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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

AND

GOVERNMENT

OF THE

REPUBLIC OF KAZAKHSTAN

E1005
v.2

AGRICULTURAL COMPETITIVENESS PROJECT (ACP)

Pest Management Manual

August 6, 2004

Contents

This report has been translated from an original one in Russian language.

ABBREVIATIONS

ACP	**Agricultural Competitiveness Project**
CC	**Coordination Center**
IPM	**Integrated Pest Management**
MOA	**Ministry of Agriculture**
NGO	**Non-governmental Organization**
NIS	**Newly Independent States**
OP	**Operational Policy**
PPQS	**Plant Protection and Quarantine Station**
PRP	**Peer Review Panel**
PMP	**Pest Management Program**
WB	**World Bank**
WHO	**World Health Organization**

1. INTRODUCTION

The Government of Kazakhstan has proposed for co-financing by the World Bank, the Agricultural Competitiveness Project (ACP) designed to increase the competitiveness of the agricultural sector in Kazakhstan by facilitating access to markets and knowledge. To achieve this objective, the project would: facilitate access to markets by improving the quality and safety of agricultural products, facilitating access to information, and improving market efficiency; and increase the quality, quantity, and relevance of public and private investments in applied agricultural research and knowledge transfer.
One of the possible project impacts will be the pesticides application use increase which could be expected due to growth of agricultural production. Improvements envisioned under the project, especially crop diversification and intensification with high value crops may require farmers to increase the use of inputs – particularly chemical fertilizers and pesticides. This PMP identifies and addresses concerns that may arise out of any such increase in chemical pesticides use and propose mitigation in compliance with the Bank Safeguard Policy on Pest Management (OP 4.09).

The Project will consist of the following four components:

- Quality and safety management of agricultural products
- Agricultural marketing,
- Applied agricultural research and extension; and
- Institutional development and agricultural policy.

The Applied Agricultural Research and Extension Component may lead to more intensive agriculture production and likely increase in the use of production inputs, such as agro-chemicals (fertilizers, pesticides and herbicides). The project will put strong emphasis on mitigating any adverse effects of increased agro-chemical use by introducing more efficient application techniques to farmers. The ACP Pest Management Program (PMP) will support the use of biological and environmental control methods for pests and diseases, which will reduce the reliance on synthetic chemical pesticides.

The project would promote application of Integrated Pest Management including:

(a) Disseminating knowledge on managing pests (keeping them below economically damaging levels) rather than seeking to eradicate them;

(b) Disseminating knowledge, to the extent possible, on non-chemical measures to keep pest populations low, and

(c) Disseminating knowledge less toxic pesticides (when they have to be used), and applying them in a way that minimizes adverse effects on living organisms, human health, and the biophysical environment.

World Bank Safeguard Policy OP 4.09 stipulates that "in assisting borrowers to manage pests that affect either agriculture or public health, the Bank supports a strategy that promotes the use of biological or environmental control methods and reduces reliance on synthetic chemical pesticides", and "in appraising a project that will involve pest management, the Bank assesses the capacity of the country's regulatory framework and institutions to promote and environmentally sound pest management. As necessary, the Bank and the borrower incorporate in the project components to strengthen such capacity". Furthermore, "The Bank does not finance formulated products that fall in WHO classes IA and IB, or formulations of products in Class II, if (a) the country lacks restrictions on their distribution and use; or (b) they are likely to be used by, or be accessible to, lay personnel,

farmers, or others without training, equipment, and facilities to handle, store, and apply these products properly".

The PMP therefore makes an assessment of the current pest management and control approach in Kazakhstan - policy and regulatory framework, institutional capacity to implement pest and pesticide management and monitoring and evaluation functions in ACP and identify capacity building needs. This plan addresses the following:

- Pest management approach;
- Pesticide management;
- Policy, regulatory framework, and institutional capacity; and
- Monitoring and evaluation

2. CURRENT PEST MANAGEMENT APPROACH IN KAZAKHSTAN

2. 1 Current and Anticipated Pest Problems

Agricultural development in Kazakhstan during the last 10 years has been exposed to serious changes. Reduction of sown areas by half comparing to 1990, monocrop increase, resulted in a deterioration of the phytosanitary and quarantine situation in the country..

Over 50 types of polyphagous and over 100 types of special pests, more than 70 types of diseases and approximately 120 types of weeds are hazardous and harmful for the republic crops. Phytosanitary situation on hazardous pests' distribution is assessed as complicated one threatening to lose up to 20-30% of crop.

There are 12 quarantine sites in Kazakhstan. Quantities of imported quarantine produce are increased; annually quarantine material is imported from more than 100 countries which pose a threat of quarantine objects penetrating. Quarantine situation in many countries importing the produce to Kazakhstan is getting strained. Therefore the intensive quarantine situation is being formed as well as quarantine centres are being expanded.

Table 2: Information on quantities and areas of quarantine sites spread on the territory of the Republic of Kazakhstan (as per results of study carried out in 2001)

Quarantine weeds	Area, thousand ha	Quarantine pests	Area, thousand ha
Vermigrade smartweed	1749.2	Oriental moth	0.5
Ragweed	2.9	San Jose scale	1.8
Perennial richweed	3.0	Colorado beetle	110.4
Thorny Nightshade	0.14	Capridae beetle	12 centres
Convolvulus	170.1	Comstoke scale	0.6
		Phylloxera	2.3
		Four-spotted caryopsis	Centres in trade areas

The main reasons of phytosanitary state worsening are:

- Increase of wasteland and uncultivated arable lands;
- Inobservance of technology on crops cultivation;
- Failure to perform all protective measures;
- Limited financial opportunities of agricultural producers

Strengthening of public support of agricultural production which has been taking place during the last 2-3 years has to improve the current situation inside the country and create the reliable barriers for penetrating quarantined pests and diseases. Public subsidies for procurement of pesticides and services to apply them has been increased, and covers now 40% of the procurement cost for domestically produced pesticides. Howver this subsidy is

not received by all farmers, and those cultivating in areas not suitable for cereal production (yields below 1 ton/ha) are not eligible.

In 2003 3,497.3 M tenge have been allocated from the Republican budget for plants quarantine and protection. 70% or 2,446.7 M tenge have been forwarded for the pesticides procurement and 742.6 M (21%) for the activities on storing, transporting and chemical treating.

Moreover there are problems of institutional nature which obstacle to ensure phytosanitary control and prevention of pesticides impact over the human health, contamination/pollution of agricultural produce, environment when phytosanitary activities are carried out:

1. The existing system of the state procurement of agricultural chemicals is mainly based on comparison of the providers' financial proposals. And the drugs having the lowest prices to treat one ha of land are preferred. Not always effective and environmentally less hazardous pesticides are procured as a result.
2. There are only two landfills on the territory of Kazakhstan (Kostanay and Pavlodar) to dispose worthless pesticides and their package.
3. Negative result of the public subsidies directed to the pesticides prices reduction is the low level of activities and farms responsibility. Some farmers completely rely on governmental support with respect to this issue.
4. Requirements to the agrochemicals providers do not open a subject regarding the package return which leads to worsening of the issue on toxic wastes formation.
5. Inadequate provision of the state inspectors on the plants quarantine with methodological, information literature, techniques on quarantine sites, appropriate international norms and standards in the field of the plants quarantine.
6. Only 3,6% out of the republican budget is annually forwarded to carry out the phytosanitary assessment, substantiation of protective measures performance and search for the most effective measures and methods for pests management (including alternatives as IPM). In Kazakhstan there is a lack of governmental support with regard to development and implementation of alternative methods for pests management .

