In densely-planted fields, at the start of the fruiting stage, fruits in shadowy areas must be carefully moved so that they are exposed to sunshine and wind. Some leaves forming shadows could be broken off to allow more light through the crop canopy. To decrease the population density for following years, fruits and fruit remains containing larvae and pupae must be buried to a depth of 1 m and covered with lime. Damage is reportedly more severe on cucurbit varieties with a thin skin.

Aphids: *Aphis gossypii*

Consider natural controls when making treatment decisions, and especially, when not controlling virus vectors. Beneficial insects are extremely important in keeping aphid populations in check. In addition to natural enemies, you can spray leaves with soapy water, and then rinse with clear water. Spraying with insecticidal soaps, planting in aluminum foil-covered beds and filling yellow pans with water to trap the aphids are also sometimes effective control measures. Where feasible, remove and bury the few severely infested plants as they appear in spring; this helps prevent rapid spreading of the aphid population. Row covers applied at planting and removed at first bloom exclude melon aphid. Silver reflective plastic mulches applied at planting have been shown to be effective in repelling aphids from plants, thereby reducing or delaying virus infection. Preserve habitat for beneficials around the field and keep dust down thereby encouraging parasitism and predation. Over fertilizing with nitrogen enhanced aphid infestations. Fields infested with melon aphid should be disked or plowed under as soon as harvest is complete.

Cucurbits Whiteflies:

Whiteflies require seldom chemical control. Natural biological controls or predators or parasitoids provide the best long-term solution to keeping most of the whitefly species at low levels along with crop host absence. Host-free periods, row covers, silver reflective mulches (if biodegradable), non-infested transplants, and good field sanitation are good control measures. Several wasps, including species in the *Encarsia* and *Eretmocerus* genera, parasitize whiteflies. Whitefly nymphs are also preyed upon by bigeyed bugs, lacewing larvae, and lady beetles. Populations peak in late summer and decrease towards year end. Plant delays or host-free periods may decrease severity of attack. Planting delays reduce the buildup probability of whitefly populations on melons. Avoid whitefly infested transplants. When possible, plant cucurbits at least one-half mile upwind from other key whitefly hosts such as cotton. Maintain good sanitation in winter/spring host plants and weeds. Remove weeds in and adjacent to the crop field as well as crop residues. Attempt to produce the crop in the shortest season possible; proper management of irrigation and nitrogen will assist in this as well.

If treatment is needed, make applications before pests build up and honeydew contaminates fruit. A soil application of imidacloprid or thiamethoxam at planting and foliar treatments with bifenthrin or spiromesifen during the growing season effectively controls whiteflies. Insecticidal soaps and narrow range oils are used in organic fields.

Powdery mildew: *Sphaerotheca fuliginea*

Plant resistant varieties, follow good sanitation practices (crop rotation, removal of infected plant materials and alternative hosts, increased light intensity, and application of water sprays in the greenhouse), and control weeds. Any practice that can break the disease cycle will slow or prevent the spread of *S. fuliginea*. Carefully monitor fields, even those with powdery mildew resistant varieties,

because there is recent evidence that plant resistance-breaking races are present. If multiple fungicide applications are needed to control powdery mildew, alternate materials with different modes of action

Fusarium wilt of cucumber: *Fusarium oxysporum* f.sp. *cucumerinum*

Generally, the use of resistant cultivars is the most acceptable and economic means of disease control. Planting fungicide-treated seed is effective in reducing the incidence of disease initiated from infected seed. All equipment used in production and cultivation of the plants as well as the structures of the greenhouses should be disinfected with appropriate solutions. Cultivation of cucumber in greenhouses during late autumn, winter, and early spring reduces disease symptoms, since wilt is not favored at relatively low temperatures. Plants with early symptoms should be destroyed. Prunings should be collected and destroyed. When the crop season is over it is essential to remove and burn the plants. Wilt is reduced by raising the soil pH to 7.5-8.2. Fertilizers low in N and containing CaO reduce the disease. Fowl (chicken) manure and mushroom compost reduce disease symptoms. Crop rotation is generally ineffective, because of the long survival of the chlamydospores in the soil. Soil solarization has some potential for controlling the disease, but it is best used in fields with low to moderate wilt potential. Experiments have been carried out to control *F. oxysporum* f.sp. *cucumerinum* using fungal and bacterial antagonists (*F. oxysporum, Trichoderma harzianum, T. viride, Gliocladium virens* and *Penicillium* spp. and *Pseudomonas fluorescens, P. putida*, respectively).

Cucurbit angular leaf spot, bacterial leaf spot: *Pseudomonas syringae pv. lachrymans*

Angular leaf spot can be minimized through the application of a comprehensive set of control measures. The use of cucumber cultivars that are resistant to angular leaf spot can be effective in reducing damage and losses due to this disease. The production of seed in arid regions under furrow irrigation is the best way to minimize pathogen population in the seed. Crops for both seed and fruit production should be grown in fields that have had no cucurbits for at least 2 years. Cultivation of the soil when it is dry is most effective in reducing bacterial survival. In a greenhouse, controlling night-time humidity with dehumidifiers reduce disease development. Limit the use of overhead irrigation. Pick fruit when the vines are dry to prevent spread in the field. Use pathogen-free seed and rotate out of cucurbits. Treat when symptoms first appear if the weather is predicted to be cool and rainy.

The biological control agent Pentaphage (a lysate of the virulent strain of *P. syringae* pv. *syringae* by bacteria phages of 5 strains) was successfully used against *P. syringae* pv. *lachrymans* on cucumbers under field condition. Pentaphage was most effective when applied at high RH (90%) in the morning and evening at intervals of 12-14 days. Systemic resistance to angular leaf spot was induced in cucumber plants by infection of first leaves with tobacco necrosis virus.

Cucumber downy mildew: *Pseudoperonospora cubensis*

Management of downy mildew relies on the use of host-plant resistance, cultural practices that minimize leaf wetness, and the timely application of fungicides. Avoid overhead irrigation, thinning to reduce plant density and increase air movement, timing irrigations so that they do not elongate dew periods, etc. Altering planting dates to avoid periods of high disease pressure can be very effective. In glasshouse cucumber production, reducing relative humidity and adequate air movement are of primary importance to controlling the disease. Apply chemical treatment when disease symptoms first occur and repeat if symptoms reappear. Fungicides effective are Cymoxanil and Mancozeb.

Cucurbits anthracnose: *Colletotrichum orbiculare (lagenarium)*

Some watermelon and cucumber varieties have resistance. Control tactics include crop rotation, use of clean seed, and inspection of transplants. Avoid sprinkler irrigation and Keep the tops of the beds dry. Fungicides (Chlorothalonil, Mancozeb) are rarely needed but may be required on seedless watermelons at the first sign of disease.

CUCUMBER MOSAIC VIRUS

Cucumber mosaic has a very wide host range including cucurbits (except watermelon), tomato, spinach, celery, safflower, beans, blackeyes, peppers, beets, potatoes, and many ornamentals and weeds. The virus is transmitted by many species of aphids. The occurrence of this virus is erratic and unpredictable. Therefore, control of this disease is not problematic. In some studies, silver reflective plastic mulches (should be quickly biodegradable or manually removed) applied at planting have been shown to be effective in repelling aphids from plants, thereby reducing or delaying virus infection.

TOMATO *(Solanum lycopersicum)*

Tomato russet mite: *Aculops lycopersici* Massee

Determine the extent of each infested area in the field by examining leaves and stems for bronzing, and mark the boundaries of the infested areas. Check these areas again in 2 or 3 days to see if they are increasing in size. Immediate treatment with Sulfur or Avermectin is necessary when damage symptoms begin to spread. Chemical methods have progressively been supplemented, especially in greenhouse situations, by biological control strategies involving predatory phytoseid, stigmaeid and tydeid mites.

Tomato whiteflies: *Trialeurodes vaporariorum*

Same as for Cucurbits whiteflies

Tomato fruit worm: *Helicoverpa spp.*

When eggs and small larvae are observed, treatment should begin. Once inside the fruit, spraying will be ineffective. Biocontrol agent *Trichogramma* ssp. and other natural enemies often destroy significant numbers of eggs, so it is important to know the antagonistic potential within the nursery or field. Conserve these parasites whenever possible. Monitor releases by determining the ratio between healthy and parasitized black eggs. Deep ploughing, disking and other methods of mechanical destruction, manipulation of sowing dates and use of trap crops can be used to kill this pest. Host plant resistance might be another option to control the tomato fruit worm in future. Sprays of *Bacillus thuringiensis* and the Entrust formulation of spinosad are used to control this pest.

Cutworms: *Agrotis segetum*

To reduce cutworm incidence, destroy plant residues before planting, especially when tomatoes follow good host crop like alfalfa, beans and other leguminous cover crops. Host plant material may also be controlled with herbicides. On the other hand, overwintering pupae will be unaffected. Because cutworm damage is often localized within a field, reseeding affected areas of a field rather than treating the whole field might be more economical. If possible, avoid planting crops in fields with a known history of cutworm problems. Use shallow tillage to keep down late autumn and early spring vegetation (where conservation practices allow). Use cutworm bait traps to assess cutworm populations, and follow by rescue treatment when the number of cutworms exceeds the economic threshold.

Aphids: *Aphis gossypii*

Same as for Cucurbits aphids.

Thrips: *Frankliniella occidentalis* and other species

Disking weeds before they flower can lessen attraction of the field to thrips. Do not disc after weeds have flowered as thrips will move to crop plantings. Monitor the populations by using yellow or blue sticky traps from sowing to flowering. Be sure to determine that thrips-related damage is occurring and consider treating only if the population is causing serious damage to shoot tips, flowers, or fruit. Unnecessary treatments can cause spider mite buildup. Good weed management also reduced thrips population buildup. Sprays of the Entrust formulation of spinosad are used if treatment is needed.

Root knot nematodes: *Meloidogyne* spp

Root knot nematodes are distributed and increased by disregarding basic phytosanitary measures. Various methods have been used to cleanse planting material, including hot water treatment. Treatment in the field also relies upon the application of nematicides although frequent rotation with cereals or other graminaceous non-host crops may also be efficacious. Glasshouse soils may be steamed or fumigated to eradicate the pest. Many crops have already utilized potential for development of resistant or tolerant varieties including tomatoes. Rotation with resistant varieties and non-host crops is as effective as fumigation. Resistant tomato varieties are not effective against the species *Meloidogyne hapla*, but are effective against *M. incognita, M. javanica*, and *M. arenaria*. Cotton is susceptible only to *M. incognita* and has relatively high tolerance to even that species. Certain varieties of alfalfa and black-eyed peas are resistant to some root-knot species, but *M. hapla* builds to high numbers on alfalfa. Soil solarization can provide control of many soilborne diseases, nematodes, and weed pests.

Bacterial canker: Clavibacter (Corynebacterium) michiganensis

The diseases primary infection path is the seed. Improved management of bacterial canker in tomato has been shown to be possible by the use of healthy seeds, seed treatment, appropriate cultural practices, chemical sprays where needed, hygiene and sanitation. Recent advances have introduced more efficient techniques to aid seed health testing, and many seed companies are using one or more of them. Cultural practices such as deep ploughing to bury infected crop residue after harvest to accelerate decomposition, and crop rotation away from solanaceous crops for at least 2 years, are recommended to reduce the incidence of canker. Production of tomato transplants in greenhouses planted in soilless medium in plastic trays was found to be more reliable and appropriate than field-grown transplants for reducing bacterial canker spread. Under conditions of frequent rainfall and prolonged wet periods, chemical sprays with copper-containing compounds have been found useful in reducing foliar blight and fruit spotting. In protected crops, strict hygiene measures such as early detection, isolation and eradication of infected plants, destruction of crop residues, rinsing hands/gloves and pruning tools with a disinfectant after working each row, and disinfection of structures and equipment are essential to manage canker.

Tomato leaf mold: *Fulvia (Cladosporium) fulvum*

Reduce primary inoculum levels through sanitation, and seed treatment. After harvest, carefully remove and destroy (burn) all plant debris. Soil sterilization by solar heating by polyethylene mulching, followed by covering the soil again with plastic and planting seedlings through holes made in the covers reduces the severity of tomato leaf mould. Avoid wetting the foliage when watering. Provide adequate plant and row spacing to avoid excessive shading. Good hygiene is very important, so remove affected foliage as

soon as it is seen, and dispose of all infected plants at the end of each season (do not compost). Leaf mold resistant varieties are available, but because the fungus mutates readily (there are at least 12 races of the pathogen) resistant varieties are of limited use. A fungicide spray program may help control the disease, but should be considered secondary to environmental control measures. Once the disease has appeared the plants should be sprayed with mancozeb. Copper fungicides can also be used, but tend to harden the foliage and are best applied later in the season. Neither mancozeb nor copper is labeled for leaf mold control, but both are labeled for control of tomato blight, and if used as directed for this disease should give some control.

Late blight: *Phytophthora infestans*

Tomato varieties resistant to certain races of the late blight fungus are grown where the disease occurs regularly. Remove any nearby volunteer tomato, potato plants and other nightshades. Check transplants to ensure they are free of late blight before planting. Fungicides (Cymoxanil, Mancozeb) are generally needed only if the disease appears during a time of year when rain is likely. Disc tomato and potato fields in fall to eliminate a winter reservoir for the fungus. The use of clean and certified seeds is highly recommended, since *P. infestans* is seedborne on tomato. In difference to many other diseases and pests, the initial protection against infection is crucial. Therefore protectant fungicide should be applied before disease development begins. After outbreak in a field, for this diseases it is important to apply additional applications at regular intervals. Also be aware, that fungicide resistance is developing (i.e. Mefenoxam). Both reduction in the amount of initial inoculum and suppression of pathogen growth rates are important in the suppression of late blight of potatoes and tomatoes. At this point, there is no biological control of known efficacy for use in suppressing late blight. Other sources of inoculum in a growing region should be eliminated. These include any place where infected tomatoes might reside: piles of unmarkable tomatoes, or unharvested tomatoes. Because sporangia of *P. infestans* can be dispersed aerially, late blight is a “communal” disease. It is important that all growers in a production region collaborate to eliminate sources of inoculum. If this does not happen, a few fields with infected plants can jeopardize production in an entire region. Late-blight-resistant cultivars and periodic application of fungicides limit pathogen growth rates. Both are effective and can be used together. In some agro ecosystems, cultivars with very high levels of resistance are available and these alone are sufficient to suppress late blight. Many 'forecasting' schemes have been developed to improve the efficiency with which fungicides are used and might be adapted to Uzbek regions. If a hot spot of late blight appears in a field, growers should destroy that section of the field as rapidly as possible and perhaps also increase the frequency of fungicide application in surrounding areas.

Verticilium wilt: *Verticillium* spp

The disease is favored by cool soil and air temperatures. A positive identification of the Verticilium species and race is required to avoid confusion with Fusarium wilt. Verticillium wilt seldom kills tomato plants but reduces their vigor and yield. Use, if available, resistant cultivars effective against Race 1. No source of resistance to Race 2 is commercially available. Sanitation, especially washing equipment to prevent movement of infested soil, as for nematodes and other soilborne problems, may help to slow spread of the Race 2 strain of the pathogen. Rotation to non-susceptible crops, such as small grains and corn, helps reduce inoculum. Treatment of soil or seed with preparations containing *Trichoderma* spp. and green manuring, often in combination, have been employed in parts of the former USSR as an aid to controlling wilt in cotton. By making healthy material available through certification schemes effectively eliminated the transmission in vegetative planting material for some important crops.