Table 1: Information on especially hazardous pests and diseases of crops and their control during 1998-2002

Name of pests and diseases	Actually cultivated areas which are subject to treatment, thousand ha								
	1998		1999		2000		2001		**Forecast** 2002
	Subject to treatment (ST)	Actually treated (AT)	ST	AT	ST	AT	ST	AT	
Locust	2197.9	1567.0	4355.6	2363.2	8100	8100	4116	4116	1844
Grain noctuid	56.9	29.4	43.4	19.9	48.7	8.65	117.3	96.7	309.2
Sunn pest	3.8	0.76	1.0	0.4	22.2	-	105.3	85.2	65.9
Hessian fly	25.0	-	51.6	-	70.0	-	190.9	34.5	165.3
Grain beetle	3.6	-	15.0	-	2.4	2.4	72.0	56.2	40.0
Cotton noctuid	51.6	45.1	90.3	109.3	62.7	34.7	26.2	8.4	60.0
Arachnoidal acarine	12.6	7.7	64.0	64.0	41.2	33.7	32.0	18.1	30.0
Corrosion and ceptorious	555.1	11.8	567.6	94.9	726.5	32.2	1053.4	187.3	1008.5

2.2 Agricultural and Physical Control Methods

Agricultural and physical methods used by farmers in Kazakhstan to help control insect pests include:

- Tillage practices, including deep tillage to bury straw and vegetative trash to prevent insect pest egg buildup
- Straw and trash control to prevent buildup of insect pests and eggs in crop straw and trash.
- Cutting and burning of diseased or egg/insect infected leaves in vegetable crops;
- Use of lure boxes to collect worms and caterpillars, e.g., boll worms in cotton, aphids in vegetables.
- Handpicking of eggs, caterpillars and larvae during periods of high infestation

2.3 Chemical Control Methods

Chemical methods to protect and quarantine plants are widely used in Kazakhstan. On the one hand this caused in agricultural monocrop and on the other due to vast sown areas in Kazakhstan. Chemical methods to control pests are better known and do not require any preliminary activities. However the full costs analysis of pests management and evaluation of the public agricultural programme component overall effectiveness has not been undertaken up to date. This assessment will be required when studying the opportunities for the IPM adaptation in Kazakhstan.

2.3.1 Overall Pesticides Use

During the 90's pesticides use has been significantly reduced because (i) significantly reduced cropped area, and (ii) country transition crisis and significant financial problems of the sector. Actually a share of cropland has been free from pesticeds for some years. At the beginning of the new century the sector has been recuperating, and so the use of pesticides has been increasing.

According to Customs data, imports of pesticides in 200 were as follows: 4,026 Tons of herbicides; 64 Tons of fungicides; 598 tons of insecticides, 10 tons of defoliants; 646 tons of other pesticides for a total totally 5,346 Tons. This vale increased to 7,000 Tons in 2002 and 9,000 tones in 2003. In addition to increased domestic production, this shows a stable growth trend of pesticides application level during the last years.

2.3.2 Pesticide Use by Crops

Table 3 shows types and doses of pesticides application against pests, weeds or diseases of plants for some grains according to recommendations of the Kazakhstan research institutes.

Table 3. **Type and application probability of pesticide use for some crops**

Crop	Pest/disease	Drug	Dose
Wheat	Wild oat	Avadex BV triallat	3,0-3,5 l/ha 3-4 l/ha
	Green amaranth and knotweed bindweed	2,4-D with supplement of lontrel 30% granstar or garden pruner	300 g/ha 8-10 g/ha 80-100 g/ha
	Stelth-bine weeds (pedicellate fleas,	BI -58 40% к.э.	1,5 l/ha

	Swedish and Hessian fly) and wheat thrips		
	ceptorious, mildew	alto,40% с.к alto, tilt, 25% к.э. tilt-premium, 37,5 % rex 49,7% к.с.	0,12-0,25 l/ha 0,5 l/ha 0,33 kg/ha 0,4 - 0,6 l/ha
Sunflower	Minor cereals and dicotyledonous weeds	stomp, 33% к.э. racer, 25% к.э. nitran,30% к.э.	3,0-6,0 l/ha 3,0-4,0 l/ha 3,3-8,3 l/ha
Rape	Minor cereals and dicotyledonous weeds	treflan, 24% к.э., nitran,30% к.э. dual, 96% к.э. butizan 400 к.с.,40%	2,4-6,0 l/ha 2,0-5,0 l/ha 1,6-2,6 l/ha 2,0-2,5 l/ha
Pea	Minor cereals and dicotyledonous weeds	Bazagran,48% в.р.	3,0 l/ha
Oats and barley	Stelth-bine weeds (pedicellate fleas, Swedish and Hessian fly) and wheat thrips	BI -58 new, 40% к.э. karate 050% к.э. sumi –alfa, 5% к.э.	1,0-1,5 l/ha 0,15 l/ha 0,2 - 0,25 l/ha
	Grey grain noctuid	bulldoc, 25% к.э. karate 0,50 % к.э. kinmix, 5% в.с. confidor, 20% в.к. sumi-alfa 20% к.э. decis-extra, 12,5 % к.э.	0,2 l/ha 0,15 l/ha 0,3 l/ha 0,06 l/ha 0,05-0,075 l/ha 0,04-0,05 l/ha

2.3.3 General Assessment of Current Pest Management Approach

Studies undertaken during the ACP preparation showed that the existing approaches to control pests in Kazakhstan are linked with list of problems:

- Dependence on chemical control methods, especially for large areas of mono-crop species,
- Use of WHO Class 1 and unregistered chemicals;
- Inappropriate handling and management of pesticides and other agricultural chemicals;
- Unsound disposal of chemicals and chemical packaging;
- Inadequate enforcement of laws and regulations on labeling and sales of agricultural chemicals;
- Low level of awareness amongst officials, farmers, and chemical resellers of IPM;
- Poor sense for safe use of pesticides.

3. POLICY, REGULATORY FRAMEWORK, AND INSTITUTIONAL CAPACITY

3.1 Kazakhstan Policies on Plant Protection

On November 13, 1992 in Moscow was signed the agreement about coordination in field of plants quarantine in Newly Independent States and Baltic's countries. In 1997 during the 6th Conference countries agreed to accept a unified list of pests to be quarantined, to common quarantine rules for import, export and transit of goods, and to provide information data about distribution of pests on countries territory.

Issues regarding use, storing and utilisation of pesticides are regulated by the policy and legislation in the field of environmental protection and agricultural production. The Law on Environmental Protection indicates the necessity of applying the limited permissible norms for application of agrochemicals on agriculture and forestry which should ensure the observance of norms for permissible residues of chemicals in food, soils and waters. That is one of the main environmental norms applied in Kazakhstan. The Ministry of Agriculture is responsible for the main laws and normative acts related to protection and quarantine of plants.