Weeds: *Cyperus rotundus, Amaranthus retroflexus,, Solanum nigrum, Xanthium strumarium, Abutilon theophrastii, Hibiscus trionum, Portulaca oleracea, Sorgum halepense, Convolvulus arvensis, Plantago major*

Effective weed management in tomatoes involves crop rotation practices, cultivation, proper field preparation, sanitation, and proper selection of herbicides. When combined with good cultural practices, available herbicides can control many of the weed species that are found in tomato fields. The choice of herbicide clearly depends on weed species that are present, succeeding rotational crops and growers cultural practices. Crop rotation can effectively reduce difficult weed problems by altering the environmental conditions that favor a particular weed species. Corn is considered a good rotational crop for tomatoes because some corn herbicides have the ability to control nightshade, yellow nutsedge, and field bindweed. Alfalfa hay is also a good choice for a rotational crop because its frequent cutting cycle reduces many weeds. Other crops considered as useful rotational crops with tomatoes include wheat, cotton, rice, dry beans, onions, carrots, and safflower. For field preparation, many major weed problems can be reduced by avoiding fields that are severely infested with problem weeds such as nightshades. Irrigation water can also be a source of weeds; therefore keep canal banks should be kept free of weeds. Avoid moving weed seed into fields on equipment. Soil solarization can provide control of many soilborne diseases, nematodes, and weed pests. A soil cap up to 10cm over the seedline at planting can reduce the first flush of weeds competing with the crop seedlings. The cap is removed just after tomato seedlings germinate but before rapid elongation of the hypocotyl. Under good conditions, weed seeds that germinate in the soil cap are destroyed when the cap is removed and fast-growing weeds that germinate in the original bed are often scraped off by the cap removal operation. After plant establishment, preventing weeds from going to seed helps reduce weed populations in subsequent crops. Maintaining deep furrows keeps the bed tops from becoming overly wet while maintaining adequate soil moisture for the crop. By keeping the bed tops drier, less weeds are likely to germinate in the soil surface. To avoid excessive competition with the tomatoes and to make removal easier, cultivate when weeds are small. Hand weeding is a very efficient method for weed control. Also flaming controls weeds very well, when hand weeding is not applicable.

ONION *(Allium cepa)*

Cutworm, turnip moth: *Agrotis segetum*

Same as for Cutworms on Tomatoes.

Onion fly (Maggot): *Delia antique*

Avoid planting in soils that are high in undecomposed organic matter, such as fields just coming out of pasture or very weedy situations. In soils amended with animal manures, allow adequate time for the manure to break down before planting. Avoid planting successive rotations of onion crops. Early spring-planted crops are more likely to be damaged when the soil is too cool for rapid germination and emergence. If serious infestations are expected, wait until the soil warms up in spring, or if feasible, plant in fall while the soil is still warm. When planting, use a chain drag or similar implement behind the drill to cover the seed row. There is a variety of predators against onion fly like predatory flies and parasitic wasps. Rotation with non host crops reduces onion flies as well. Removal of all harvest remains and autumn plowing is beneficial too. Use yellow sticky traps to assist in determining the necessity and timing of treatments. Treatments for onion maggot are preventative and should be considered for fields that are high in organic matter or undecomposed organic material, or that have had previous maggot problems. Insecticides used are Diazinon (rejected by PERSUAP) and Chlorpyrifos. Chemical application should be

done in the early morning, when onion fly activity is high. Removing volunteer onions in spring and minimizing cultivation damage to onions reduced onion fly populations further.

Onion thrips: *Thrips tabaci*

For appropriate evaluations, randomly sample leaves and evaluate thrips numbers and damage under leaf folds. Natural enemies like predaceous mites, minute pirate bugs, and lacewings, are often found feeding on thrips. These beneficials, however, are very susceptible to insecticide sprays and might be therefore not effective if insecticides have been used. Do not plant onions near grain fields. Thrips numbers often build up in cereals in spring. Rainfall provides some suppression of thrips populations, but treatments with Spinosad are often still necessary. Thrips resistance to organophosphates is suspected.

Aphids: *no species given*

Yellow sticky traps can be used to monitor aphid movement into fields. Proper identification of aphid species is important because many aphid species are dispersing to wheat and alfalfa also (pea aphid, blue alfalfa aphid, greenbug, etc.). Several predators and parasitoids attack aphids on onions. However, natural enemies rarely provide adequate control of high field populations in spring.

Downy mildew: *Peronospora destructor*

Initial sources of disease can be infected bulbs, sets, seeds, and plant debris. Consequently, Using disease-free bulbs, sets, and seed reduces the initial disease pressure. A 3-year rotation away from Allium crops in fields where the disease has occurred is recommended. Destroy volunteer Allium plants in and around the field and buildings. Locate onion fields where there is good air movement to promote rapid drying of foliage. Currently, some red onion cultivars are resistant to downy mildew. Well-drained, not clay, soil, and weed control are good control measures as well. Using bulbs free of systemic infection is also suggested as is seeding or planting onions in rows running in the direction of prevailing winds because of their influence on humidity. High doses of fertilizers, high rate of seeding and numerous irrigations, especially overhead sprinkling, increase the severity of downy mildew. Spray with Chlorothalonil, Mancozeb or copper based compounds at the first sign of disease; fungicides may be applied on a 7-day schedule, if necessary. For all fungicides, thorough coverage of foliage is important in the control of downy mildew.

Weeds: *Cyperus rotundus, Amaranthus retroflexus, Solanum nigrum, Xanthium strumarium, Abutilon theophrastii, Hibiscus trionu, Portulaca oleracea, Sorgum halepense, Convolvulus arvensis, Plantago major, Cynodon dactylon, Cuscuta campestris*

Monitor the fields and keep records of the weed species that occur in each field during the period of the year when the crop will be grown. Pay special attention to weeds likely to be present at planting time. Plant onion and garlic in the most weed-free fields available, avoiding fields with high populations of difficult-to-control weeds. To avoid buildup of weed seed in the soil, cultivate weeds before they set seed in rotation crops. Clean cultivate the field or plant a green manure crop to limit weed infestations after onion harvest. Fields heavily invested with certain weeds can be plowed with moldboard plows to bury tubers deeply. Another measure is to irrigate the field before planting to germinate weed seeds and afterwards cultivate the soil killing the weeds. Cultivate shallow so that weed seed is not brought up from deeper soil layers. After plant establishment, preventing weeds from going to seed helps reduce weed populations in subsequent crops. Maintaining deep furrows keeps the bed tops from becoming overly wet while maintaining adequate soil moisture for the crop. By keeping the bed tops drier, fewer weeds are

likely to germinate in the soil surface. To avoid excessive competition with the tomatoes and to make removal easier, cultivate when weeds are small. Hand weeding is a very efficient method for weed control. Also flaming controls weeds very well, when hand weeding is not applicable.

RICE *(Oryza sativa)*

Rice fly: *Ephydra macellaria*

The primary management strategy is draining fields. An early and effective weed control program is an important way to discourage the development of economically damaging populations of flies on weeds and future movement to rice.

Horseshoe crab (Tadpole shrimp): *Triops cancriformis* (*longicaudatus*)

Management of tadpole shrimp involves rapid seeding of the field after flooding and monitoring twice within the first 2 weeks following flooding to determine the need for chemical treatment. As an alternative, some population reduction can be obtained by flooding and draining the field before flooding for seeding. Flooding and draining the field before planting will kill hatched tadpole shrimp through dessication and are alternatives to chemical control. Do not drain the field until 4 to 5 days after initial flood so the maximum egg hatch can occur. The draining time will vary based on soil type and weather but should continue for at least 24 hours after all standing water is gone. However; a decision to drain must take into account possible negative aspects such as fertilizer loss, encouragement of weeds, or interruption of weed control procedures, interruption of pesticide holding requirements, and the economics of irrigation.

If muddy water does not allow an adequate visual inspection of the plant stand after 8 days, treatment decisions (application of copper sulfate) must be based on the presence of shrimp and shed skins, and observations of chewed shoot tips or roots, or uprooted floating seedlings.

Panicle thrips: *Haplothrips aculeatus*

Flooding to submerge the infested field for 2 days as a cultural control practice is very effective against the rice thrips. There are identified cultivars with known resistance to the rice thrips. Predatory thrips, coccinellid beetles, anthocorid bugs, and staphylinid beetles are biological control agents that feed on both the larvae and adults.

Rice blast: *Magnaporthe grisea (Pyricularia oryzae)*

Rice blast management requires implementing a variety of cultural practices: destruction of infested residue, use of non-infested seed, water seeding, continuous flooding, and avoiding excess nitrogen. Planting resistant varieties against the rice blast is the most practical and economical way of controlling rice blast. Early sowing of crops is advisable as later sown crops can be infected by inoculum coming from earlier sown neighboring crops. Inter-planting of resistant and susceptible varieties can reduce infection on the susceptible variety. Silicon soil amendments are known to increase host resistance to attack.

Chemicals are rarely used to control blast. Scout the field for the presence of blast. Direct control may be required if there are more than 30% of plants infected.

Fusarium head blight: *Fusarium ssp.*

Use clean and disease-free seeds and plant resistant cultivars. Burn plant residues with known infection in fall may help limit the disease. Practice a proper crop rotation strategy. Field trials indicate that a seed treatment with sodium hypochlorite (Ultra Clorox Germicidal Bleach) is effective at reducing the incidence of this disease. Using a thoroughly premixed solution of 5 gallons of bleach to 100 gallons of water, seed is soaked for 2 hours, then drained and soaked in fresh water. Optimal agronomical measures include maintenance of crop rotation, cultivation of relatively resistant cultivars, careful removal of plant residues, separating seeds from shrunken grains, treatment of seeds before sowing by fungicides, treatment of crops by fungicides during vegetation period.

WHEAT *(Triticum aestivum)*

Sunn pest: *Eurygaster integriceps*

Cultural practices can protect wheat to a small extent from *E. integriceps*. Early spring fertilizing of winter crops by mineral fertilizers with subsequent harrowing, early sowing of crops. A well tillered crop, uniform, advanced in vegetation as a result of sowing at the optimum time, in a fertile, well worked soil is in the best position to withstand attack by *E. integriceps*. Early harvesting can confine the attack and reduce feeding conditions leading to higher mortality of *E. integriceps* during diapause with subsequent shelling and autumn plowing, selection of resistant varieties; spraying of crops with insecticides against young larvae.

Over 20 oophagous parasitic species belonging to four genera have been recorded as parasites of *E. integriceps*: *Trissolcus* (*Asolcus*, *Microphanurus*), *Telenomus*, *Gyron* and *Ooenocyrtus*. Parasites of the nymphs and adults include two families of *Hymenoptera* (*Scelionidae* and *Chalcididae*) and four genera of *Diptera* (*Phasia*, *Ectophasia*, *Clytomyia* and *Helomyia*) from the family *Tachinidae*. Both oophages and tachnid flies are oligophagous. The parasites of nymphs and adults are less important than oophages or predators. During diapause, some insects are destroyed by nematodes and others by entomoparasitic fungi.

The use of chemical control should be based on an accurate estimation of the pest population in a certain area and applying pesticide to those surfaces exceeding the economic damage threshold.

Corn ground beetle: *Zabrus tenebrioides*

Control measures include appropriate crop rotation (no more than two years of consecutive grain crops.); early harvest of grain crops, exclusion of grain losses, immediate and careful removal of straw from fields, stubble shelling with subsequent plowing to a depth of 20-22 cm; chemically dressing seeds, dusting and spraying crops using insecticides to control young-instar larvae.

Yellow and leaf rust: *Puccinia striiformis and Puccinia triticina*

Control is achieved through the use of resistant cultivars. Eliminate grassy weeds and volunteer wheat at least 3 weeks before planting to prevent a ‘green bridge’ for movement of the pathogen. Delay planting of winter wheat (to avoid the ‘green bridge’). In the event that new races of the fungus render current sources of resistance obsolete, foliar fungicides can be applied to control disease outbreaks. Fungicides such as propiconazole can be applied to control disease outbreaks. Applications should be made between tillering and heading to protect the flag leaf.

Powdery mildew: *Erysiphe graminis f. sp. tritici*

Use of Resistant cultivars. Crop rotation, elimination of crop residue, and control of volunteer grains and weed hosts reduce inoculum survival from one season to the next. Isolation of autumn-sown and spring-sown cereals (i.e. not growing them too close together) will reduce the risk of infection of the autumn-sown crop spreading to the spring-sown crop. In addition, because nitrogen fertilizer promotes lush crop growth and encourages mildew development, excessive use of nitrogen should be avoided. Although normally not economical, foliar fungicides can be used to control disease outbreaks and provide partial disease control. Applications should be made between tillering and heading with the objective being to protect the flag leaf. Depending on weather conditions from tillering to early dough stage, one or more applications may be needed.

Loose smut: *Ustilago tritici*

Plant clean, disease-free seed. Certified seed is not guaranteed to be free of loose smut or other seed borne diseases. Seed production fields should be inspected at early heading for the presence of the conspicuous diseased heads as they emerge from the boot. If loose smut is present in the field, the seed should be treated with a fungicide prior to planting. Seed treatment with systemic fungicides is a very effective and inexpensive way to control loose smut. Several systemic fungicides are now available for use on small grain crops such as Carboxin. Hot water treatment can eliminate smut fungi from contaminated seed, but it must be used carefully to avoid reducing seed vitality. Seed treatment is necessary because loose smuts are borne internally in seed.

Common bunt: *Tilletia caries and Tilletia laevis*

Resistance is available but its use is made difficult by pathogenic variation in the fungus. Wheat sown into soil while the temperatures remain above 15°C will escape infection. Chemical control is readily achieved and relatively inexpensive. Spores on the seed are readily controlled by a range of contact and systemic fungicides, which may also prevent infection of seedlings. Treatment of all seed wheat will reduce common bunt to trace levels.

COTTON *(Gossypium L.)*

Cutworms, turnip moth: *Agrotis segetum*

Same as for Cutworms on Tomatoes.

Cotton bollworm: *Helicoverpa armigera (Chloridae obsoleta)*

A major constraint to the development of IPM for *H. armigera*, particularly on cotton, has been the need to deal with a complex of pests where control needs may be irreconcilable, as for example in the characteristics of the cotton plant which can either be unfavorable to *H. armigera* or to jassid pests in terms of leaf hairiness, and in the withholding of early season applications to encourage the build-up of natural enemies against the need to control sucking pests which can be severe on young plants.

Control measures include: cultivation of resistant or tolerant varieties, weeding, removing crop residues from fields, deep autumn plowing, inter-row cultivation, winter watering for pupae destruction, insecticide treatments of plants during period of larva development and release of entomophages, such as *Trichogramma* spp. and *Habrobracon hebetor* Say; and *Bacillus thuringiensis* applications. Monitoring is possible by use of sex pheromone traps. Some cultural methods, such as an enforced 'close' season, may

be regarded as regulatory, but to be effective these will depend on strict compliance, geographical isolation and the absence of a significant alternative wild host population in the area.

Carmine spider mite*: Tetranychus telarius*

Managing spider mites requires preserving natural enemies as long as possible each season and anticipating outbreaks following insecticide applications. When treating for mites, follow resistance management guidelines. Preserve natural enemies of mites by avoiding early season, broad-spectrum insecticide applications. The most important predator early in the season is the western flower thrips. Later, bigeyed bugs, minute pirate bugs, predaceous mites, and other predators are also important. Water-stressed plants stimulate spider mite outbreaks; be sure to keep the crop properly irrigated. In addition, sprinkler irrigation has been observed to suppress spider mites. Pima cotton is less susceptible to spider mites than upland cotton varieties. Biological control as releases of predatory mites and sprays of insecticidal soap, some oils, and sulfur are acceptable to use on organically grown cotton. It is important that you monitor for resistance immediately before making a decision about which miticide to use. Rotation of abamectin, etoxazole and hexythiazox, or other recently registered miticides with the older miticides may help to reduce resistance to any one of them and slow the development of resistance in areas where it is not yet a problem. Growers are urged to use a miticide only once per season, and, if a second application is needed, switch to another miticide. Growers should also rotate to a different miticide the following season. In all situations, early season use of pyrethroids for aphids, lygus bugs, or whiteflies can aggravate spider mite populations because they destroy natural enemies so avoid them when possible. On the other hand, most miticides are specific for mites and should not cause disruptions of insect pests. The critical time for monitoring spider mites is between crop emergence and first open boll. To improve efficiency of your monitoring program, combine sampling of spider mites with other pests. From crop emergence to seedling growth, sample mites, aphids, and thrips together. From early squaring to boll development, combine sampling for spider mites, aphids, and whitefly. Generally treatment of seedling cotton is required if defoliation is occurring and the mite populations are high. From early squaring to first open boll, treatment can be considered if 30 to 50% of leaves have spider mites following the monitoring procedures outlined above. Sometimes field margins are much more severely infested than the remainder of the field, particularly when another host crop, such as alfalfa, beans, sugar beet, or safflower, is grown next to the cotton. In such cases, treatment of a field margin may be justified. Monitor field margins separately from the remainder of the field.