Relevant national policies on plant protection and quarantine include:

1. Regulation of the Government of the Republic of Kazakhstan dated 15 April 1996, No 439 «On ceasing to apply the environmentally hazardous pesticides and their disposing procedure in the Republic of Kazakhstan»
2. Law of the Republic of Kazakhstan dated 15 July 1997, No 160-1 «On Environmental Protection»
3. Law of the Republic of Kazakhstan dated 11 February 1999, No 344-1 "On Quarantine of Plants"
4. Rules to perform the registration tests/trials and state registration of pesticides (chemical weed-killers) in the Republic of Kazakhstan (dated 26 December 2002, No 432)
5. List of quarantine sites control of which is accomplished at the expense of the republican budget. Pests, plants pathogens and weeds which are absent on the territory of the Republic of Kazakhstan having a quarantine significance (10 December 2002, No 1295)
6. List of quarantine production which is subject to phytosanitary control under the plants quarantine (30 May 2002, No 166)
7. Rules on protection the territory of Kazakhstan against quarantine sites (1 August 2003, No 773)
8. Law of the Republic of Kazakhstan dated 3 July 2002, No 331-II "On Plants Protection"
9. Qualification requirements for physical and legal entities operating with application of pesticides by aerosol and fumigation methods (20 August 2003, No 833)
10. Instruction on issuing the licenses for operating with the pesticides application by aerosol and fumigation methods (26 January 2004, No 26)

Ministry of Agriculture is accomplishing the state control/monitoring over observance of legislation, fixed rules and performance of activities in the field of protection and quarantine of plants including:

- identification, localization and liquidation of quarantine sites as well as prevention of their penetration to the republic regions where they are missed;

- prevention of the pesticides impact on the human health, pollution/contamination of agricultural production, environment when the phytosanitary activities are performed;

- ensuring the favourable phytosanitary situation;

The Kazakhstan governmental system of the plants quarantine provision comprises of:

1) MoA and its territorial authorities with frontier points and posts;

2) Republican, zonal and boundary quarantine laboratories, introduction and quarantine nurseries

The Ministry of Agriculture is to arrange and carry out the state procurements of pesticides, works and services for their storing, transporting, using for localization and liquidating the centres of quarantine sites spread.

3.2 Institutional Control of Distribution and Use of pesticides

3.2.1 Pesticides Use

List of pesticides permitted to use in Kazakhstan complies with international requirements. The Regulation of the Government No 439 dated 15 April 1996 prohibits to apply “high toxic pesticides” holding of showed cumulative, carcinogenic, mutagenic, teratogenic, embrio- and gonadotoxic properties and having the ability to get accumulated in plants, soils and water environment» on the basis of information of the International List of potentially toxic chemicals of the UN Environmental Programme.

Kazakhstan has signed the Stockholm Convention and ratified the Basel Convention. Probably Kazakhstan will soon join the Rotterdam Convention and sign the Kyoto Protocol.

The pesticides could be used only after the state registration. The pesticides are accepted for the state registration for which the following has been developed:

1) application regulations;

2) norms for pesticides residues in crop production and environmental objects;

3) methods to identify the pesticides residues in crop production and environmental objects.

Positive expert conclusions of the state environmental and sanitary-epidemiological control authorities should be provided for the pesticides. Applications for the pesticides registration tests active substances of which relate to especially toxic and also are included to the list of prohibited drugs are subject for rejection.

3.2.2. Storing and Using of Pesticides

The pesticides application is regulated by qualifying requirements and since 2004 is the licensed type of activity. The qualifying requirements for physical and legal entities of the Republic of Kazakhstan operating with application of the pesticides by aerosol and fumigation methods are:

1) the availability of special machinery and equipment for the pesticides application ensuring the safety and quality of chemical treatment;

2) the availability of special storages for the pesticides complying with the sanitary and epidemiologic rules and norms, construction norms and rules, requirements of fire safety;

3) compliance with environmental requirements, sanitary and epidemiologic rules and norms, safety and labour protection;

4) individual protective facilities, fire extinguishing equipment;

5) qualified staff with corresponding education and training having experience of practical work on the pesticides application by aerosol and fumigation methods.

3.3.3 Pesticides Neutralisation

Special landfills are used to neutralise the prohibited worthless pesticides and their packages. The state environmental control authority is responsible for issuing the permit to construct the landfills and neutralise the pesticides.

Neutralisation of the pesticides procured at the expense of the state budget is the responsibility of the MoA and local state authority (local budget). Legal and physical entities the activities of which are linked with the state phytosanitary control objects are obliged to neutralise the pesticides. However in Kazakhstan there are only two landfills used for unused pesticides and their package disposal.

4. GENERAL APPROACH OF THE ACP PEST MANAGEMENT PROGRAM

4.1 Objectives

The main principle will be: Strengthen pest forecasts, apply agricultural control measures first, then choose physical and biological control measures, and finally chemical control measures. In addressing the issues listed above the ACP Pest Management Program will aim to:

- Prevent and minimize the use of highly toxic chemicals by farmers
- Promote the awareness, knowledge and adoption of alternative pest management practices
- Promote safe use and disposal of chemicals
- Improve testing pesticide residues in food products

The project will further promote the concept of IPM through:

- Introduction of chemical quality standards into the procurement policy for assessing grant applications
- Capacity building of the government extension service in IPM approaches, and
- Education of agricultural chemical distributors and resellers in IPM approaches.

4.2 Focus area

The focus areas for the ACP Pest Management Program will be:

On Farm. The project will help farmers to develop pest management approaches relevant to their farms. IPM methods will be incorporated into the training of project-supported extension agents who will be responsible for training of farmers. Field demonstrations using established IPM approaches will be conducted in all project areas by extension agents.

Pesticide procurement. Procurement of chemicals will be assessed, monitored and approved by PRP as required through the grant proposals assessment procedures to ensure that no WHO Class I chemicals and prohibited (and not registered) in Kazakhstan are procured or used by project beneficiaries.

Chemical Resellers and Distributors. Chemical resellers will be provided with training in chemical use and handling by both extension agents and approved distributors. Requires monitoring to ensure that all pesticides sold meet labeling laws requirements are registered products (Class II and below), and that IPM approaches are promoted to farmers

Policy. Review and strengthening of policies and the regulatory environment to ensure the provision of quality agricultural inputs at reasonable prices to project beneficiaries is a major focus of the project. The project will aim to increase influence on the policy-making mechanism on the quality and use of agricultural chemicals, and the expansion of the sustainable agricultural production strategy.

5. PESTICIDE MANAGEMENT UNDER ACP

IPM is a knowledge intensive and interactive methodology. Its success will depend on a good communication and capacity building arrangements. The need to accurately identify pests and pest problems and understand ecosystem interactions could enable farmers with less hazardous pest management techniques, including biological control measures and in making pragmatic pest control decisions. ACP should develop institutional and human capacity, promote sustainable agricultural technology transfer and adoption, and facilitate experiential learning for making informed decisions in integrating scientific and traditional knowledge to solve location-specific problems.