Cotton seedling thrips: *Thrips tabaci*

Use of resistant and tolerant varieties. Control of weeds will reduce the probability of an outbreak. The critical time for monitoring thrips is from crop emergence through seedling stages. Spot or strip treatments with acephate may occasionally be needed. *T. tabaci* and various combinations of insect pests attack cotton in all major producing countries, and a number of sophisticated predictive methods and integrated control practices have been developed. Heavy rain is well known to destroy many *T. tabaci*, and it has been widely noted that irrigation reduces infestations: sprinkler irrigation tends to suppress populations by sealing pests in the soil during pupation. *T. tabaci* does better on light soils than on clay soils Representatives of the wide range of polyphagous, general predators should be encouraged by avoiding excessive pesticide application. Key natural enemies currently available commercially in Europe for biological control are *Neoseiulus cucumeris* and *Amblyseius mckenziei*, *Orius insidiosus* and *Verticillium lecanii*. The parasitoid *Ceranisus menes* (Eulophidae) is an important cosmopolitan parasite.

Lucerne bug: *Adelphocoris lineolatus*

Lucerne bugs migrate to cotton from other hosts, so management of this pest begins with assessing its populations outside the field. Check for them on weeds, in nearby lucerne, and in other crops. Proper management of lucerne harvest can reduce damaging migrations to cotton. The need for insecticides in cotton must be evaluated carefully on a field-by-field basis, as treatments may result in secondary outbreaks of spider mites, aphids, or other pests. Other crops are more attractive to the bug than cotton. These include lucerne (seed and hay), safflower, sugar beet, tomato, beans, and potato. As these crops are prepared for harvest, winged adults migrate out of the field in search of new hosts. Careful management of these crops can reduce the migration of the bug into cotton fields during cotton's most vulnerable period: mid-May through late July. Watch closely cotton fields that are downwind from these crops by sampling the cotton and surrounding fields often. Lucerne hay can be managed to minimize movement of bugs by staggering alfalfa cuttings to maintain a favored habitat. Avoid cutting all fields in an area within a short time period by leaving uncut strips along the border between alfalfa and cotton in order to slow migration (these uncut strips of alfalfa can be treated with an insecticide if needed). Many weeds are good hosts. When weedy fields and orchards are located near cotton, the bug population in these fields may migrate when the weeds begin to dry. Avoid such migrations by removing the weeds before the population of bugs reaches the winged adult stage. Before disking or mowing weeds, inspect them for the presence of bugs and the stage of population development. If the population is already in the adult stage, migration will occur. Where possible, apply an insecticide before disking or drying the field.

Planting trap crops can be helpful in managing bug, but unless the crop has the same growing requirements as cotton, it can be difficult to maintain. Lucerne is a good trap crop but can be difficult to grow under the same conditions as cotton. When used as an interplanted crop for bug management, 20-foot strips of lucerne are planted every 300 to 500 feet of cotton. (When two crops are growing in the same field, harvest restrictions, label restrictions, and crop destruction for both crops must be obeyed.) Other trap crops more compatible with cotton production include cowpea and lima bean. Generally the trap crop is not planted for commercial purposes and should be considered part of the pest control cost.

Recent surveys have shown that populations of lucerne bugs from cotton, alfalfa hay, and alfalfa seed fields are developing resistance to organophosphate, carbamate, and pyrethroid insecticides. Pyrethroid resistance increased significantly in the late 1990s, shortening the residual period for bug control following an application. To manage resistance in bugs that are infesting cotton fields, try to spray as few times as possible and rotate between insecticides with a different mode of action group number. Remember that sprays applied for other pests such as aphids can select for resistance in bugs if they are present.

Insecticide Selection. There are two basic approaches to selecting an insecticide for bug control. The first approach occurs during early fruiting when monitoring indicates bug densities are low and square retention is only slightly off (5%). Under these circumstances, re-inspect the field again in 3 days before making a control decision. Upon re-inspection, if square retention continues to be slightly off normal and there is some migration in from surrounding areas, consider an insecticide that provides adequate control but has little residual effect on natural enemies. Examples of such insecticides include flonicamid, novaluron, indoxacarb, oxamyl, or a side dress of aldicarb if irrigation is imminent.

The second approach is when population densities of bugs are high and there is the potential for repeated and sustained invasion, or there is evidence of widespread reproduction. In addition, square retention is below the expected level and reduced greatly from previous inspections. Insecticides that provide quick and residual protection are required; these include the pyrethroids (bifenthrin, cyfluthrin, lambda-

cyhalothrin, or a side dress of aldicarb combined with a quick-acting treatment such as an organophosphate (dimethoate, methamidophos, methidathion), if required. Research has demonstrated the link between pyrethroid use and aphid population buildup, and this must be considered when planning to use one of these products.

Tarnished plant bug: *Lygus pratensis (lineolaris)*

Controlling weeds in and around crop fields reduces in-field overwintering and removes sources of early-season flowers that attract adult tarnished plant bugs to fields. However, weeds should not be mowed when cotton buds are forming and flowers are beginning to open, as tarnished plant bugs will move from weed hosts to cotton at a time when the crop is especially vulnerable to damage. Certain weeds, such as *Erigeron* spp., are nursery crops for plant bugs. These weeds, or crops such as mustard, can be planted and used as trap crops.

Producers are advised to control tarnished plant bugs if the field has suffered substantial damage from tarnished plant bugs in previous years or if tarnished plant bug adults are present in the field and sweep net samples produce more than 2 tarnished plant bug adults per 10 sweeps as buds begin to form. Insecticides are commonly used for control and compared with some insect pests, *L. lineolaris* is easily controlled with contact insecticides, as adults are quite mobile. However, resistance to pyrethroids in cotton-growing areas has been documented; therefore use the same tactic for insecticide selection as for the lucerne bug.

Cotton aphid: *Aphis gossypii*

Generally, cotton aphid populations on seedling cotton plants (pressure) are not considered a pest problem. However, some areas have consistently severe and prolonged problems with early season aphids. Growers in these areas may need to adopt a more aggressive approach to monitoring and controlling these pests, especially when their fields have a history of early season aphids persisting into the period when squares are produced and yield losses can occur. During the pre-squaring period of the crop, natural control of aphids is generally strong. The parasitic wasp *Lysiphlebus testaceipes* and a group of aphid predators (including the lady beetles *Hippodamia convergens* and *Coccinella novemnotata franciscana* and the predatory larvae of syrphid flies) are important natural enemies. During the period of square and boll production and continuing until harvest, parasitic wasps and coccinelid beetles may still be present, especially if aphids reach extremely high densities, but in most fields they are rare. The most common aphid natural enemies at this time are minute pirate bugs *(Orius tristicolor)*, bigeyed bugs *(Geocoris* spp.), damsel bugs *(Nabis* spp.), a complex of green lacewings *(Chrysoperla* and *Chrysopa* spp.), and a fungus *(Entomophthora* sp.). Although these natural enemies do provide some control, they generally are not able to strongly suppress aphid populations, or cause strong suppression only after severe damage has occurred to the plant.

Higher cotton aphid populations consistently develop on late-planted cotton than on early-planted cotton. Aphid populations prefer cotton plants that are well watered and highly fertilized. Avoid excessive or poorly scheduled nitrogen applications that stimulate late season growth. Cultivar selection also appears to influence aphid population growth. Pima cultivars appear to be more susceptible to aphid infestations and associated damage. Within the Acala cotton cultivars, hairy-leaf varieties, which comprise the majority of the market, are more susceptible to aphids than are smooth-leaf varieties. In cotton, an unusual approach was to top the plants after boll opening. This removed the top leaves where aphids fed, and thereby reduced contamination of bolls below these leaves. Topping was done by hand, using a

pruning knife to remove the terminal spray of each plant. Cultural and biological controls and sprays of insecticidal soap, oils, and azadirachtin are acceptable for use on organically grown cotton.

Chemical control of cotton aphid can be extremely erratic and unpredictable. Part of the problem is that cotton aphid has developed resistance to many chemical classes, including organochlorine, organophosphate, carbamate, and pyrethroid insecticides. In addition, these broad-spectrum pesticides kill the natural enemies of the cotton aphid. Another resistance concern is with the neonicotinoid insecticides. Repeated applications of any neonicotinoids can result in resistance to *all* neonicotinoids. To manage resistance, follow the basic principles of IPM: (1) spray only when pests reach economic thresholds; (2) start with the most selective pesticides and avoid pyrethroids early in the season in order to preserve natural enemies; (3) save the broad-spectrum pesticides for mid- to late-season aphid outbreaks; and (4) rotate insecticides that have a different mode of action group number if you have to spray more than once. The critical time for monitoring aphids is from crop emergence through preharvest. Make insecticide applications only when the cotton aphid population exceeds the economic threshold. Terminate the crop as early as feasible, using the nodes above cracked boll (NACB) method.

Groundnut aphid: *Aphis medicaginis (craccivora)*

Early sowings allow plants to start flowering before aphids appear, while dense sowings provide a barrier to aphids penetrating in from field edges. Sanitary measures are important within crops and between seasons to prevent the spread of viruses for which *A. craccivora* is a vector. Virus-infected plant material should be removed after harvest and any volunteer plants or weeds that harbor viruses should also be destroyed. Treatments with insecticides having less impact on natural enemies may be necessary if large populations are present. Border harvesting or strip cutting can be important for preserving natural enemies. Two common aphid parasites are *Lysiphlebus* spp. and *Diaraetiella* spp. Although parasitism as high as 95% has been documented, aphid population levels can become so high that enough non-parasitized individuals remain to cause significant injury. This aphid is also susceptible to the usual complement of aphid predators including lady beetles, lacewings, bigeyed bugs, damsel bugs, and syrphid flies. Use border-strip cutting during harvest to help maintain populations of parasites and predators within the field. Organically certified insecticides such as azadirachtin, neem oil, and pyrethrin control aphids.

Aphid infestations in a field are typically patchy, especially an early infestation. Because of the spotty distribution of aphid infestations, spot treatments may be feasible, especially if the infestation is on the field border.

Aphid: *Acyrthosiphon gossypii*

Same as for Cotton aphid (*Aphis gossypii)*

Whiteflies: *Trialeurodes vaporariorum*

Same as for Cucurbits whiteflies

Tobacco whitefly: *Bemisia tabaci*

Same as for Cucurbits whiteflies

Bacterial blight: *Xanthomonas axonopodis pv. malvacearum*

Use of resistant cultivars, plant disease-free seeds combined with crop rotation, ploughing-in of crop residues, and the use of furrow irrigation in preference to sprinklers are effective measures to control this disease.

Control measures against bacterial blight are necessary in all the main cotton-growing areas of the world. Control is achieved mainly through the use of resistant varieties which have reduced the disease to a minor status on Upland cottons in many countries where it was once a serious problem. To ensure that it remains a minor disease, it is necessary to avoid the introduction of exotic races of the pathogen on imported seed and to continue screening for blight resistance in cotton breeding programmes.

X. axonopodis pv. *malvacearum* cannot survive in the soil outside of crop residues and is therefore readily controlled with rotations. One crop season without cotton is usually sufficient to virtually eliminate crop residues as a source of primary inoculum. If this is combined with seed certification to ensure that crops used for seed production are free of bacterial blight, the disease can be controlled even where susceptible varieties are grown. Cotton seed can also be treated with carboxin to reduce the risk of seed transmission.

Foot rot: *Rhizoctonia ssp., Pythium ssp., Fusarium ssp.*

To reduce foot rot diseases, make sure that conditions at planting favor rapid germination and seedling growth so that cotton seedlings quickly outgrow the most vulnerable stage and infection is less likely. Fungicide seed treatments can usually prevent severe losses caused by seedling diseases as long as growing conditions are reasonably good. Always use the highest quality seed you can afford. If possible, select seed that has shown a high rate of germination in a cold test. If you must use lower quality seed, plant as late as possible to allow the soil to warm up. Regardless of seed quality, never plant if rain or cold weather is expected during the 4 or 5 days following planting. Use an adequate seeding rate so that the loss of a few plants to seedling diseases will not leave skips that must be replanted. Do not plant deeper than 2 inches because excessive depth delays emergence and exposes more hypocotyl surface to invasion by fungi. Soil that is too wet at planting or during germination favors seedling diseases. To avoid excess moisture, allow pre-irrigated beds to drain adequately before planting, and do not irrigate up the crop during cool weather. Firming wheels on planters operated in wet soil often create a shallow compacted layer that aggravates seedling disease problems. Roots growing through compacted layers may develop constricted, weakened areas vulnerable to infection by fungi and may restrict growth later in the season.

Soil solarization with clear polyethylene tarps and crop rotation with sorghum, safflower and small grains has been shown to be effective in reducing or eliminating soil populations in the fields.

Always use seed treated with fungicides effective against *Rhizoctonia solani* (Carboxin) and *Pythium* spp (Metalaxyl). In cooler areas, especially in early plantings, it is advisable to include a material effective against *Thielaviopsis basicola* such as triadimenol.

Black root rot: *Chalara elegans (Thielaviopsis basicola)*

Same control measures as for foot rot. Moreover, incorporation of hairy vetch as a green manure reduced black root rot on cotton as a result of reductions in the population of the pathogen from the release of ammonia from the decomposing residue.

ANNEX 3

TERMS OF REFERENCE PESTICIDE EVALUATION REPORT AND SAFE USE ACTION PLAN (PERSUAP) FOR AGLINKS UZBEKISTAN

The USAID AgLinks Project (Contract EDH-I-00-05-00004, Task Order # EDH-I-07-05-00004-00) in Tashkent seeks consultants capable of providing a survey and analysis of pesticide products for selected commodities within Uzbekistan. The pesticide evaluation report (PER) must conform with USAID standards for this type of report as represented by approved reports from other countries and must include a safe use action plan (SUAP). The resultant draft PERSUAP report will be subject to peer review prior to final submission to USAID for formal approval.

I. INTRODUCTION

A. AGLINKS PROJECT

AgLinks is a USAID funded project implemented by the DAI consulting firm. The project mandate is to develop the capacity of local service providers to examine and capitalize on market opportunities, provide needed farmer production assistance to meet market demand, and ameliorate choke points in the market linkages between producers, input suppliers and buyers. The AgLinks Project is registered as a representative office by the Ministry of Foreign Economic Relations, Investment and Trade of the Republic of Uzbekistan (Registration #1995, 26th November 2007) and scheduled to run through July 2011.

AgLinks activities are targeted to 4 provinces (Tashkent, Samarkand, Fergana and Namangan) and focus on a select number of agricultural commodities (stone fruits and grapes) within these areas. The initial list of AgLinks commodities in Uzbekistan has been expanded to include other potential crops of interest now and in the near future by AgLinks and other USAID projects. The AgLinks project requires the Uzbekistan PERSUAP include treatment of the following crop commodities :

1) Stone fruits (especially apricots and peaches plus plums & cherries)
2) Grapes
3) Tomato
4) Onion
5) Melons (cucurbits especially melons, including watermelons, and cucumbers)
6) Pomegranate
7) Wheat
8) Rice

B. CENTER FOR PLANT PROTECTION AND AGROCHEMICALS (PPA)

The Center for Plant Protection and Agrochemicals (PPA) within the Ministry of Agriculture and Water Resources is the principle Government of Uzbekistan point of contact for PERSUAP analysis. The Center was established in 2004 and has 13 provincial (province) centers which are further supported by 155 district (rayon) plant protection groups. The PPA supports both agrochemical stations and educational bio-laboratories with a total of 860 bio-laboratory branches nationwide.