The ACP Pest Management Program will support pest management research and extension subprojects which could promote use of a combination of crop-specific agricultural, physical, biological, and chemical pest and disease control methods based on IPM

approach. Safe and sound pesticides handling and application techniques will be promoted to prevent negative effect on environment and health.
Improved communication between research institutions, farmers and extension agents will lead to targeted research and adoption of promising options generated by researchers. The farmers will learn biological and ecological processes underpinning IPM options, and use the newly acquired knowledge to choose compatible methods to reduce production and post-harvest losses through frequent field visits meetings, demonstrations, adaptive research trials.
CC, after making an assessment of capacity and training for IPM, seek proposals from national research institutions/NGO sector in Kazakhstan for the development of IPM protocols for project watersheds and training modules for participating communities, local administration and extension. In the first year of the project, TOTs will be organized for extension agents. In subsequent years, it is proposed that trained agents will train farmers. Agricultural and Environmental specialists of CC will coordinate the activities at the regional and local project level. The national institution will be expected to bring in policy makers, research and extension leadership, development agencies, NGOs, rural and national press during training and capacity building activities to spread the message.
CC would be the main coordination unit for this PMP and would develop annual work plan in consultation with the AB and project beneficiaries in line with their respective local action plans to indicate institutions and networks that will be required to provide research and development support. Selected national institution will develop and deliver IPM packages and training program and provide technical assistance to extension agents. Extension agents will organize farmer groups and identify their training needs and arrange monitoring in consultation with CC.

5.1 Agricultural and Physical Control Methods

Agricultural and physical control methods include:

- Tillage practices, including deep tillage to bury straw and vegetative trash to prevent insect pest egg buildup; soil tillage in rice paddy immediately after harvesting to prevent buildup of rice borer;
- Regular rotation of dryland crops to avoid buildup of soil-borne insect pests and diseases, e.g., vegetables followed by beans followed by vegetables.
- Straw and trash control to prevent buildup of insect pests and eggs in crop straw and trash.
- Cutting and burning of diseased or egg/insect infected leaves in vegetable crops; and branches in cotton;
- Deep flooding practices in rice paddy to assist control of soil-borne eggs and pupas of rice pests and other insects.
- Use of lure boxes and light traps for relevant crops.
- Light lures making use of insect phototaxis to attract pests in vegetables.
- Hand-picking of eggs, caterpillars and larvae during periods of high infestation

5.2 **Biological Control Methods**

Biological control methods to be promoted by ACP include:

- Extension of crop varieties resistant to insect pests
- Support to diversification and reduction of mono-cropping
- Awareness of the financial and environmental impact of crop rotation
- Dissemination of technologies such as intercropping of target species to attract insect pests away from the main cash crop
- Testing duck raising in rice fields. This can control pests and wild grass in the rice field without applying pesticides or herbicides.

- Extension of biological pesticides. The biological pesticides usually are applied 2-3 days before application of chemical pesticides in order to get ideal results.
- Nurturing and protecting predators for insects, making good use of predators such as frogs and spiders to control pests.

If appropriate predators for major insect pests can be identified from the research conducted by research institutions and/or PPQS, then the project would assist with trial applications of these.

5.3 Chemical Control Methods

Chemical control methods will apply the following principles:

1. Use of non-pesticide chemicals where these are appropriate and cost-effective in control.
2. Dissemination of knowledge about "biological pesticides" such as the BT, abamectin to control rice stemborers and vegetable insect pests, and pesticides of plant origin (e.g., nicotine to control vegetable pests) where these are cost effective.
3. Application of highly effective, low toxicity, and low residue pesticides, such as imidacloprid.
4. Extend control techniques that have low toxicity to human beings, domestic animals, and fauna; low residues in agricultural products; and little environmental pollution. Such techniques include:
    - Use of low toxicity and low residue pesticides.
    - Spraying of pesticides before transplanting.
    - Applying timely, effective low concentration pesticides to control various insect pest species
    - When the density of insect pests is above a critical threshold to ensure optimal effectiveness of each pesticide application.
    - Maintaining safe intervals between pesticide applications.
5. Use of safe spray equipment (e.g.. backpack sprayers. optimal nozzle sizes) to increase the efficiency of pesticide use and control effectiveness.
6. Extension and training in safe methods of pesticide application (e.g., correct clothing. spraying in still conditions, application of soil-based pesticides as relevant).
7. Safe storage of chemicals (e.g. away from children and food, etc).
8. Proper disposal of chemical wastes and used chemical containers (e.g., by deep burial).

5.4 Environmental risks

The main environmental risks from pesticide were identified:

- Deterioration in water quality from pesticide residues and potential for increases in pesticides in aquatic biota (e.g., fish).
- Contamination of water supplies resulting from spraying or chemical spills near drinking water sources.
- Possible impacts on non-target species (especially bees, birds, domestic animals, and natural enemies of pests) from high toxicity pesticides.
- Development of pest resistance from continued overuse of some pesticides (e.g. in cotton bollworms).
- Deterioration in soil quality from pesticide residues.

Measures to mitigate the above risks include:

- Awareness training of village leaders, farmers and chemical resellers in the likely environmental impacts of specific chemicals and recommended spraying methods and equipment;
- Spray monitoring to ensure that spraying of toxic chemicals is not conducted near water sources, and working with village leaders to enforce this;

- Procurement of approved safe spray equipment under the project;
- Making agreement with pesticide manufacturer or supplier about return of outdated pesticides, as well as metal and plastic containers;
- Use of pesticides with low residual half-lives;
- Procurement of sound (preferably mobile) equipment for safe incineration of combustible containers or unused pesticides;
- Minimizing use of chemical pesticides near areas with rare or endangered fauna.
- Use of a range of pest control techniques (agricultural/physical, biological, chemical) to ensure that pest resistance to chemical pesticides does not build up.

5.5 Occupational/Health Risks

The main occupational/health risks from pesticide use include:

- Sickness resulting from inhalation of pesticide fumes when handling concentrated chemicals and/or pesticide vapor during spraying if protective masks are not used.
- Skin damage from sprays or chemical spillage during handling if protective clothing is not worn.
- Contamination of drinking water if spraying is conducted close to drinking water sources or if there are chemical spills near drinking water sources.

Measures to mitigate the above risks include:

- Awareness training and demonstrations for village leaders, farmers (men, women) and chemical resellers in:
    - Likely occupational/health impacts of specific chemicals
    - Recommended handling and spraying methods
    - Approved equipment and its use (e.g., sprayers, nozzle sizes, etc)
    - Wearing safe clothing (long sleeve shirt, mask, hat, gloves, long trousers, footwear)
    - Spraying in non-windy conditions
    - Safe storage of chemicals in locked cupboards that children cannot easily access
    - Safe disposal of chemical packaging and wastes by deep burial or burning (when appropriate).
- Monitoring of implementation of the above practices followed by refresher training if not correctly implemented.
- Implementation of the project management measures listed in Section 6.5.

5.6 Selection of Pesticides Authorized for Procurement

Pesticides will be purchased directly by project beneficiaries with grants from the Applied Agricultural Research and Extension Component. Any pesticides to be purchased by project beneficiaries will be assessed by the Peer Reviewing Panel. The PRP Environmental specialist will check that the pesticides are on the recommended list of chemicals used in Kazakhstan (in Annexes 3-5).

Agricultural, physical (e.g., lures), biological control practices or bio-pesticides (e.g. Bt, Abamectin) that have the same cost-effectiveness as synthetic pesticides, would be used in preference to pesticides. Unregistered chemicals or any that have WHO Class I active ingredients will not be financed.

6. STRENGTHENING PEST MANAGEMENT CAPACITY

6.1 Policy Issues

Pest management policy measures to be promoted by the Project include:

- Facilitating enforcement of laws against banned pesticides by testing pesticide residues in food products
- Disseminating knowledge about risks of banned and unregistered pesticides
- Banning the use of WHO Class I pesticides, and requiring their replacement with less toxic alternatives for project activities
- Adherence to the national standards on agrochemical use, including pesticides
- Promotion and support IPM approaches through discussions and by providing examples of successful IPM programs and their benefits (particularly long-term benefits)
- Supporting IPM measures to farmers and research and extension programs
- Conducting evaluation of effectiveness and efficiency of national support program for procurement of agrochemicals

6.2 Infrastructure, Capacity, Institutional Arrangements and Collaboration

Strengthening of the basic plant protection infrastructure and institutional control on distribution and use of pesticides under the Project will be undertaken through:

- Training of plant protection and quarantine specialists, extension agents, and farmers (Section 7.3)
- Establishment of a monitoring program (Section S) to assess pest management and application of IPM techniques in project implementation
- Making an agreement with pesticides manufacturers and resellers about return of the metal and plastic containers for project activities
- Working with research institutions, such as the Academy of Agricultural Sciences, in orienting their research and extension programs towards IPM
- Establishment of collaborative links with national universities to strengthen cooperation, local capacity and knowledge in the country of IPM techniques for project-specific crops
- Disseminating knowledge on benefits of crop rotation and testing alternative cropping patterns
- Promoting support and collaboration in promoting safe pest management measures and IPM approaches where relevant
- Promoting the project approach of reduced use of toxic pesticides and encouraging IPM approaches to the private sector particularly the agro-chemicals sector.

6.3 Overview of Training and Human Resource Development

The project Research and Extension Subcomponent provides for training of technicians, farmers, and training of trainers. It also provides for preparation of extension materials, including audio-visual; agricultural extension field demonstration sites; provision of books, journals, and data bases on agricultural technology.

Under the Research and Extension Subcomponent, the following pest management capacity building activities are proposed:

1) Conduct of farmer-need driven research towards IPM implementation under the Applied Research activity.

2) Visits by county crop protection specialists and technicians to qualified agencies, such as the PPQS and Academy of Agricultural Sciences, to receive training in new pest control methods, including IPM methods for specific crops/pests.

3) Regular training courses for extension staff by plant protection and quarantine specialists on new pest control methods, including IPM for specific crops/pests.

4) Training of extension agents to ensure effective enforcement of pesticide regulations.

5) Preparation and distribution of IPM training materials and guidelines prepared in simple language, and well supported by appropriate audio-visual aids.

6.4 Training of Farmers

The aim of farmer training is to strengthen farmers' ability to safely and cost-effectively control insect pests. This includes training farmers how to identify insect pests, make appropriate control decisions, and take proper measures to control them.
Each farmer would receive training course. Training content would include:

- Characteristics of insect pests
- Damage caused by different insect pests
- Natural enemies of each major insect pest
- Field sampling approaches
- Control measures, including IPM approaches involving agricultural, physical, biological, and chemical control methods.
- Safety in storage, handling, and disposal of chemical wastes and containers
- Chemical application methods and protective clothing requirements.

7. MONITORING AND EVALUATION UNDER ACP

Monitoring of development and spread of pests, plants diseases and weeds is practically missed in Kazakhstan due to lack of required funding and service for phytosanitary diagnostics and forecast. The structure performing the systematic monitoring of development and spread of pests, plants diseases and weeds. To address the issue within the agrofood programme for 2003-2005 the Ministry of Agriculture is planning to establish the republican Methodological Centre for Phytosanitary Diagnostics and Forecast. This will allow addressing the issue of controlling the spread and localisation of pests and plants diseases.

Nevertheless it is unlikely that the monitoring of consequences of the pesticides application. Since at the present time the more priority issue for the MoA is the plants protection the nearest future it is not worth to expect the increase of attention to the environmental issues. The necessity of monitoring the effectiveness of practicing methods of managing the pests and plants diseases and assessment of the pesticides impact over the environment is the essential elements of the ACP.

Monitoring of impact of the existing methods of plants protection upon the environment and their comparison with alternative methods could have a number of benefits both for public agricultural management and farmers. For instance refusal of the chemical methods application and/or reduction of quantities might significantly decrease costs for chemical treatment of crops and the pesticides procurement. The necessity to involve qualified specialists is come off when applying the alternative (non-chemical) methods; the farmers could treat the crops by their own. As a result of the pesticides residues in the production the quality and safety will be increased.

7.1 Activities Requiring Local Monitoring during Implementation

The following activities require local monitoring during project implementation:

- Extent of IPM adoption by farmers
- Pesticide use pattern
- Crop production
- Changes to the agro-ecosystem
- Other indicators.

A detailed list of possible monitoring indicators is provided in Annex 6.
The above monitoring should be done by Rayon Plant Protection and Quarantine Stations (RPPQS) staff based on a sample of project households in the project area in each county. Early World Bank and Coordination Centre supervision missions should assist the RPPQS

with establishment of an appropriate monitoring system, sampling procedure and provide training in implementation and analysis of the monitoring system.
(Annex 4).

7.2 Activities Requiring Monitoring during Supervision

The following activities require external monitoring during World Bank supervision missions:

- Pesticide registration
- Implementation of the local monitoring program and assistance in analyzing results.

A detailed list of possible monitoring indicators is provided in Annex 6. Supervision mission inputs should be conducted 2 times per year, preferably during periods of high pest control activity to observe field implementation of pest management practices. This supervision work should be undertaken by an Agriculture Specialist with experience in agricultural pest management and environmental monitoring specialist of CC. Supervision costs would be financed from the World Bank funds.

Annex 1:
List of quarantine objects the management of which is accomplished at the expense of the republican budget

A. Pests (39)

Anoplophora glabripennis Motschulsky

Callosobruchus analis L.

Spodoptera litura Fabr.

Hyphantria cunea Drury.

Liriomyza trifolii (Burg)

Premnotrypes spp.

Unaspis citri Comst.

Pantomorus leucoloma Boh.

Tetradacus citri Chen.

Pseudococcus citriculus Green.

Unaspis yanonensis Kuw.

Numonia pyrivorella Mats.

Spodoptera littoralis Boisd.

Diabrotica virgifera virgifera le Conte

Frankliniella occidentalis Perg.

Callosobruchus phaseoli Gyll.

Ceroplastes rusci L.

Epitrix tuberis Gentner

Epitrix cucumeris Harris

Phthorimaea operculella Zell.

Callosobruchus chinensis L.

Lymantria dispar L.(asian race)

Thrips palmi Karny.

Carposina niponensis Wlsghm.

Conotrachelus nenuphar Hb.

Ceratitis capitata Wied

Liriomisa sativae Blanch.