C. BACKGROUND AND OVERVIEW OF PERSUAP REVIEW REQUIREMENTS

A PERSUAP basically consists of two parts, a "PER" and a "SUAP." The Pesticide Evaluation Report (PER) section performs the systems analysis of the country's pesticide sector from production (or import) to ultimate disposal. It addresses the 12 informational elements required in USAID's Pesticide Procedures. The Safer Use Action Plan (SUAP) puts the conclusions and recommendations reached in the PER into a plan of action, including assignment of responsibility to appropriate parties connected with the program or project proposing to use pesticides.

All USAID activities are subject to evaluation via, at minimum, an Initial Environmental Examination (IEE) and, at maximum, an Environmental Assessment (EA). USAID environmental regulations require 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 due to high risk concerns with their use. For several years USAID has requested a systems approach be employed to examine these risks in a particular type of document, termed a "Pesticide Evaluation Report and Safer Use Action Plan" (PERSUAP), which is generally submitted as an attachment to the IEE. PERSUAP focuses on the particular circumstances of the program or project in question, the risk management choices available, and how a risk management action plan would be implemented in the field.

When the US Environmental Protection Agency (EPA) registers pesticides for use in the United States it specifies the manner in which the product can be "safely" used (i.e., with an acceptably small risk) including safety equipment needed when applying the pesticide, how to apply it, the allowed uses, etc. The context in which EPA makes registration decisions is important to note. An extensive system of capabilities and resources exist in the US that combine to provide EPA confidence that specifications will be followed and the product used appropriately. These include a 97% literacy rate meaning most of the population can read pesticide labels; close control by EPA over the content of the label; training requirements and programs for pesticide products requiring applicator certification; worker protection requirements; occupational safety regulations; and relatively effective federal, state and local enforcement mechanisms.

USAID cannot rely on the same societal capabilities and resources available to the EPA to assure appropriate product use when considering use of certain pesticides in its overseas programs. The preparation of a PERSUAP gives USAID program managers and project implementers the opportunity to consider practical actions to reduce program-specific pesticide product risk, taking into consideration the context in which the products will be used, the particular elements of the program, and the different capacities of the partners involved.

II. PURPOSE

This Terms of Reference (TOR) describes the services requested for an expert team of consultants, led by a Principle Investigator (PI) as Pesticide Management Specialist (PMS), to perform services for the USAID AgLinks project in Uzbekistan. The services described herein will enable AgLinks Uzbekistan to respond to and comply with the requirements of USAID Regulation 22CFR 216.3(b), which outlines USAID's pesticide procedures. These services will enable the project to achieve project goals while comprehensively contributing to environmental and human health safety.

The PI/PMS will be primarily responsible for producing a *Pesticide Evaluation Report and Safe Use Action Plan* (PERSUAP) for Uzbekistan within the context of the USAID Initial Environmental Examination (IEE) for AgLinks dated March 2007. The PERSUAP provides the technical data and analyses to support decision(s) in the IEE by examining the pesticide system from import through distribution to disposal using a systems analysis approach. The pesticide system analysis will provide the backdrop for accurately addressing the 12 parts of Regulation 216's Pesticide Procedures.

III. OBJECTIVES

The PERSUAP will:

- Ensure compliance with the Agency's pesticide procedures;
- Ensure compliance with the Government of Uzbekistan pesticide importation, testing, storage, use, disposal and registration regulations, laws, policies and procedures;
- Identify and recommend appropriate mitigation actions for incorporation into the projects' activities;
- Identify and recommend alternative actions and/or pesticides, as appropriate;
- Facilitate use of Integrated Pest Management (IPM) with a view to avoid or reduce unnecessary pesticide risk; and
- Identify and address key pesticide use issues, particularly those impacting pesticide utilization by small-scale producers, laborers, and surrounding communities.

This SOW requires the PERSUAP produce:

- Documentation on the specific uses of pesticides that will comply with 22 CFR 216.3(b)(1)(i)(a through l) for each activity concerned with procurement or use of pesticides, including promoting the adoption of particular pesticides and pesticide use technologies supported by USAID; and
- Mechanisms for capacity building of the various partners. This should specifically include design of the Safe Use Action Plan (SUAP) part of the PERSUAP, including mitigation and training to ensure procedures required under 22 CFR 216.3 (b)(1) are disseminated and understood by all partners.

IV. SCOPE OF WORK

Pesticides, if not used properly, can kill, damage or otherwise injure both human beings and environmental resources. Pesticides are synthetic or natural products (plant, microbe) or derived chemical products intended to kill, control, and repel insects, plant diseases, weeds, and other pest organisms. Plant-derived insecticides and those restricted, cancelled, or suspended by the US EPA are listed in two chapters of *Integrated Pest Management* (Schroeder, 2004, Tellus Institute) and *Safer*

Pesticide Use (Schroeder, 2004, Tellus Institute) and contained within *"Environmental Guidelines for Small-Scale Activities"* prepared by USAID's Africa Bureau. The present analysis will cover those pesticides proposed for use by USAID's AgLinks project that are:

- Registered by US EPA for the same or similar uses without restrictions;
- Also registered by the Government of Uzbekistan; and
- Available in the country of Uzbekistan.

The study will cover activities under the project, which may involve assistance for the procurement or use of pesticides. Under this SOW, assistance for the procurement or use of pesticides is defined broadly and includes recommending the conduct of training programs in pesticide handling and use.

The PERSUAP shall include appendices evaluating the economic, social, and environmental risks and benefits of the planned pesticide use by crop commodity to determine whether the use may result in significant environmental impact. An Environmental Assessment (EA) in accordance with §216.3(b)(l) requirements, in addition to the PERSUAP, will be conducted (separate from this TOR) if the PI/PMS determines a specific pesticide use will significantly affect the environment and/or human health based on the evaluation results. This EA will include, but not be limited to, an analysis of the factors identified in §216.3(b)(l)(i) and be subject to an amendment to this PERSUAP contract.

The SUAP portion of the PERSUAP report will:

- Assure accessibility of protective clothing and equipment needed with training on safe use;
- Emphasize operational monitoring & evaluation;
- Work with the project to define key staff and interested actor roles such as public, commercial private and non-profit private sector entities.
- Integrate mitigation measures
- Disposal provisions for used pesticide containers

RESPECTIVE TASKS AND RESPONSIBILITIES OF USAID, AGLINKS AND THE PI/PMS

The Cognizant Technical Officer (CTO) and Mission Environmental Officer (MEO) for USAID's AgLinks project will take an active role in this PERSUAP process by approving the technical activity, this TOR to conduct the analysis and all draft PERSUAP reports produced. The MEO will provide specific technical guidance and direction, review progress and other draft materials produced by the PI/PMS and perform liaison functions, as needed, with the Bureau Environmental Officer (BEO) and USAID's AgLinks project. The Regional Environmental Officer (REO), as appropriate, may also collaborate in the technical review of this SOW to provide information and perspective and links to EPA, as might be necessary.

The AgLinks project implementer will assign a contact person or persons to work with the PI/PMS. The contact person will assist the PMS in implementing the study by providing information about uses and conditions of use for all pesticides, types of activity implementation, roles and responsibilities of implementing partners, farmers, laborers, extension officers, and local service providers to ensure all relevant pesticides are covered and to help the PI/PMS design training for at-risk populations in the field.

The contact person(s) will be responsible for reviewing and providing comments on the draft and final versions of the study prior to the submission for peer review.

Overall, the PMS/PI will:

- Acquire and synthesize information on Uzbekistan's ways, means and capacity to regulate or control the acquisition, distribution, use, storage and disposal of pesticides;
- List US EPA and local restrictions on use of pesticides;
- Examine, by site visits to targeted project activity areas and clients, the conditions under which various pesticides will be used (ex., climate, flora, fauna, geography, hydrology, soils, proximity to water bodies, etc.); and
- Acquire from the project information on the extent to which pesticide use is and could be part of an integrated pest management (IPM) program.

Specifically, the PMS/PI will:

- Review the list of potential pesticides to be procured and used by crop commodity and review US EPA status of the pesticides.
- Contact the Mission MEO, appropriate national Ministries, Departments and Agencies to review compliance requirements and pest management options to develop an agreed upon definition of "assistance for procurement or use of pesticides."
- Assess the overall capabilities and limitations of the AgLinks project's pesticide management relative to the more common pesticide use problems affecting the targeted users and implementers.
- Outline "Off the Shelf" IPM and GAP (Good Agriculture Practices) measures that could be tried and used by the project's clients for each production or commodity constraint.
- Recommend and outline a training program, including a plan to train participants who will be implementing the recommendations of the analysis.
- Recommend mitigation measures for project activities (in addition to training), identified in concert with project personnel that involve pesticide use.
- Develop a Mitigation and Monitoring Plan consist with the requirements of the IEE.

Following a description of the proposed usage and expected benefits of the targeted pesticides by crop commodity the PI/PMS will address each of the following factors listed under 22 CFR 216.3(b)(1)(i):

- The US EPA and Local registration status of the requested pesticides.
- Extent to which the proposed pesticide is part of an integrated pest management approach.
- The proposed method of application, including availability of appropriate application and safety equipment.
- Any acute or long term toxicological hazards, either human or environmental, associated with the proposed use, and measures available to minimize such hazards.
- The effectiveness of the pesticide for the proposed use.

- Compatibility of the proposed pesticide with target and non-target ecosystems.
- The availability and effectiveness of other pesticides or non-chemical control methods.
- Provisions made for monitoring the use and effectiveness of the pesticide.
- Uzbekistan's ability to regulate or control the distribution, storage, use, and disposal of the pesticide; including review of the Country Regulatory Acts on pesticide registration and application.
- Provisions made for training users and applicators, and outline a training plan for participants and extension officers.

The PI/PMS will draft the PERSUAP, submit the first draft to AgLinks (and by extension USAID's CTO and MEO) and incorporate feedback into a final draft. The final draft will be submitted by AgLinks to independent peer review at no cost to the PI/PMS implementing team. The PI/PMS will, however, incorporate feedback from the peer reviewer prior to submitting the final PERSUAP report for Uzbekistan.

V. LOGISTICS

The principle point of contact within AgLinks Uzbekistan is the AgLinks Project Director or his designee. AgLinks Uzbekistan will provide contacts and establish initial meetings with the Center for Plant Protection and Agrochemicals (PPA) within the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan. Draft PERSUAP reviewers may include AgLinks Uzbekistan technical staff, the AgLinks CTO, the MEO, and BEO.

The timeframe for implementation is dependent upon the size of the team proposed (see Section VII , below). However, the draft final report is expected by early-January 2009. Six-day work weeks are approved under this contract to allow sufficient time to prepare the report before the start of the 2009 spring planting season In Uzbekistan.

All reports must be electronic copies in Word and/or Excel. Word documents will be prepared single-spaced, on A4 paper, Arial font, 11 point with 2.5 cm margins on all four sides.

VI. DELIVERABLES

The major deliverable of this contract is the final report with intermediate deliverables such as preliminary work plan, draft report, and final draft report. The total time required is estimated at 60 person days.

1st Deliverable. The successful applicant will submit a work plan no later than 2 working days after contract signature. The work plan will include a brief description of the approach, working hypotheses, and a timeline of expected activities, including travel, plus the proposed completion dates for subsequent deliverables.

2rd Deliverable. A draft English language report submitted in electronic format (MS Word and Excel) submitted to the AgLinks Uzbekistan office no later than 45 working days after contract signing.

3rd Deliverable. A draft final report in English submitted in electronic format (MS Word and Excel) to the AgLinks Uzbekistan office 55 working days after contract signing. Draft final report will incorporate comments and suggestions offered by reviewers on the 2nd Deliverable.

4th Deliverable. Final report submitted under the same format conditions as the drafts no later than 5 working days after receiving feedback and incorporating comments from the peer reviewer.

VII. PERSONNEL

The consultant(s) are encouraged to propose their preferred staffing patterns to accomplish this terms of reference within the required timeframe. AgLinks Uzbekistan will provide contact and site visit planning assistance in Uzbekistan. The PI/PMS must have an advanced degree and significant expertise in entomology, plant pathology, weed science, IPM, pesticide toxicology or soil science. Supporting team members should have track records of at least 3 years demonstrated experience in both quantitative and qualitative research techniques within the environmental field. All team members must have regional knowledge and language skills within the Central Asian Republics or experience with research methodologies, tools, analytical techniques and a proven ability to write clear and concise analytical reports. Familiarity with Regulation 216 is necessary and experience performing PERSUAPs, or similar pesticide environmental reviews, is preferred.

In addition to the skills outlined in the above paragraph the PI/PMS must also meet the following minimum requirements:

- Previous approval by the Bureau Environmental Officer for PERSUAP work.
- Experience with PERSUAP analysis and reports.
- 2 years minimum experience in Central Asia.
- Conversant in written and oral Russian.

ANNEX 4

ON-FARM PESTICIDE DISPOSAL OPTIONS

PESTICIDE DISPOSAL

The first option to dispose of excess pesticides still registered for use and not deteriorated in quality is to use them according to the directions on the label. If you cannot use them, ask neighbors whether they have a similar pest control problem and can use them. If it is no longer usable, contact the manufacturing company to see if it will accept the pesticide for reprocessing. If all the remaining pesticide cannot be properly used, check with the local solid waste management authority, environmental agency, or health department to find out whether your community has a household hazardous waste collection program or a similar program for getting rid of unwanted, leftover pesticides. These authorities can also inform you of any local requirements for pesticide waste disposal.

PESTICIDE CONTAINER DISPOSAL

Pesticide containers are often contaminated with residual products. Farmers and growers should check whether manufacturers and suppliers of pesticides offer a recovery service for used containers. Empty pesticide containers should never be re-used for any purpose except where the manufacturer offers a refilling service.

Pesticide containers should always be thoroughly rinsed into the spray tank before disposal or return. Label instructions for cleaning should be followed. The cleaned containers should never be reused, or left lying about, as they can be a source of pollution and a potential safety hazard due to the presence of residues. Cleaned containers can be disposed of via the local authority waste collection service (if available) or by a registered waste disposal contractor. The burning on farm of empty, even rinsed, pesticide containers is not advised. Burning can release toxic fumes. The same personal protective equipment worn while handling pesticide concentrate during mixing should be worn while rinsing containers.

The following guidelines will help reduce the hazards of disposing of empty containers:

Plastic, glass, and metal containers holding liquid formulations:

Triple rinsing. After empty pesticide containers are triple rinsed they are no longer considered hazardous waste and usually may be disposed of as trash in a sanitary landfill, operated by the city or county. Triple rinse the container immediately after emptying:

- Empty the product into the spray tank by turning the container so that any product trapped in the handle can flow out. Once flow is down to a drip, drain the container an additional 30 seconds.
- Add rinse water to the empty container until it is 1/4 full.
- Rinse the container thoroughly. Pour rinsate into spray tank and drain for 30 seconds.
- Repeat 3 times.

- Puncture triple rinsed containers at both ends to assure they are empty.
- Store cleaned containers where they will be protected from rain until they can be recycled or disposed of properly.

Pressure rinsing. This method continuously washes the inside of the container and drains into the spray tank. A pressure nozzle punctures and rinses the container in one step. It is easier and more effective than triple rinsing.

- Empty contents of container into spray tank, turning the container so that any product trapped in the handle can flow out. Once flow is down to a drip, drain the container an additional 30 seconds and begin rinsing immediately.
- Force the tip of the pressure nozzle through the lower portion of the side closest to the handle.
- Connect nozzle to a clean water source of at least 40 psi. Rotate the nozzle inside the container to assure good coverage of all sides, including the handle and rinse at least 30 sec.
- Drain all rinse water into the spray tank and allow the containers to dry.
- Store cleaned containers where they will be protected from rain until they can be recycled or disposed of properly.

Containers holding dry formulations (bags and boxes):

- Completely empty the contents of the container into the spray tank.
- Open both ends of the container to help remove any remaining pesticide and to prevent reuse of the container. Do not let material blow around.
- Empty bags should be accepted for disposal at a licensed sanitary landfill.

Containers holding aerosol formulations:

- Relieve pressure as much as possible.
- Do not puncture the container.
- Deposit the empty container in a sanitary landfill.

Pesticide Neutralization Method: Empty organophosphate and carbamate containers can be neutralized by adding alkaline substances. The following procedure is recommended for 200-L barrels. Use proportionally less material for smaller containers.

- Add 20 L of water, 250 ml of detergent, and 1 kg of flake lye or sodium hydroxide.
- Close the barrel and rotate to wet all surfaces.
- Let stand for 15 minutes.
- Drain completely and rinse twice with water. The rinse water should be drained into a shallow pit in the ground located far away from wells, surface water, or inhabited areas.
- Containers cleaned by any of the above methods are still not safe to use for any other purpose. Glass containers should be broken and plastic or metal containers punctured or crushed. Containers can then be buried in an isolated area at least 50 cm below ground surface.

ANNEX 5

EXAMPLES OF BOTANICAL PESTICIDES, REPELLENTS, AND BAITS REGULATED BY EPA[1, 2, 3]

Name	Other Names or Origin	Use	Toxicity	Target Crops	EPA code No.
Allium sativum	Garlic	Insect repellent	Low	Seedlings of vegetable plants, fruit trees, grain crops	128827
Azadirachtin	Azadirachta indica, neem tree extract	Insecticide	Low, IV	Food and non food crops	121701
Bergamot		Repels vertebrates		Ornamentals	129029
Black pepper oil		Repels vertebrates	low	Ornamentals, lawns	000669
Canola Oil	*Brassica napus*, *B. campestris*, *B. juncea*, and *B. rapa*	Insect repellent	Low	Wide range of plants (Tomatoes, fruit trees, melons)	011332
Capsaicin	*Capsicum frutescens L.*	Insect and vertebrate repellent	Low, III	Fruit and vegetable crops, ornamentals,…	070701
Chenopodium ambrosioides	American Wormseed	Insecticide, acaricide	Low	Ornamentals	599995
Cinnamaldehyde	Ceylon and Chinese cinnamon oils	Insecticide, fungicide vertebrates repellent, Bait traps: corn rootworm beetles	Low	Many food crops, cotton	040506
Clarified hydrophobic extract of neem oil	Neem tree seeds	Insecticide, Fungicide	Low	Food and non-food crops	025007
Corn gluten meal	Corn kernels	Herbicide	Low	Lawns	100137

Name	Other Names or Origin	Use	Toxicity	Target Crops	EPA code No.
Diallyl sulfides	*Allium* spp. extract	Fungicide (controls white rot disease)	Low	*Allium* spp	129087
Eugenol	Oil of cloves	Insecticide, Bait traps: Japanese beetles	Low	Many food crops, ornamentals	102701
Geraniol	Oil of rose (isomeric with linalool)	Bait traps: Japanese beetles	Low	Fruits, vegetables	597501
Indole	all plants	Bait traps: corn root- worms and corresponding beetles	Low	Fruits, Vegetables, Corn for feed & food	025000
Jojoba Oil	Jojoba bean	Kills & repels whiteflies, Kills powdery mildew	Low	All crops Grapes and ornamentals	067200
Methyl Eugenol		Fruit flies trap	III-IV	Agricultural fields and orchards	203900
Mustard Oil		Repels insects, Spiders, and vertebrates	Low	ornamentals	004901
Pelargonic acid		Herbicide	Low	All food crops	217500
2-Phenylethyl-propionate	Peanuts	Kills insects, ticks, mites and spiders, attracts Japanese Beetles	Low	Food and Feed crops	102601
Plant Extract 620		Nematicide, Fungicide	Low	Food and feed crops	169007
Sabadilla alkaloids	*Schoenocaulon* spp.	Controls thrips	III, IV	Citrus, avocados & mangos	002201
Saponins of Chenopodium Quinoa	*Chenopodium Quinoa*	Fungicide	Low	Seeds of Potatoes, beans and cereals, Tomatoes seedlings	097094
Sesame stalks		Nematicide	low	Many food crops	128970

Name	Other Names or Origin	Use	Toxicity	Target Crops	EPA code No.
Soybean Oil	Soja	Acaricide, Insecticide	Low	food and feed crops	031605
Sucrose Octanoate Esters		Controls mites, aphids, catterpillars	Low (eye irritation)	Food and non food crops	035300
1,2,4 Trimethoxy-benzene	Squash	Trap bait: corn root-worm, cucumber beetles	Low	Fruit, vegetables, and feed crops	040515

[1] This table does not necessarily describe all plant oil active ingredients.
[2] More detailed information available for most of the oils: http://www.epa.gov/pesticides/reregistration/status.htm.
[3] Natural Source: Only one or a few sources are listed. Most of these chemicals are found in many different plants.

ANNEX 6

GENERAL IPM PLANNING AND DESIGN PROTOCOL

IPM PROGRAM DESIGN

This protocol outlines general principles of an IPM approach. Detailed IPM programs for specific crops should be developed with all of the fundamental parts of any good management plan. The vital parts of a plan include a definition of the targeted primary (small- or large holder farmers) and secondary (marketers, processors, transporters, and consumers) beneficiaries, implementation partners (farmers, laborers, extension personnel, and national, regional, and international organizations), listed production constraints (problem identification) and IPM strategies for dealing with them.

ELEMENTS OF IPM PROGRAM

Since IPM is not generally an active part of crop production in Uzbekistan, the basic steps or elements needed in an IPM program are outlined below.

Step 1: Assess IPM needs and establish priorities

In planning an IPM activity, consider crop protection needs, farmers' perceptions of pest problems, pesticide use history and trends, availability of IPM technology, farming practices, access to sources of IPM expertise, support for IPM research and technical assistance, and training needs for farmers and project field extension workers.

Next, identify strategies and mechanisms for fostering the transfer of IPM technology under various institutional arrangements, mechanisms, and funding levels. Define what is available for immediate transfer and what may require rapid and inexpensive adaptation and validation research. During the planning stages of an IPM program, the inputs from experienced IPM specialists will be extremely useful. If possible, set up an initial planning workshop to help define and orient implementation activities, and begin to assign individual responsibilities.

Step 2: Learn and value farmers' indigenous IPM tactics, and link with and utilize all local resources/partners

Most farmers are already using their own forms of IPM, many of which are novel, self-created, and adapted for local conditions, and many of which work well. These include: mechanical and physical exclusion; crop rotation, trap crops, cover crops, and green manures; local knowledge of strategic planting or harvesting times; water, soil, and fertilizer resource management; intensive intercropping with pest-repellent plants; leaving refuge habitat for natural enemies; soil augmentation and care leading to healthy nutrient cycling; transplanting; and weeding.

Accurate assessments of these farmer technologies, as well as actual losses due to different constraints in farmers' fields, are essential before designing a crop production and pest management program. Crop loss figures provided by small and large farmers alike, and thus projected and reported by international organizations, are often inaccurate and thus overestimated.

Step 3: Identify key pests for each target crop

Although hundreds of species of organisms can be found in a crop at any one time, only a few of them may cause substantial crop losses, and be considered pests. Become familiar with the key pests of target crops, whether they are primary or secondary pests, and how to positively identify them. Monitor their population size, the kind of damage they cause, and their life cycle. These usually amount to a relatively small number of species on any one crop and can include any combination of insects, pathogens, weeds, diseases, and vertebrates. A few other species, known as secondary or occasional pests, attain damaging status from time to time, especially if over-spraying occurs and kills predators that naturally regulate their populations.

The vast majority of insect species found in any one crop are actually predators and parasites of the plant-feeding species. Many smallholder farmers are not aware of these distinctions and must be taught to correctly identify the more common beneficial species, as well as pests, found in their crops. Incorrect identification of beneficial insects, predators, or neutral insect species may lead to unnecessary pesticide applications. This diagnostic phase requires sampling and careful observation. Usually, most key pests are fairly well known by local farmers and government extension personnel. However, a few species may be poorly known or understood because they occur at night, are hidden, or are small. These include soil-inhabiting species such as nematodes and insect larvae (wireworms, white grubs, cutworms), mites, and pathogens (viruses, bacteria, mycoplasma, fungi). In addition, farmers usually do not understand the role of some insects as vectors of plant diseases.

Step 4: Develop effective activities and training to promote IPM

A number of activities are very effective in promoting IPM in developing countries:

LEARNING-BY-DOING/DISCOVERY TRAINING PROGRAMS

The adoption of new techniques by small- and large holder farmers occurs most readily when program participants acquire knowledge and skills through personal experience, observation, analysis, experimentation, decision-making and practice. First, frequent (usually weekly) sessions are conducted for 10–20 farmers during the cropping season in farmers' fields by trained instructors or extension agents. Because these IPM training sessions take place in the farmers' own environment, (1) they take advantage of the farmers' own knowledge and (2) the farmers understand how IPM applies to their own farms.

Of these IPM training sessions, four or five analyze the agroecosystem. They identify and describe conditions such as soil type, fertility, and needs; weather; crop stage; and each pest, their natural enemies, and relative numbers of both. Illustrations and drawings are provided, as necessary. Extensionists can apply an AgLinks Uzbekistan method, guiding farmers with questions to discover important insights and supplying information only when absolutely necessary.

Farmers may also experiment with insect zoos where they can observe natural predators of their pests in action and the impact of pesticides on both. Knowledge and skills necessary for applying IPM are best learned and understood through practice and observation, understanding pest biology, parasitism, predation, and alternate hosts; identifying plant disease symptoms; sampling population size; and preparing seed beds.

RECOVERING COLLECTIVE MEMORY

Pest problems often emerge because traditional agricultural methods were changed or lost. These changes can sometimes be reversed. This approach uses group discussions to try to identify what changes might have prompted the current pest problem.

SMALLHOLDER SUPPORT AND DISCUSSION GROUPS

Weekly meetings of smallholders, held during the cropping season, to discuss pest and related problems can be useful for sharing the success of various control methods. However, maintaining attendance is difficult except when there is a clear financial incentive (e.g., credit).

PROJECT

Subsidized experiments and field trials at selected farms can be very effective at promoting IPM within the local community. These pilots demonstrate IPM in action and allow comparison with traditional synthetic pesticide-supported cultivation.

EDUCATIONAL MATERIAL-UZBEKISTAN

In many countries, basic written and photographic guides to pest identification and crop-specific management techniques are unavailable or outdated. Such material is essential. Videos featuring graphic pictures of the effects of acute and chronic pesticide exposure and interviews with poisoning victims can be particularly effective. A study in Nicaragua found videos to be the most important factor in motivating farmers to adopt IPM.

YOUTH EDUCATION

Promoting and improving the quality of programs on IPM and the risks of synthetic pesticides has been effective at technical schools for rural youth. In addition to becoming future farmers, these students can bring informed views back to their communities.

ORGANIC FOOD MARKET INCENTIVE

Promoting organic certification can be a strong incentive to adopt IPM.

Step 5: Partner successfully with other IPM implementers

Many IPM projects consist of partnerships between two or more organization, e.g., donors, governments, PVOs, and NGOs. If these partnerships are not forged with care, the entire project may be handicapped. The following design steps are considered essential.

ARTICULATE THE PARTNERSHIP'S VISION OF IPM

Organizations may forge partnerships based on a common commitment to IPM—only to discover too late that their visions of IPM differ considerably. It is important that partners articulate a common, detailed vision of IPM, centered on the crops and conditions the project will encounter.

CONFIRM PARTNER INSTITUTIONS' COMMITMENT

Often, organizations make commitments they do not intend to (or are unable to) fulfill completely. The extent of commitment to IPM integration into project design, and thus implementation, depends strongly upon the following key variables:

- **IPM program integration into larger project.** The IPM program is likely to be part of a larger "sustainable agriculture" project. The IPM program must fit into a partner's overall program. The extent of this integration should be clearly expressed in the proposed annual work plan.
- **Cost sharing.** The extent of funds (or in-kind resources) is a good measure of a genuine partner commitment.
- **Participation of key IPM personnel.** Large partner organizations should have staff with expertise in IPM assigned specifically to IPM work. In strong partnerships, these staff members are actively involved in the partnership.

Step 6: Monitor the fields regularly

The growth of pest populations usually is related closely to the stage of crop growth and weather conditions, but it is difficult to predict the severity of pest problems in advance. The crops must be inspected regularly to determine the levels of pests and natural enemies and crop damage. Current and forecast weather should be monitored. Farmers, survey personnel, and agricultural extension staff can assist with field inspections. They can train other farmers to be able to separate pests from non-pests and natural enemies, and to determine when crop protection measures are necessary.

Step 7: Select an appropriate blend of IPM tools

A good IPM program draws from and integrates a variety of pest management techniques. IPM does not require predetermined numbers or combinations of techniques, nor is the inclusion or exclusion of any one technique required for IPM implementation. Flexibility to fit local needs is a key variable. Pesticides should be used only if no practical, effective, and economic non-chemical control methods are available. Once the pesticide has been carefully chosen for the pest, crop, and environment, it should be applied only to keep the pest population low. When dealing with crops that are already being treated with pesticides, IPM should aim first at reducing the number of pesticide applications through the introduction of appropriate action thresholds, while promoting appropriate pesticide management and use practices and shifting to less toxic and more selective products and non-chemical control methods. In most cases, NGOs/PVOs will probably need to deal with low to moderate levels of pesticide use. Either way, an IPM program should emphasize preventive measures and protect a crop, while interfering as little as possible with the production process.

Step 8: Develop education, training, and demonstration programs for extension workers

Implementation of IPM depends heavily on education, training, and demonstration to help farmers and extension workers develop and evaluate the IPM methods. Hands-on training conducted in farmers' fields (as opposed to a classroom) is essential. Special training for extension workers and educational programs for government officials and the public are also important.

Step 9: Monitor and Evaluate

First, develop data collection tools, and then collect baseline data at the beginning of the project to identify and determine the levels of all variables that will need to be tracked. These may include numbers

and types of pests, predators, and soil microorganisms; relative numbers of all non-target animals (birds, lizards, etc.) that may be negatively impacted if pesticides are used; soil and water samples to determine levels of pesticide residue; soil samples to learn dominant soil types and to predict soil nutrition requirements and fertilizer/pesticide activities; pesticide application and safety equipment available; and amounts and type of training received by target audiences.

Develop methods for measuring the effectiveness of each IPM tactic used, as well as their combined effectiveness in reducing pest damage and crop losses. Also, develop methods for monitoring environmental health (maintaining and encouraging high levels of predators and soil microorganisms) and human health if pesticides are used. Kits are available for determining the level of cholinesterase-inhibiting pesticides to which farmers and applicators have been exposed. Make checklists for farmers to use when applying pesticides that indicate the type of application and safety equipment used (see Annex 7), and the rates at which pesticides were applied.

IMPLEMENTATION OF AN IPM PLAN

The following IPM evaluation and implementation process contains very useful preventive and reactive interventions to manage pests. Measures are also included for minimizing risk if synthetic pesticides are chosen as one of the pest management methods integrated into the IPM program.

Step 1: Evaluate and use non-pesticide management options first

Use both preventive and responsive/curative options that are available to manage pest problems. Farmers may prevent pests (and avoid requiring pesticides) by the way they select plants, prepare the site, plant and tend growing plants. Along with prevention, farmers may respond to or cure the problem via physical, mechanical, or biochemical methods.

General Preventive Interventions:

Plant selection

1. Choose pest-resistant strains.
2. Choose proper locally adapted plant varieties.
3. Diversify plant varieties or intercrop plants.
4. Provide or leave habitat for natural enemies.

Site preparation and planting

- Choose pest-free or pest-avoidance planting dates (e.g., early planting in rainy season avoids stem borers in cereals).
- Enhance/provide shade for shade-grown crops.
- Assign crop-free (fallow) periods and/or rotate crops.
- Install buffer zones of non-crop plants and/or physical barriers.
- Improve soil health.
- Use an appropriate planting density.

- Rotate crops.
- Low-till, no-till.

Plant Tending/Cultivation Practices

- Fertilize and irrigate appropriately.
- Remove weeds while small and before sowing crop.