Pseudaulacaspis pentagona (Targ.)

Pectinophora gossypiella Saund.

Bemisia tabaci Gew.

Dialeurodes citri Rillcy

Phyllocnistis citrella Stainton

Pseudococcus gahani Green.

Liriovyza huidobrensis Blanch.

Rhagoletis pomonella Walsh.

Agrilus mali (Mats).

Popillia japonica (Newm).

Geroplastes japonicus Green.

Leucaspis japonica Ckll.

Б. Plants diseases

Fungoid (16)

Glomerella gossypii (South) Edgerton

Didymella chrysanthemi (Tassi) Gar. et Gull.

Puccinia horiana P.Henn.

Angiosorus solani (Thirum et O Brier)

Diplodia macrospora (Earle)

Diplodia frumenti (Ellet Ev)

Tilletia (Neovossia) indica Mitra

Cochliobolus carbonum R.Nelson

Synchytrium endobioticum (Schild.) Percival

Atropellis pinicola Zeller & Goodding

Atropellis piniphillf (Weir.) Lohman & Cash

Phymatotrichum omnivorum (Schear.) Guggar

Ceratocystis fagacearum (Bretz.) Hunt.

Phytophthora fragariae Hickman.

Phomopsis helianthi (Munt-Wetetal)

Cochliobolus heterostrophus Drechsler rasa T. (Helminthosporium maydis Nisicado et Miyake)

Bacterial (9)

Xanthomonas ampelina (Panagopoulus)

Erwinia stewartii (Smith.)

Clavibacter michiganehis subsp

sepedonicum (Spieckermann and Kotthoff) Davis et al.

Xanthomonas oryzae pv. oryzae (Ishiyama) Swings et al

Xanthomonas oryzae pv .oryzicola (Fang et al) Swings et al

Ralstonia solanacearum (Smith.) Yabuuchi et al

Erwinia amylovora (Curill.)

Clavibacter tritici (Carls et Vidav) Davis

Phytoplasmic and virology (9)

Potato Andeam mottle comovirus

Potatj Andean latent timovirus

Potato T trichovirus

Grapevine flavescence doree phytoplasma

Peach latent mosaic viroid

Potato yellowing alfamovirus

Cherry rasp leaf virus

Peach rosette mosaic nepovirus

Plum poxpotyvirus

Hook-worm (4)

Globodera pallida (Stone) Mulvey et Stone

Globodera rostochiensis (Woll.) M. et. St.

Meloidogine chitwoodi Golden et al

Bursaphelenchus xylophilus (Steiner et Buhrer)

B. Weeds (12)

Ambrosia trifida L.

Iva axillaris Pursh.

Ipomoea hederacea L.

Ipomoea lacunosa L.

Solanum carolinense L.

Solanum elaeagnifolium Cav.

Solanum triflorum Nutt.

Helianthus californicus DC.

Helianthus ciliaris DC.

Striga sp.sp

Cenchrus payciflorus Benth.

Bidens pilosa L.

Quarantine Objects Limitedly Spread on the Territory of Kazakhstan

A. Pests (7)

Grapholitha molesta (Busck.)

Quadraspidiotus perniciosus (Comst.)

Trogoderma granarium (Ev.)

Leptinotarsa decemlineata Say.

Viteus vitifolli (Fitsch).

Pseudococcus comstocki Kuw.

Callosobruchus maculatus F .

Б. Weeds (5)

Ambrosia artemisiifolia (L.)

Ambrosia psilostachya (D.C.)

Acroptilon repens (D.C.)

Solanum rostratum Dun.

Cuscuta sp.sp

List of Especially Hazardous Organisms

1. Pests:

1) locusts (Asian, Morocco and Calliptamus);
2) corn-bug;
3) grain noctuid;
4) Hessen fly;
5) grain beetle;
6) cotton noctuid;
7) arachnoidal acarine;
8) gophers;
9) mouse-type rodents.

2. Plant diseases – erosion and ceptorious of grains

Annex 2.

LIST OF CHEMICALS OF LIMITED SCOPE ON THE TERRITORY OF THE REPUBLIC OF KAZAKHSTAN

Acetal, 55% к.э.	Phastac 10% к.э.	Nimrode (bupirimat)
Bazagran M 37,5	Phenrio 20% к.э.	pyrimor (pyrimicab)
Benlat 50% с.п. and its analogues on the basis of technical benomil	Phenvalerat 20% к.э.	Petroleum oil
Vophatox 18% с.п.	Shakkimol 70% к.э.	Reglon (diquat)
Heterofos 7,5% г.	Shatochlorine 40% к.э.	Sevin (carbaryl)
Derozal 50% с.п. and 50% к.с. and its analogues on the basis of carbendazim	Isatrene (bioresmetrine, biobenziphouraline, chrisronforte)	Bactoroncencide ashminokostniy
Decis 2,5%	Aphugan (pyrazofos, curamil)	Ramrode (acilin, niticide, propachlorine)
2,4 D-amine salt	Benomile (benlat, phoundazol, uzghen), BMK (carbendazim, derozal, olghyn, phounaben)	Polychlorocamen (PHK, camphechlorine, toxaphene)
Lentagran-combi, 35%к.э.	Biocin (boletin)	Sumicidin (phenvalerat, phenrio, pedrin, belmark)
Lentagran 64%, к.э.	Topsyn-M (tiofanatmethyl)	Rideon (diphenamyl, enid, zarur)
Laddox 40% к.э.	GHBD (perchlorodivinyl, hexachlorobutadiene)	Tiodan (endosulfan, endosel, hexasulfan, cyclodan, timul)
Metation 50% к.э.	Heterophos	TMTD (thiram, thiuram)
2M-4X Natrium salt	GHCG, 12% dust	Phthalafox (phosmet, imidan)
Nitran 30% к.э.	Decis (deltametrin, supermetrin)	Tork (vendex, phenbatationoxide)
Policarbice and chemicals on its basis	DNOK/dinitro-o-cresol (dinotro-o-cresol, dinisal, dytrol)	Phosphamide (BI-58, rogor, dimetoat)
Chemical 242	Dursban (chlorineperifis)	7% Trichlorfon
Ricid P 50% к.э.	D-trapex	Trichlorfon (Trichlorfon, dypterex)
Rogor 40% к.э.	Campozan (astrel)	Tur (chlormequat, chlorholynchloride, cekodel)
Rubigan 12% к.э.	Mytac (amitraz, tactic)	Cineb (aspor, ditan)
Thiram and chemicals on its basis	Metaphos (vophatox, mathylparation, dulf)	

Annex 3.