Responsive/Curative Interventions:

Physical/mechanical control

- Remove or destroy diseased plant or plant parts and pests.
- Weed.
- Install traps.

Biochemical Control

- Pheromones (very effective, but not currently easily accessible or economical; however, they are becoming more so).
- Homemade botanical pesticides.
- Repellents.

Biological control

- Release or augment predators.
- Release or augment parasites/parasitoids.
- Release or augment microbial pesticides.

Step 2: Evaluate the use of synthetic pesticides, if needed

The use of synthetic pesticides should be avoided for many reasons. First, they may be serious constraints to IPM adoption. Second, there are many errors associated with pesticide use in developing countries. Below are some common IPM constraints and pesticide use errors, with possible solutions.

Pesticides as Constraints to IPM Adoption

- Manufacturers aggressively market pesticides.
- Governmental policies/donors promote the use of pesticides.
- Institutional habits (extension services, research groups) favor pesticides.
- Centralized decision-making operates in favor of pesticides.
- Economic/financial factors impede training in IPM /use of IPM techniques.

Some Common Errors Associated with Pesticide Use

- Pesticide is not registered in the host country.
- Pesticide is not evaluated/registered in the country of origin.
- Pesticide is not effective for the planned use.
- Formulation is not stable in tropical conditions.
- Formulation is not adapted to the available application equipment.
- Quantities exceed the real need.
- Pesticide is too dangerous for the users.
- Label is missing or is in a foreign language.
- Packaging is too large or too small for the volume of fertilizer.
- Packaging is not strong enough.

Possible Solutions to Help Reduce Pesticide Risks

- Promote IPM as the preferred approach for pest control.
- Help the host country improve its management of pesticides.
- Use good practices in the provision of pesticides.
- Use only EPA- and OECD-registered pesticides.
- Don't use pesticides in WHO classes Ia, Ib, and II (see below).
- Don't use pesticides found on Prior Informed Consent (PIC) and Persistent Organic Pollutants (POPs) Convention lists.
- Follow World Health Organization guidelines for vector management.
- Determine status of pesticides in Special Review at EPA.
- Determine acceptable levels of pesticide residues for trade and consumption by checking the United Nations for the CODEX limits.
- Go to PEST-BANK (http://www.bcr.org/services/databases/ovid/pestbank.html) to order information that can help to determine pesticides' suitability for intended uses
- Know how to treat pesticide poisoning—you can find a good handbook on poisoning at http://www.epa.gov/pesticides/safety/healthcare/handbook/handbook.htm
- Check pesticide labels and the U.S. Code of Federal Regulations on the Web before ordering pesticides
- Follow USEPA's guidelines for biological pesticide registration and use their Web site as a resource for novel green technologies
- Recognize that some botanical pesticides are regulated by USEPA, but additional ones may be evaluated by EPA on a case-by-case basis.

World Health Organization Acute Toxicity Classes

Class Toxicity Advice for Uzbekistan

- Ia Extremely Hazardous DO NOT USE
- Ib Highly Hazardous DO NOT USE
- II Moderately Hazardous USE GREAT CARE!
- III Slightly Hazardous Use with care
- U Unlikely to present any acute hazard in normal use

ANNEX 7

PESTICIDE USE CHECKLIST FOR PVOS, NGOS, AND OTHERS

The following checklist is intended to assist in identifying potential environmental problems with pesticide use. It will also help in guiding project management to ensure that pesticides are not used inappropriately. Since pesticide use is mainly an issue with agricultural projects involving trees or food production, livestock projects, and health projects (control of mosquitoes, schistosomiasis pathogens, tsetse fly, etc.), particular care should be taken with those sectors. The same caution should be used anytime pesticides are employed as part of project activities in any sector.

1. Check off all ways in which pesticides will be used.

	By Project Staff	By Recipient	Others(Specify)
Demonstration	_____	_____	_____
Research	_____	_____	_____
Training	_____	_____	_____
Vector Control	_____	_____	_____
Others (list)	_____	_____	_____

2. Check the technical expertise of the people to be handling pesticides:

	By Project Staff	By Recipient	Others(Specify)
Well-trained	_____	_____	_____
Moderately trained	_____	_____	_____
Not trained	_____	_____	_____
Others (explain)	_____	_____	_____

3. Pesticides are needed to manage pests on (check one or more):

_____ Crops

_____ Livestock

_____ Others; please specify: _____

4. Can your staff identify the main pest organisms?

_____Yes _____No

5. Do you know which pesticides are needed?

_____Yes _____No

6. List pesticides needed, indicating each commodity (crop type, livestock type, tree, etc.) and specify pests (name of specific insects, diseases, weeds, storage pests, etc.) needing control, using the format shown below.

Commodity Pest Pesticide Common Name Trade Name

7. Pesticide Storage Facilities

a) Do you have a storage facility on the project site designated solely for pesticides?

_____Yes, describe:

_____No

b) Is the storage shed well lit, ventilated, and safe from flooding?

_____Yes _____No

c) Are pesticides kept away from food, feed, or water?

_____Yes _____No

d) Are storage facilities secure and kept locked when not in use?

_____Yes _____No

e) Are all pesticides kept in their original, labeled containers?

_____Yes _____No

f) Are warning signs posted outside the storage sheds?

_____Yes _____No

g) Are pesticides stored away from flammable/combustible materials?

_____Yes _____No

h) Is there a well-established procedure to clean up spills?

_____Yes, namely:

_____No

8. Safe Use of Pesticides

a) Do you have a place to mix the pesticides safely?

_____Yes, describe:

_____No

b) Do you have protective clothing (e.g. rubber boots, coveralls, gloves, masks, eye protection)?

_____Yes, describe:

_____No

c) Do you have measuring and mixing equipment?

_____Yes, describe:

_____No

d) Do you have a supervisor in the project designated to oversee all pesticide operations?

_____Yes, who?:_____;

Level of training? _____

_____No

e) Is your staff familiar with appropriate pesticide disposal procedures?

_____Yes _____No

f) Describe how you plan to dispose of pesticide containers:

metal? _____

glass? _____

plastic? _____

paper? _____

cardboard? _____

g) Is your staff familiar with first-aid procedures for pesticide poisoning?

_____Yes _____No

h) Are emergency procedures in place in case of accidental poisonings?

_____Yes: Briefly

describe_____ _____

_____ _____

_____No

i) Are there procedures for observing restricted entry intervals after applications?

_____Yes _____No

9. Application Equipment

a) Describe equipment you will be using to apply the pesticide.

b) Is there a trained person on the project whose job will be to maintain application equipment, including nozzles and sieves?

_____Yes _____No

c) Are spare parts available in local stores?

_____Yes _____No

10. General Pest Management Concerns

a) Have you identified pesticide-related risks in your project area and analyzed whether pesticide use is justified, affordable, and can be adequately managed and supervised?

_____Yes _____No

_____N/A

b) Will your staff be training other people in pest management and pesticide use?

_____Yes, whom?

_____No

c) Are funds available for necessary materials, training methods, and follow-up included in your project paper?

_____Yes, estimated costs? _____ _____

_____No

11. IPM approach

a) Is the project promoting the adoption of preventive, non-chemical management measures?

_____Yes _____No

If yes, indicate which (crop rotation, biocontrol, use of resistant cultivars, crop diversification, tillage, sanitation, manual weed destruction,
etc):_____

_____

b) Are pesticides being applied only as last-resort measures and based on action threshold criteria? Are there pest monitoring procedures being used to determine the need for pesticide treatments?

_____Yes _____No

c) Can farmers and project extensionists readily distinguish pest from non-pest organisms? Can they recognize common beneficial species (pollinators, predators, and parasitoids)?

_____Yes _____No

12. Environmental Impact

a) Are there wildlife sanctuaries, preserves, or any other protected habitats in or near the project implementation area that might be affected by pesticide use?

_____Yes, namely:

_____No

b) Are there water bodies (lakes, lagoons, reservoirs, rivers, streams, estuaries, etc.) near the project areas that might be subject to pesticide contamination through drift, runoff, or spills?

_____Yes. Describe:

_____No

c) Are wildlife and domestic animals protected from poisoned baits?

_____Yes. How?

_____No

13. Pesticide monitoring

Is there a system in place for tracking pesticide use activities, including frequency of

applications, techniques, chemicals used, doses, target pests, effectiveness, criteria for applying, and safe use practices?

_____Yes

_____No

14. Literature Needs

Have you included literature needs in your activity?

_____Yes

_____No

15. Check off areas where additional assistance may be needed:

	Consultancy	Training
Pest identification	_____	_____
Pesticide selection	_____	_____
Handling pesticides (transport, mixing, loading, application, equipment clean up, disposal)	_____	_____
Application equipment	_____	_____
IPM	_____	_____
Pesticide storage	_____	_____
Protective clothing	_____	_____
Measuring & mixing equipment	_____	_____
Training (designate activity)	_____	_____
Literature	_____	_____
Training materials	_____	_____
Other (specify)	_____	_____

Double check above

ANNEX 8

PROTECTIVE CLOTHING AND EQUIPMENT GUIDE

Route of Exposure	Toxicity Category - Label Signal Words			
	I Danger	II Warning	III Caution	IV Caution
Dermal Toxicity or Skin Irritation Potential[1]	• Coveralls worn over long-sleeved shirt and long pants • Socks • Chemical-resistant footwear • Chemical-resistant Gloves[2]	• Coveralls worn over short-sleeved shirt and short pants • Socks • Chemical-resistant footwear • Chemical-resistant Gloves[2]	• Long-sleeved shirt and long pants • Socks • Shoes • Chemical-resistant Gloves[2]	• Long-sleeved shirt and long pants • Socks • Shoes • No minimum[4]
Inhalation Toxicity	• Respiratory protection device[3]	• Respiratory protection device[3]	• No minimum[4]	• No minimum[4]
Eye Irritation Potential	• Protective eyewear[5]	• Protective eyewear[5]	• No minimum[4]	• No minimum[4]

[1] If dermal toxicity and skin irritation toxicity categories are different, PPE shall be determined by the more severe toxicity category of the two. If dermal toxicity or skin irritation is category I or II, refer to the pesticide label/MSDS to determine if additional PPE is required beyond that specified in Table.

[2] Refer to the pesticide label/MSDS to determine the specific type of chemical-resistant glove.

[3] Refer to the pesticide label/MSDS to determine the specific type of respiratory protection.

[4] Although no minimum PPE is required for these toxicity categories and routes of exposure, some specific products may require PPE. Read pesticide label/MSDS.

[5] Protective eyewear" is used instead of "goggles" and/or "face shield" and/or "shielded safety glasses" and similar terms to describe eye protection. Eye glasses and sunglasses are not sufficient eye protection.

ANNEX 9

TOXICITY OF PESTICIDES: EPA AND WHO CLASSIFICATIONS

GENERAL TOXICITY

Pesticides, by definition and name, are poisons, but the toxicity and hazards of different compounds vary greatly and might be different from organism to organism. Toxicity refers to the inherent intoxicating ability of a compound, whereas hazard refers to the risk or danger of poisoning when the pesticide is used or applied. Pesticide hazard depends not only on toxicity but also on the chance of exposure to toxic amounts of the pesticide. Pesticides can enter the body through oral ingestion, through skin, or through inhalation. Once inside the body, they may produce poisoning symptoms, which are either acute (from a single exposure) or chronic (from repeated exposures or absorption of smaller amounts of toxicant).

EPA AND WHO TOXICITY CLASSIFICATIONS

Two major systems of pesticide toxicity classification are used: These are the USEPA and the WHO systems of classification. It is important to note that the WHO classification is based on the active ingredient only, whereas USEPA uses product formulations to determine the toxicity class of pesticides. WHO classification shows relative toxicities of all pesticide active (or technical) ingredients, whereas EPA classification shows actual toxicity of the formulated products, which can be more or less toxic than the active ingredient alone and are more representative of actual dangers encountered in the field, influenced by additives and formulations like EC or WP (see Annex 1). The tables below show classification of pesticides according to the two systems.

USEPA CLASSIFICATION (BASED ON FORMULATED PRODUCT = ACTIVE INGREDIENT PLUS INERT AND OTHER INGREDIENTS)

CLASS	Descrip-tive term	Mammalian			Irritation		Aquatic invert/fish (LC_{50} or EC_{50})[2]	Honey bee acute oral (LD_{50})
		LD_{50} Oral	LD_{50} Dermal[1]	LC_{50} Inha-lation	Eye	Skin		
I	Extremely toxic	≤50	≤200	≤0.2	Corrosive		< 0.1	
II	Highly toxic	50-500	200-2000	0.2-2.0	Severe		0.11-1.0	< 2 µg/bee
III	Modera-tely toxic	500-5000	2000-20000	2.0-20	No corneal opacity	Mode-rate	1.1-10.0	2.1-11 µg/bee
IV	Slightly toxic	≥5000	≥20000	≥20	None	Mode-rate or slight	10.1-100	
	Relatively non-toxic						101-1000	

	Practically non-toxic	1001-10,000	> 11 µg/bee
	Non-toxic	> 10,000	

[1] Corneal opacity not reversible within 7 days for Class I pesticides; corneal opacity reversible within 7 days but irritation persists during that period for Class II pesticides; no corneal opacity, and irritation is reversible within 7 days for Class III pesticides; and Class IV pesticides cause no irritation.

[2] Expressed in ppm or mg/L of water.

LC50 is the concentration of a chemical which kills 50% of a sample population by the animal breathing it in

LD50 measure generally used when exposure is by swallowing, through skin contact, or by injection.

EC50 is a commonly used abbreviation which refers to the (exposure) concentration of a toxic material which has a defined effect upon 50% of a test population.

WHO CLASSIFICATION (BASED ONLY ON ACTIVE INGREDIENT)

Class	Descriptive term	Oral LD_{50} for the rat (mg/kg body wt)		Dermal LD_{50} for the rat (mg/kg body wt)	
		Solids	Liquids	Solids	Liquids
Ia	Extremely hazardous	≤5	≤20	≤10	≤40
Ib	Highly hazardous	5-50	20-200	10-100	40-400
II	Moderately hazardous	50-500	20-2000	100-1000	400-4000
III	Slightly hazardous	≥501	≥2001	≥1001	≥4001
U	Unlikely to present acute hazard in normal use	≥2000	≥3000	-	-

ANNEX 10

BASIC FIRST AID FOR PESTICIDE OVEREXPOSURE

Get medical advice quickly if you or any of your fellow workers have unusual or unexplained symptoms during work or later the same day. Do not let yourself or anyone else get dangerously sick before calling a physician or going to a hospital. It is better to be too cautious than too late. First aid is the initial effort to help a victim while medical help is on the way. If you are alone with the victim, make sure the victim is breathing and is not being further exposed to the poison before you call for emergency help. Apply artificial respiration if the victim is not breathing. Read the first aid instructions on the pesticide label, if possible, and follow them. Do not become exposed to poisoning yourself while you are trying to help. Take the pesticide container (or the label) to the physician. Do not carry the pesticide container in the passenger space of a car or truck.

Poison on skin

- Act quickly
- Remove contaminated clothing and drench skin with water
- Cleanse skin and hair thoroughly with detergent and water
- Dry victim and wrap in blanket.

Chemical burn on skin

- Wash with large quantities of running water
- Remove contaminated clothing
- Cover burned area immediately with loose, clean, soft cloth
- Do not apply ointments, greases, powders, or other drugs in first aid treatment of burns

Poison in eye

- Wash eye quickly but gently
- Hold eyelid open and wash with gentle stream of clean running water
- Wash for 15 minutes or more
- Do not use chemicals or drugs in the wash water; they may increase the extent of injury

Inhaled poison

- Carry victim to fresh air immediately
- Open all doors and windows so no one else will be poisoned
- Loosen tight clothing

- Apply artificial respiration if breathing has stopped or if the victim's skin is blue. If patient is in an enclosed area, do not enter without proper protective clothing and equipment. If proper protection is not available, call for emergency equipment from your fire department

Poison in mouth or swallowed

- Rinse mouth with plenty of water
- Give victim large amounts (up to 1 quart) of milk or water to drink
- Induce vomiting only if instructions to do so are on the label

Procedure to induce vomiting

- Position victim face down or kneeling forward, Do not allow victim to lie on his back, because the vomit could enter the lungs and do additional damage
- Put finger or the blunt end of a spoon at the back of victim's throat or give syrup of ipecac
- Collect some of the vomit for the physician if you do not know what the poison is
- Do not use salt solutions to induce vomiting

When NOT to induce vomiting

- If the victim is unconscious or is having convulsions
- If the victim has swallowed a corrosive poison. A corrosive poison is a strong acid or alkali. It will burn the throat and mouth as severely coming up as it did going down. It may get into the lungs and burn there also
- If the victim has swallowed an emulsifiable concentrate or oil solution. Emulsifiable concentrates and oil solutions may cause severe damage to the lungs if inhaled during vomiting

ANNEX 11

RECOMMENDED DISTRIBUTION

AgLinks Uzbekistan, all staff

USAID Uzbekistan and other USAID financed projects

USAID Central Asia, Almaty

USAID Washington, E&E

E&E – Bureau Environmental Officer (BEO)

ANNEX 12

WEBSITES USEFUL FOR PESTICIDE SEARCHES

GENERAL INFORMATION SYSTEMS

http://www.fao.org/agris/

http://cfpub.epa.gov/ncea/iris/index.cfm?fuseaction=iris.showSubstanceList

National Pesticide Information Retrieval System (NPIRS)

http://ppis.ceris.purdue.edu/npublic.htm

National pesticide information center

http://npic.orst.edu/index.html

www.epa.gov for compliance

www.who.int/ipcs/publications/pesticides for WHO classification

www.kellysolutions.com for product registration status information; www.greenbook.net and www.cdms.com for efficacy information and Material Safety

http://www.inchem.org/ Chemical Safety Information from Intergovernmental Organizations

PESTICIDE INFORMATION, REGULATORY, EQUIPMENT

http://www.pesticideinfo.org (PAN most complete and up to date pesticides database)

http://extoxnet.orst.edu/pips/ghindex.html (Extoxnet Oregon State database)

http://www.epa.gov/ecotox/ (EPA Ecotox Database)

http://www.cdpr.ca.gov/docs/epa/m2.htm

http://cfpub.epa.gov/oppref/rereg/status.cfm?show=rereg (EPA Registr.Eligib.Decisions)

http://www.epa.gov/pesticides/biopesticides/ai/all_ais.htm (EPA regulated biopesticides)

http://www.epa.gov/opppmsd1/RestProd/rupjun02.htm (EPA restricted use pesticides)

http://www.epa.gov/pesticides/health/tox_categories.htm (EPA Toxicity Classifications)

http://www.epa.gov/opppmsd1/PPISdata/index.html (EPA pesticide product information)

http://www.chemfinder.camsoft.com (chemical database & internet search)

http://www.hclrss.demon.co.uk/index.html (compendium of pesticide common names)

http://www.agf.gov.bc.ca/pesticides/f_2.htm (all types of application equipment)

http://www.hclrss.demon.co.uk/class_insecticides.html pesticides classification and common names compendium

http://www.cdpr.ca.gov/docs/label/labelque.htm (California pesticide regulation)

http://www.epa.gov/search.html (EPA searches)

http://vegetablemdonline.ppath.cornell.edu/NewsArticles/Onion_LabelRts.html (fungicides for specific crops)

http://nysipm.cornell.edu/factsheets/vegetables/default.asp (Pest disease fact sheets vegetables)

http://www.nappo.org/menu_e.shtml (NAPPO)

http://www.croplife.org/website/pages/About_CropLife_International.aspx?wt.ti=About%20CropLife%20International Croplife pesticides

http://cfpub.epa.gov/ncea/iris/index.cfm (IRIS)

http://ec.europa.eu/food/plant/protection/evaluation/index_en.htm (EU commission plant protection)

http://www.ilo.org/public/english/protection/safework/cis/products/icsc/dtasht/index.htm for chemical information's

LABEL INFORMATION

https://premier.cdms.net/webapls/FormsLogin.asp?/webapls/

http://www.cepep.colostate.edu/labels.htm

PESTICIDE TOXICITY TO HONEY BEES

http://www.entm.purdue.edu/Entomology/ext/targets/e-series/EseriesPDF/E-53.pdf

http://www.ohioline.osu.edu/hyg-fact/2000/2161.html (Ohio State Extension site)

PESTICIDE TOXICITY TO NATURAL ENEMIES (BENEFICIAL'S)

http://www.ipm.ucdavis.edu/PMG/r108900111.html

BIOLOGICAL PESTICIDES LIST

http://www.epa.gov/pesticides/biopesticides/ai/all_ais.htm (EPA's biopesticide list)

MINIMUM RESIDUE LIMITS FOR PESTICIDES & VETERINARY DRUGS IN FOOD

http://faostat.fao.org/faostat/collections?version=ext&hasbulk=0&subset=FoodQuality

INTERNATIONAL CONVENTIONS

http://www.pops.int/ (POPs website, Stockholm convention)

http://www.pops.int/documents/convtext/convtext_en.pdf (POPs Convention text)

http://www.chem.unep.ch/pops/pdf/redelipops/redelipops.pdf (reduce & eliminate POPs)

http://www.pic.int/home.php?type=t&id=5&sid=16 (Rotterdam convention)

http://www.codexalimentarius.net/web/index_en.jsp (Codex alimentarius)

http://www.codexalimentarius.net/mrls/pestdes/jsp/pest_q-e.jsp (MRL)

PEST AND DISEASES, WEEDS

http://www.umassvegetable.org/soil_crop_pest_mgt/disease_mgt/cabbage_phoma_black_leg.html (disease management)

http://weeds.ippc.orst.edu/pnw/weeds (Weed management)

TAXONOMY

http://www.forestryimages.org/stats/statsorg.cfm?org=Colorado%20State%20University&sort=5 images

IPM

http://www.fao.org/ag/AGP/AGPP/IPM/gipmf/index.htm ipm links

http://www.fao.org/ag/AGP/AGPP/IPM/gipmf/en/02_resources/02a.htm IPM year round apricot example

http://www.ipm.ucdavis.edu/PMG/C005/m005yi01.html#DORMANT

PERSUAPS SITES

http://www.encapafrica.org/sectors/pestmgmt.htm (PERSUAPS guidance)

http://www.wateriqc.com/millenium_conference/Proceedings/powerpoint_presentations/Day_4/1

030rossier.pps#285,10,Critical Pesticide Management Issues (EA History PPT)

http://www.encapafrica.org/egssaa.htm (Pesticide evaluation)

AUDIO-VISUAL IPM AND SPU RESOURCES

http://entweb.clemson.edu/pesticid/publictn/resource.htm

UZBEKISTAN INFOS

http://pdf.usaid.gov/pdf_docs/PNACN475.pdf

http://www.cbd.int/countries/?country=uz

http://earthtrends.wri.org/country_profiles

http://lcweb2.loc.gov/frd/cs/profiles/Uzbekistan.pdf

TRADING

http://ec.europa.eu/trade/issues/bilateral/regions/cis/index_en.htm

http://www.uzreport.com/

www.mfer.uz

ANNEX 13

LIST OF CONTACT PEOPLE OF GOVERNMENTAL INSTITUTIONS, INTERNATIONAL ORGANIZATIONS ACTIVE IN UZBEKISTAN AND AGLINKS CLIENTS

Name	Institute/organization	Position	Address	Telephone/Mobile
Mr. Qalandar Bobobekov	Republican Center of Plant Protection and Agricultural Chemistry, Ministry of Agriculture	Deputy Chairman	Navoyi st, 4 Tashkent	(998-71) 2391340
Dr. Botirjon Sulaymonov	Tashkent State Agrarian University Scientific Biological Center	Director	Universitet st. 2, Tashkent	(998-71) 2605059
Mr. Ahror Sagdullaev	Uzbek Scientific Research Institute of Plant Protection	Director	Bobur st, 4, Qibray district, Tashkent province	(998-71) 2604852
Mr. Ralf Pefeling	GTZ	COP	Abdullaev, 2a Tashkent	(998-71) 1400489
Mr. Hamidila Shermatov	"UZKIMYOSANOAT" state joint-stock company	Deputy Director	Navoyi st, 38 Tashkent	(998-71) 1400489
Mr. Alexander Kalashnikov	USAID	CTO	3 Maykurgan, Tashkent	(998-71) 1402486
Mr. Abdusalom Fozilov	Plant protection department, Ferghana	Director	36, Tillahujaev Ferghana city	(998-73) 2245663
Mr. Aliboy Juraev	Plant protection department, Namangan	Director	28, S. Ayniy Namangan city	(998-69) 2343564
Mr. Saidmurod Alimuhammedov	Plant protection department, Tashkent	Director	Nukus street, Tashkent city	(998-71) 2547731
Mr. Abdurashid Anorboev	Plant protection department, Samarkand	Director	2, S. Ayniy Samarkand city	(998-66) 5730025
Mr. Alijon Burkhanov	"Muyan sohibkorlari" agrifirm	Director	Muyan vil., Quvasoy, Ferghana	(998-73) 3732776
Mr. Habibullo Razzoqov	"Quvasoy bekhizor" agrifirm	Director	Sufon vil., Quvasoy, Ferghana	(998-73) 3732565
Mr. Matvali Ahmedov	"To'raqo'rg'on sohibkorlari" agrifirm	Director	Kumidon vil., Turakurgan, Namangan	(998-69) 2311053
Mr. Jamshid Bahriev	"Istiqlol meva sabzavot" agrifirm	Director	Kavchinon vil., Samarkand, Samarkand	(998-66) 2264585
Mr. Islom	"Dilkusho sifat" agrifirm	Director	Kurgancha vil.,	(998-66) 2616944

Name	Institute/organization	Position	Address	Telephone/Mobile
Usmonov			Toylok, Samarkand	
Mr. Xusanboy Ermatov	“Pungon” Water user’s association (WUA)	Manager	Pungan vil., Pop, Namangan	(998-69) 2539071
Mr. Joraboy Matoirov	“Shirinsuv yangier” WUA	Manager	Vodiy vil., Pop, Namangan	(998-73) 5049015
Mr. Allayor Umirzoqov	“Qarshiboy Mirob AUS” WUA	Manager	Kupaki vil., Payarik, Samarkand	(998-66) 9191123
Mr. Erkin Eshquvvatov	“Hujabo’ston suv tarmog’i” WUA	Manager	Javshar vil., Payarik, Samarkand	(998-92) 5264839
Mr. Mirzaev Hudoyor	“Damhasa arig’I MHA” WUA	Manager	Muhammadi vil., Payarik, Samarkand	(998-90) 7433067
Mr. Mirrahim Adilov	“BERAD-AGRO” private company	Director	Karakalpak vil., Parkent, Tashkent	(998-71) 2123134
Mr. Mehroj Fayzilov	“Agromir” processing company	Director	Samarkand, Samarkand	(998-90) 6002222
Mr. Abduhakim Sarimsoqov	Ministry of Health of Uzbekistan	Lead Toxicologist	Navoyi 12, Tashkent city	(998-71) 1280646
Mrs. Zulfiya Suleymonova	State committee for Nature Protection of the Republic of Uzbekistan	Department Head	U. Nosir 13a, Tashkent city	(998-71) 2540849
Mr. Abduvohid Sharobov	Ministry of Labor of Uzbekistan	Department Head	Avloniy 20a, Tashkent city	(998-71) 2394403
Mr. Fahriddin Qirg’izboev	Ministry of Agriculture and Water Resources	Fruit and Vegetable Department specialist	Navoyi 4, Tashkent city	(998-71) 2410742

ANNEX 14

MITIGATING POTENTIAL PESTICIDE DANGERS: MEASURES TO ENSURE SAFE USE

If there are no feasible alternatives to pesticides, take the following measures to mitigate and reduce their risks to human health and the environment. These include transport, storage, use, clean up and other measures to ensure safe use. Note that risk is a function of both toxicity and exposure. Reducing risk means (1) selecting less toxic pesticides and (2) selecting pesticides that will lead to the least human exposure before, during and after use.

REDUCE EXPOSURE TIME OR THE DEGREE OF EXPOSURE

Before Using

Transport:

- Separate pesticides from other materials being transported

Packaging:

- Follow international and national norms and guidelines
- Use packaging (small containers) adapted to local needs
- Eliminate re-use of packaging materials

Storing:

- Develop strict guidelines for village-level storage
- Ensure permanent, well-marked labeling
- Follow and respect national norms
- Use appropriate language and approved pictograms

Formulating:

- Use appropriate type and concentration

During Use

Training:

- Should be continuous
- Should identify level and audiences (distributors, farmers, transporters, etc.)

Use application equipment:

- Should be adapted to user needs and possibilities
- Should assure maintenance and availability of parts and service

Use protective equipment and clothing:

- Should be adapted to local climatic conditions
- Should be adapted to user needs and resource possibilities
- Should eliminate exposure rather than just reduce it, if at all possible

Focus on "buffer zones" around the following:

- Housing
- Environment: water, sensitive areas

After using

- Know, enforce, respect exclusion or reentry periods after application
- Assure proper cleaning and rinsing off:
  - Applicators' preparation and application equipment
  - Applicators' clothing
  - Storage containers
- Develop a workable monitoring and evaluation system for:
  - Adherence to national and international policies regarding pest management and pesticides
  - Health effects on applicators, the local population, and domestic animals
  - Efficacy on target pests
  - Impacts on environment: water, soils, etc.
  - Elimination of pesticide leftovers and containers

ANNEX 15

MITIGATION OF HUMAN TOXICOLOGICAL EXPOSURES

Most pesticide poisonings result from careless handling practices or from a lack of knowledge regarding the safer handling of pesticides. The time spent learning about safer procedures and how to use them is an investment in the health and safety of oneself, one's family, and others. Pesticides can enter the body in four major ways: through the skin, the mouth, the nose, and the eyes. A checklist is given below to help avoid these various routes of overexposure to pesticides.

To avoid dermal (skin) exposure

- Check the label for special instructions or warnings regarding dermal exposure
- Use recommended protective clothing and other equipment as listed on the label
- Do not re-enter the area until deposit has dried or re-entry interval is past

To avoid oral (mouth) exposure

- Check the label for special instructions or warnings regarding oral exposure
- Never eat, drink, or smoke, chew tobacco while working with any pesticide
- Wash thoroughly with soap and water before eating, drinking, smoking, or chewing tobacco
- Do not touch lips to contaminated objects (such as nozzles)
- Do not wipe mouth with contaminated hands or clothing
- Do not expose food, beverages, drinking vessels, or cigarettes to pesticides
- Wear a face shield when handling concentrated pesticides

To avoid respiratory (lungs) exposure

- Read the label to find out if respiratory protection is required
- If respiratory protection is required, use only an approved respiratory device
- Stay upwind during application

To avoid eye exposure

- Read the label to find out if eye protection is required
- If eye protection is required use goggles to protect eyes or a face shield to protect eyes and face
- Keep pesticide container below eye level when pouring

In addition to these common sense measures, there is a way to ensure protection against exposure to pesticides by the type of clothing (Annex 8) required for different classifications of pesticides (the classification of each pesticide by EPA toxicity Class I, II, III, or IV (Annex 9), and signal word DANGER, WARNING, CAUTION). Toxicity class and signal word is provided for each AgLinks Uzbekistan pesticide in Annex 1. Good protection is achieved by following the protective clothing and equipment guide.

The EPA system for determining toxicity of pesticides (as well as the WHO system) is included as Annex 9 to this PERSUAP.

ANNEX 16

UN PIC AND U.S. PIC-NOMINATED PESTICIDES LIST AND PESTICIDE COMPOUNDS WITH USEPA-CANCELLED OR SUSPENDED PRODUCTS

UN PIC & U.S. PIC-NOMINATED PESTICIDES LIST

Following is a list of 22 UN Prior Informed Consent (PIC) pesticides, 4 UN Severely Hazardous Pesticide Formulations (SHPF), 6 UN PIC pesticides added during the interim period, and 36 additional U.S. actions reported, originally nominated for inclusion on the PIC list, and based on PIC definitions of the voluntary program. (Two of the six interim pesticides were included in the original U.S. list, bringing the total to 64.)