List of chemical and biological measures for managing the pests, plant diseases and weeds, defoliants and plants growth regulators permitted for application in agriculture and forestry of the Republic of Kazakhstan for 1997-2001

2,4 D
2,4 D (DMA-6)
2M-4X 750
AVADEX BV
AGATE 24 K
AGROCYTE
AKPYNOL
ACROBATE MC
AKTELLYK
ALYET
ALTO 400 SC
ALFAGUARD
ALFA-COMBY
APPOLO
ARRIVO
ARSENAL
ATABRON
ATYLCORD
BAZAGRAN
BAZAGRAN-M
BAZAMIDE
BAZUDIN
BAILETON
BAITAN UNIVERSAL
BUMPER
BANVEL
BANKOL
BASTA
BENLAT
BATANAL AM
BATANAL-PROGRESS AM
BETANAL C
BI-58
BITOXIBACILLYN
BORDEAUX MIXTURE
BRESTANIDE
BROMINE METHYL
BRONATAC
BULDOC
BUREFEN FD-11
BUTIZAN 400 KS
BUCTRIL D
VENZAR
VERTIMEK
VIDAT
VINCYTE
VITAVAX 200
VMTAVAX 200 FF
GALAXM TOP
GAUCHO
HEXAGUARD-50
GLIN
GLISOL
GOLTIX
GRANSTAR
DIVIDEND
DICOPUR
DIMILYN OF-6
DIPEL
DIPHEZAN
DROP-ULTRA
DUAL
DURSBAN
GREEN VITRIOL
ZELLEK SUPER
ZENKOR
ZOLON
ILLOXAN
IMPACT
INSEGAR
IOTRYL
K-OIOL
CAMPOZAN-M EXTRA
KARATE
QUICKFOS
REFINED CELTAN
KEMIKAR T
KEENMIX
CLERAT
COWBOY
COLFUGO-SUPER
CROSS
CUPROXAT
LEBICIDE
LENTAGRAN
LENTAGRAN-COMBY
LEPIDOCITE
LONDAX
LONTREL 300
LONTREME
LUVARAM
MAGTOXIN
MALIX
BLUE VITRIOL
MICAL
MITAC
NABU
NEORON
NISSORAN
NITRAN
NOVODOR
NURELL D
OKTIGHEN
OMITE
ORDRAM 6E
ORTUS
PANTHER
PEGAS
PIVOT
PIX
RACER
REX
RIDOMYL MC
ROVICURT
ROVRAL
ROVRAL FLO
RUBIGAN 12
SUMMITE
SAPROL
SATIS
SATURN
SELECT (CENTURION)
SIRIUS
SCORE
SPARTAC
STARANE 200
STOMP
SUMI-ALFA
SUMI-8
SUMITION
TALSTAR
TARGA SUPER
TATTU
TECTO 450
TYLT
TYLT-PREMIUM
TYTUS
TMTD
TOPAZ
TOPIC
TOPOGUARD
TOPSIN-M
TORDON 22K
TOTRYL
TREBON
TREZOR
TREPHLAN 24
THRIALLAT
THRYFLOUREX
TROPHY
TROPHY SUPER
URAGAN
USTAD
PHASTAC
FACET KS
PHEMORAM
PHLUTAR
PHOLYKOR VT
PHOSPINOL
PHOSTOXIN
FRONTIER
PHOUNDAZOL
FURORE SUPER
FURY
FUSILAD SUPER

GRODIL	PIX 600	HARVEID 25F
HUMATE NATRIUM	PIRAMIN-TURBO	HARMONY
DACONYL	PIRAMIN FL	HARNESS
DACONYL 500	POAST	HARNESS-PLUS
DANITOL	PRELUD SP	COPPER OXYCHLORIDE
DEZORMON	PREP-720	CYMBUSH
DEMITAL	PUMA-SUPER	CYRAX
DEROZAL	PUMA-SUPER COMBY	CYTCOR
DECIS	RAXIL	CHYSTALAN
DIAZINON	RAPKOL TZ	SHERPA
DIASOL	ROUNDAL	STORM
DIALEN	REGIO	EPTAM 6E
DIALEN-SUPER	REGLON SUPER	ERADICAN

Annex 4.

LIST OF PESTICIDES AND INDUSTRIAL STABLE ORGANIC POLLUTANTS PROHIBITED TO BE APPLIED ON THE TERRITORY OF KAZAKHSTAN

NAME	MANUFACTURER	NAME	MANUFACTURER
2,4-DM 60% и 45% к.э.	NITIG, Russia	Pholition 50% к.э.	Beyer, Germany
2,4- DM % п.р.	NITIG, Russia	Phounaben 20% к.э.	Poland
2M-4HM 80%р.п. and 45% к.э.	NITIG, Russia	Fademorf 20% к.э.	Czechia and Slovakia
2M-4HP 50% в.р.	NITIG, Russia	Fluran 24% к.э.	Adica, Italy
Applaud 25% с.п.	Nihon Nohiaku, Japan	Forsat 50% с.п.	NITIG, Russia
Azotiram 65% с.п.	Russia	Citrasone 20% к.э.	Nippon Soda, Japan
Azocenole 15% с.п.	Russia	Chistart 70% в.р.	NITIG, Russia
Arylon 98-100% р.н.	Russia	Ecamet 50% к.э.	Sandoz, Switzerland
Alanap 24% п.р.	Uniroyal, USA	Edyl 45% в.р.	Russia
Acetazyn 50% м. с.	NITIG, Russia	Etoxilyn 45% к.э.	Uzbekistan
BMK 50% с.п.	Russia	Etaphos 50% к.э. and 30% с.п.	Russia
Bifidan 25% к.э.	Beyer, Germany	Avenge (diphensoquat)	
Baversan 20% к.э.	Russia	Aldryn (octalyn)	
Butylour 80% с.п.	NITIG, Russia	Anabasine-sulphate (neonicotine)	
Botran 75% с.п.	Schering, Germany	Calcium Arsenate	
Bazudin 50% р. for UMO	SIBA, Switzerland	Sodium Arsenate	
BUHT-424 15% к.э.	Czechia and Slovakia	Aphos (FS-UMO)	
Vydzhyl 12,5% в.с.	Zeneka, England	Butiphos (merfos, folex, tributyl phosphate)	
Velpar	Dupont, USA	Halectron (chlordimeform, phyndal)	
Heterofos 7,5%	Russia	Heptachlor (velsikol), its blend with hexachlorobenzene and TMTD	
DEPRA 21,8% к.э. and 50% с.п.	NITIG, Russia	Mercurhexane	
Diazinon 25 and 80% for UMO	Russia, Nihon Nohiaku	Mercurbenzene	
Dibromine 50% р. for UMO	Russia	Technical GHCG	
Dimiline 25% с.п.	Dufare, Holland	DDB	
Dazomet 85-90% г.	Romania	DDT and chemicals on its basis	
Digermine 25% к.э.	Montedisson, USA	Desporal (elevat)	
Diamet-D, 44 6% в.р.	Ukraine	Dieldrin	
Diaprene 40% в.р.	Ukraine	Diuron (dichlorphininidim, carmex) and chemicals on its basis (cerbmix, cerb-ultra)	
Dicotex-40 40% в.р.	Czechia and Slovakia	Dichlorethane	
Innam-40 40% в.р.	Russia	Intration (thiolutin, ecavit, M-81 preparation)	
KMAH 50% с.п.	Russia	IFK (ahermene, carbagran)	
Carbation 40% в.р.	Russia	Kallixene (tridemorf)	
Croneton 50% к.э.	Beyer, Germany	Stillage bottoms of dichlorethane, vinyl chloride, methylene chloride	
Creptan, 50% с.п.	Russia	Linuron (afalon, asalon, harnitan, meturon)	
Coprang 15M 70% с.п.	Russia	Maneb (malsat, neospor)	
Coprang 70% с.п.	Russia	Methylmercaptophos	
Cuscid 97% в.к	Uzbekistan	Monolynuron (aresene, methoximuron)	
Larvin 37,5% FLO	Rhone-Poulenc, France	Nemagon (DBHP, nebromine, nemaphum, fumagon)	
Lasso-Atrazine 48% т.с.	Monsanto, USA	Nicotine-sulphate	
Miasin 15% м.м.с.	NITIG, Russia	Nitasene	
Miodan 12% к.э.	Biochemistry Scientific Research Institute of the	Nitrochlor (nitrophen, TOK) and chemicals on its basis	