UN PIC & U.S. PIC-NOMINATED PESTICIDES LIST

#	Pesticide	UN PIC List	Banned	Severely Restricted	SHPF
1	***Aldrin***	x	x		
2	arsenic trioxide			x	
3	***asbestos all forms (Interim)***	x	x		
4	***benzene hexachloride[BHC]***	x	x		
5	***binapacryl (Interim)***		x		
6	2,3,4,5-Bis(2-butylene)tetrahydro-2-furaldehyde [Repellent-11]		x		
7	bromoxynil butyrate		x		
8	cadmium compounds		x		
9	Calcium arsenate		x		
10	***captafol***	x	x		
11	carbofuran (granular only)			x	
12	carbon tetrachloride		x		
13	Chloranil		x		
14	***chlordane***	x	x		
15	chlordecone (kepone)		x		
16	***chlordimeform***	x	x		
17	***chlorobenzilate***	x	x		
18	chloromethoxypropylmercuric acetate [CPMA]		x		
19	copper arsenate		x		
20	daminozide/alar			x	
21	DBCP		x		
22	***DDT***	x	x		
23	***Dieldrin***	x	x		
24	***dinoseb*** and salts	x	x		
25	Di(phenylmercury)dodecenylsuccinate [PMDS]		x		
26	***DNOC (Interim)***	x	x		
27	***1,2-dibromoethane ethylene dibromide - EDB)***	x	x		

#	Pesticide	UN PIC List	Banned	Severely Restricted	SHPF
28	***ethylene dichloride (EDC) (Interim)***		x		
29	***ethylene oxide (ETO) (Interim) agricultural uses only***			x	
30	endrin		x		
31	EPN		x		
32	ethyl hexyleneglycol [6-12]		x		
33	***fluoroacetamide***	x	x		
34	***heptachlor***	x		x	
35	***hexachlorobenzene [HCB]***	x	x		
36	lead arsenate		x		
37	leptophos		x		
38	***Lindane***	x		x	
39	***mercury compounds*** (mercurous chloride and mercuric chloride)	x	x		
40	***methamidophos***	x			x
41	***methyl parathion***	x			x
42	Mevinphos		x		
43	mirex		x		
44	***monocrotophos***	x	x		
45	nitrofen (TOK)		x		
46	OMPA (octamethylpyrophosphoramide)		x		
47	***parathion*** (ethyl)	x			x
48	***pentachlorophenol***	x		x	
49	phenylmercury acetate [PMA]		x		
50	phenylmercuric oleate [PMO]		x		x
51	***phosphamidon***	x			
52	potassium 2,4,5-trichlorophenate [2,4,5-TCP]		x		
53	pyriminil [Vacor]		x		
54	safrole		x		
55	Silvex		x		
56	sodium arsenate			x	
57	sodium arsenite		x		
58	TDE		x		
59	Terpene polychlorinates [Strobane]		x		
60	Thallium sulfate		x		
61	***toxaphene (chlorinated camphene) (Interim)***	x	x		
62	tributyltin compounds			x	
63	***2,4,5-Trichlorophenoxyacetic acid [2,4,5-T]***	x	x		
64	vinyl chloride		x		

* Pentachlorophenol is still registered for use in the U.S. as a wood preservative.

PESTICIDE COMPOUNDS WITH USEPA-CANCELLED OR SUSPENDED PRODUCTS

The following is a list of generic or accepted common chemical or compound names for problematic pesticides. At least half of the products made with each pesticide are suspended, cancelled, or not registered (i.e., they have no "Active" registrations) in the United States by the U.S. Environmental Protection Agency (USEPA). Note that thousands of trade names exist, few of which appear on this list. Carefully examine the label of any pesticide to ascertain whether the accepted common (or generic) name appears on this list.

acetamide-na	coumaphos-na	fluoroacetamide-c	potassium pentachlorophenate-c
acrolein-cna	creosote oil	fluvalinate-c	profenphos-na
acrylonitrile-c	creosote-c	fonofos-c	pronamide
alachlor-cna	Creosote, pentachlorphenol-dd	**heptachlor-dd-s**	propanoic acid
alar	cupric oxide-c	hydrocyanic acid-c	safrole-b
aldicarb-dd	cyanazine-cna	hydrogen cyanamide-na	silvex-b
aldrin-dd-b	cycloheximide-c	imazaquin-c	simazine
allyl alcohol-c	cyhalothrin-na	isazofos-c	sodium arsenate-s
alpha chlorhydrin-c	cyhexatin-b	isofenphos-c	sodium arsenite-b
aluminum phosphide	Cypermethrin	kepone	sodium cyanide
amitraz-cna	daminozide-s	lead arsenate-b	sodium dichromate
amitrole	**DBCP-dd-b-c**	**lindane-dd-b**	sodium fluoride
arsenate-b, and sodium arsenite-b	DDD (TDE)	magnesium phosphide	sodium fluoroacetate-cna
arsenic acid	**DDT-dd-b**	mercury compounds-b	sodium methyldithiocarbamate
arsenic pentoxide-cna	demeton-c	metaldehyde	sodium monofluoroacetate
arsenic trioxide-s	diallate-c	methamidophos	sodium pyroarsenate-c
atrazine	dichloenil (2,4-D)	methiocarb	strobane-b
avitrol-cna	dichloropropene	methomyl-cna	strychnine
azinphos methyl	diclofop methyl	methyl bromide-cna	sulfotep-cna
bendiocarb-can	dicofol	**methyl parathion-dd**	sulfuric acid
benomyl	dicrotophos-cna	mevinphos-c-b	sulfuryl fluoride
BHC-dd-b	**dieldrin-dd-b**	mirex-b	**2,4,5-T-dd-b**
bis (tributyltin) oxide	diflubenzeron	monocrotophos-c-b	2,4,5-TCP-b
brodifiacoum-c	((dimethoate))	niclosamide-cna	tefluthrin
bromoxynil	dinocap	nicotine	TEPP-c
bromoxynil butyrate-b	dinoseb-b	nitrogen, liquid-na	terbufos-na
butylate-c	dioxathion-cna	OMPA-b	tergitol-c
cadmium chloride-c	diphacinone-c	oxamyl-na	TFM-na
cadmium-b	disulfoton	10,10' oxybisphenoxarsine	thallium Sulfate-b
calcium arsenate-b	dodemorph-c	oxidemeton methyl-cna	TOK (nitrofen)-b
calcium cyanide-c	EBDCs	oxyfluorfen	toxaphene-dd-b
captafol-b	**EDB-dd-b**	**paraquat-dd**	tributyltin fluoride-cna
captan	E-mevinphos-c	**parathion-dd**	tributyltin methacrylate

carbofuran-s	endrin-cna	PCBs	tributyltin-s
carbon tetrachloride-b-c	**endrin-dd-cna**	PCNB	((trifluralin-c))
chloranil-b	EPN-c-b	**pentachlorophenol-dd-cna**	triphenyltin hydroxide
chlorbenzilate-b	EPTC	**pentachlorophenol-sodium S-dd-cna**	vinyl chloride-b
chlordane-dd-b	ethion-cna	Permethrin	Wood Preservatives: calcium arsenate-b,
Chlordimeform-dd-b	ethoprop-cna	phenarsazine chloride	zinc phosphide
Chlorfenvinphos-c	ethyl parathion-can	phorate-cna	z-mevinphos-c
chlorophacinone-cna	ethylene dibromide-c	phosacetim-c	
chloropicrin	fenamiphos-cna	Phosalone-c	
chlorothalonil	fenitrothion-cna	phosphamidon-c	
chromic acid	fensulfothion-c	picloram-c	
coal tar creosote	fenthion	picloram, isooctyl ester-c	
coal tar-cna	fenvalerate-cna	picloram, potassium salt-cna	
copper arsenate-b	flouroacetamide-c	picloram, triisoprpanolamine	
copper oxychloride-c	flucythrinate-c	polychlorinated terphenyls	

b: chemicals with all products banned
c: all products cancelled
can: canceled and no active registered products
dd **dirty dozen member = dd**
na: no active registered product
s: most uses strictly restricted

ANNEX 17

UNDERSTANDING THE PESTICIDE LABEL

The label is the printed material attached to the pesticide container. If possible, pesticides without an approved label attached to the container should not be purchased. The ability to read or understand the information on the label is essential, and vendors and farmers should understand the value of an adequate label. Even those who cannot read need to be helped to grasp the information on the label or to understand the pesticides they are selling or using. Users will find the label and other product documentation helpful:

- Before purchasing the pesticide, to determine if the chemical will manage the pests on the crop in question and can be used safely for their specific conditions;
- Before mixing the pesticide, to determine if users have the necessary protective clothing, how much pesticide to use, and how to mix it;
- Before applying the pesticide, to learn the safety measures required, when to apply the pesticide, how to apply it, when it is safe to reenter the treated area, when it is safe to harvest the treated crop, and what restrictions would prohibit its use under current conditions;
- Before storing the container, to ensure safe and proper storage; and
- Before disposing of the container, to ensure safe and proper disposal.

The pesticide label should include:

- **USEPA or other registration number**
- **Brand name:** Name assigned by the manufacturer
- **Common name:** Short name approved for the chemical's active ingredient (the material that actually kills the pest)
- **Chemical name:** Full name of the active ingredient, presented according to the rules of nomenclature used in Chemical Abstracts
- **Ingredient statement:** Lists the active ingredient or ingredients, along with the percentage of inert or inactive ingredients
- **Amount of active ingredient:** For powders, this is listed as a percentage. For instance, "50% WP" means that the powder consists of 50 percent active ingredient and 50 percent inert ingredient. For liquids, it is measured as pounds of active ingredient per gallon. For example, "2 EC" means that the compound contains 2 pounds of active ingredient per gallon of product.
- **Net contents:** Shows the actual amount of product in the container
- **Name and address of the manufacturer**
- **Signal words and symbols:** Quick reference to product's relative toxicity to humans

- **Precautionary statements:** Given to protect users, others, animals, and the environment from damage resulting from using the pesticide
- **Route of entry:** Possible ways the pesticide can harm or enter a handler's body
- **Specific action:** Actions that help the handler protect the routes of entry specified above
- **Protective clothing and equipment:** Lists any that are needed to prevent overexposure to the pesticide
- **Practical treatment:** Specifies the recommended first aid in case of overexposure
- **Environmental hazards:** Explains how misuse of the product can harm the environment
- **Special toxicity:** Explains how to use the product without harming non-target organisms, such as honeybees, fish, birds, and other wildlife
- **Physical or chemical hazards:** Explains any special fire, explosion or chemical hazards the product can pose during transportation or storage
- **Reentry statement:** Gives the time that must pass between application of the pesticide and when it is safe to reenter the treated area
- **Storage and disposal:** Outlines recommended methods
- **Directions for use:** Occupies a large area of the label. Lists crops, sites and target pests for which the product is registered, along with recommended application rate, method of application, timing, any known compatibility or phytotoxic (plant-poisoning) problems, and other information about use. The period between application and when the crop is safe to eat ("days to withhold") is sometimes listed here.

Signal words, symbols and color codes.

A label may display a signal word such as "Danger—poison," "Warning" or "Caution," depending on how toxic the product is. The most poisonous products will also have a skull and crossbones on the label. Various measures are used to find the category to which a pesticide belongs.

Pesticide label "color coding" schemes have been developed by the FAO and others. For example, in Zimbabwe the pesticide registration officer of the Plant Protection Research Institute collaborates with the Hazardous Substances and Articles Control Board to assign a color code to a pesticide. The color reflects the size of the pesticide's acute oral lethal dose (LD50), the concentration of its formulation, and the length of time it persists in the ecosystem after application. The colors green, amber, red and purple represent pesticides with LD50 ranges of >2,001; 500–2,000; 101–500; and 0.1–100 mg/kg body weight, respectively. In addition, the color-coding system signals the hazards the chemical possesses; who, by law, may handle or use it; and the type of protective clothing a person must wear when handling or using the pesticide. See the Web site http://www.ifgb.uni-hannover.de/ppp/ppp_s01.pdf for more information on this concept.

ANNEX 18

TRANSPORT, MIXING, LOADING AND STORAGE

PESTICIDE TRANSPORT

Pesticides should be transported where people are least likely to be exposed to them. They should be placed inside another container or bag and kept as far from passengers as possible. Check the transporting surface to be certain there are no nails, bolts, screws, or other sharp objects that could puncture pesticide containers. Never transport pesticides with persons or animals. Never transport pesticides where they could come into contact with groceries, livestock feed, seed or other products that might become contaminated. Pesticide containers should be well sealed and secured during transport to prevent spillage or loss in case of sudden starts, stops or turns.

MIXING AND LOADING PESTICIDE

Most pesticides are sold as concentrates that require dilution with a “carrier” (usually water) before application. Always read the label before mixing a pesticide; it will tell how much to dilute the formulated product and how much of the mixture to apply per unit of area. It is essential to measure the exact amount of pesticide recommended. Applying smaller amounts usually does not manage the pest. Applying more than is recommended not only needlessly increases production costs but could also be harmful to the applicator and the environment. It could also make the crop unsafe to eat and/or hard to sell abroad due to excessive pesticide residues. Pour the specified quantity of pesticide into the water. If stirring is necessary, use a stick, never hands.

Make sure all the protective clothing specified on the label is available and is used. Soap and water for washing should be accessible as well. If a pesticide spills or splashes onto the farmer during mixing, the next two minutes are critical. Immediately remove clothing and wash affected areas thoroughly with soap and water. Following the mixing process, close the containers securely and return them to storage. Wash all measuring and mixing containers and store. Wash all protective clothing, and store any that is not required for application.

PESTICIDE STORAGE

The success of pest management campaigns depends on pesticides being available in the areas that need treatment. Pesticides should be placed in a safe and secure storage area as close as possible to agricultural areas that are likely to need treatment. Pesticide stocks must be securely in place at the crop protection service’s bases and in villages before the rainy season, when transportation often becomes much more difficult. A good storage facility should have a fenced and covered area for the pesticides. (A thorn-branch fence will do if other materials are unavailable or too expensive.) The facility should:

- be secure against illegal entries, as well as children and livestock, and locked when not in use;
- be constructed in a site not exposed to flooding during the rainy season;
- be isolated from dwellings, to avoid fire, leakage and water contamination;

- be supplied with water, to clean spills and fight fires;
- be well ventilated (aerated) to avoid concentration of toxic fumes;
- have a current inventory list of pesticide stocks;
- have protection gear such as suits, boots, gloves, goggles and breathing masks;
- have a first aid kit with antidotes; and
- be serviced by trained personnel familiar with measures to take in cases of poisoning.

The following considerations are also of vital importance:

- The pesticides must be kept dry; if they get wet, they lose their power to control pests. Therefore, the roof should be waterproof (zinc sheeting is good), and pesticides should be placed on a shelf or pallet—never directly on the floor or ground.
- Plants should not be allowed to grow around the storage area because they will attract domestic animals to feed. Animals can be poisoned by eating plants that have been contaminated with pesticides.

A management system is needed to record the date each pesticide arrived at the facility, how long it stays in storage, and when it is removed for use. In addition, storage requirements for each pesticide must be posted and known by the management staff. Stored pesticides must be tested periodically to insure the active ingredient is as described on the label and the formulation concentration is correct. In addition, disposing of unused and obsolete pesticides, and destroying their containers, must be part of the management system.

If no village storage facility is available, farmers may decide to keep pesticides on their farms for their own use. As far as possible, they should store pesticides in accordance with the principles described above. Place special stress on keeping the pesticides covered and dry; well ventilated; secure from thieves, children and animals; and isolated from the rest of the farm, with no plants growing around the pesticide area. Smallholder farmers, in particular, are often unaware of these principles, which should be carefully explained to them. Larger-holder farmers may have this information already, and may have a safe building where pesticides are stored.