	Scientific Academy, Byelorussia	
Milgo 28% кол.р.	Zeneka, England	Octamethyl (shradan, pestox)
Nisonit 25% к.э.	Russia	Paris green
Nicomisolon 90-96% н.	Uzbekistan	Pentachlornitrobenzene (PHNB, quaintozole, quinticen)
Orlo 30% т.н.	Russia	Pentachlorophenol (pentachlor, pentachlorol)
Oxazon 48% в.р.	Oxon, Italy	Polychlorpinen (PHP, stroban, chlorpenal)
Oxonot 72% к.э.	Oxon, Italy	Rubigan (phenarimol)
Olitreph 24% к.э.	Hungary	2,4,5-T (dinoxol, THB)
Ovadophous	Poland	Temik (aldikarb)
Prodate 24% к.э.	Agrolinz, Austria	Thiophos (paration, paration-ethyl)
Prometrene 50% с.п.	APC, Oxon, Italy	Trucydor, kylval (vamidotion, validoat)
Protrazin 50% с.п.	NITIG, Russia	Cyanplav (black cyanide)
Primextra 50% к.с.	SIBA, Switzerland	Cyram (metasene, Zimate, Zerlat, opalat)
Pirimor 50% с.п.	Zeneka, England	Mercaptophos (demeton systox)
Plantwax 20% к.э.	Plantwax Uniroyal, USA	Phenkapton (phenotal)
Panoram 75% п.	Rhone-Poulenc, France	Morocide
Previcour 70% в.р.	Schverin, Germany	Cartex M
Pirithon 50% к.э.	Czechia and Slovakia	Cerb mix B
Ritacine 50% к.э.	Russia	Cerb ultra
Rovikyl 10% к.э.	Hungary	Trichloromethafos-3
Romucide 20% к.э.	Russia	Phentiuram
Rotapreme-5000 50% к.с.	SIBA, Switzerland	Hardona
Rysan 80% к.э.	NITIG, Russia	Tedion
Rosalene 50% с.п.	Uzbekistan	S-9491
Synbar 80% с.п.	Dupont, USA	Nesion
Sitrene 50% с.п.	NITIG, Russia	Small-grained gamma-isomer
Sulfacarbation К 90-95% п.	Russia	Large-grained gamma-isomer GHCG
Selectene 50% с.п.	Czechia and Slovakia	Hexachloran, blend with phosphorite powder
Sulfidophous 50% к.э.	Russia	Acrex (isophen)
Torc 50% с.п.	Shell, England	DDVF-highly toxic
Trebon 10% ФЛО	Mitsui Toatsu, Japan	2.4 D with dioxin liberation
Tozonit 25% с.п.	Russia	Unysh
Triffon 25% к.э.	Russia	Fentyuram
Trifmene 30 с.п.	Nippon Soda Japan	Methylene chloride
Tigam 30% т.п.	Russia	Trichloroethylene
Tiolent 72% к.э.	Agrolinz, Austria	Vinyl chloride
Threeflouralyn 24% к.э.	Philip Brothers, USA	Mugan
		Celtan
Phenval 20% к.э.	Searle, India	EF-2

Annex 5. Pesticide Classification List - WHO

Table 1. Extremely hazardous (Class la) technical grade active ingredients of pesticides (common name) - not permissible in the project

Aldicarb	Difethialone	Parathion-methyl
Brodifacoum	Diphacinone	Phenylmercury acetate
Bromadiolone	Disulfoton	Phorate
Bromethalin	Ethoprophos	Phosphamidon
Calcium cyanide	Flocoumafen	Sodium fluoroacetate
Captafol	Fonofos	Sulfotep
Chlorethoxyfos	Hexachlorobenzene	Tebupirimfos
Chlormephos	Mercuric chloride	Terbufos
Chlorophacinone	Mevinphos	
Difenacoum	Parathion	

Table 2. Highly hazardous (Class lb) technical grade active ingredients of pesticides (common name) - not permissible in the project

Acrolein	Ethiofencarb	Omethoate
Allyl alcohol	Famphur	Oxamyl
Azinphos-ethyl	Fenamiphos	Oxydemeton-methyl
Azinphos-methyl	Flucythrinate	Paris green {C}
Blasticidin-S	Fluoroacetamide	Pentachlorophenol
Butocarboxim	Formetanate	Pindone
Butoxycarboxim	Furathiocarb	Pirimiphos-ethyl
Cadusafos	Heptenophos	Propaphos
Calcium arsenate	Isazofos	Propetamphos
Carbofuran	Isofenphos	Sodium arsenite
Chlorfenvinphos	Isoxathion	Sodium cyanide
3-Chloro-1,2-propanediol	Lead arsenate	Strychnine
Coumaphos	Mecarbam	Tefluthrin
Coumatetralyl	Mercuric oxide	Thallium sulfate
Zeta-cypermethrin	Methamidophos	Thiofanox
Demeton-S-methyl	Methidathion	Thiometon
Dichlorvos	Methiocarb	Triazophos
Dicrotophos	Methomyl	Vamidothion
Dinoterb	Monocrotophos	Warfarin
Edinofenphos	Nicotine	Zinc phosphide

Table 3. Moderately hazardous (Class II) technical grade active ingredients of pesticides (common name) - not permissible in the project

Alanycarb	Endosulfan	Paraquat
Anilofos	Endothal-sodium	Pebulate
Azaconazole	Esfenvalerate	Permethrin
Azocyclotin	Ethion	Phenthoate
Bendiocarb	Etrimfos	Phosalone
Bensulide	Fenitrothion	Phoxim
Bifenthrin	Fenobucarb	Piperophos
Bilanafos	Fenpropidin	Pirimicarb
Bioallethrin	Fenpropathrin	Prallethrin
Bromoxynil	Fenthion	Profenofos
Brobuconazole	Fentin acetate	Propiconazole
Bronopol	Ferntin hydroxide	Propoxur
Butamifos	Fenvalerate	Prosulfocarb
Butylamine	Fipronil	Prothiofos
Carbaryl	Fluxofenim	Pyraclofos
Carbosulfan	Formothion	Pyrazophos
Cartap	Fuberidazole	Pyrethrins

Chloralose
Chlordane
Chlorfenapyr
Chlorphonium chloride
Chlorpyrifos
Clomazone
Copper sulfate
Cuprous oxide
Cyanazine
Cyanophos
Cyfluthrin
Beta-cyfluthrin
Cynalothrin
Cypermethrin
Alpha-cypermethrin
Cyphenothrin
Deltamethrin
Diazinon
Difenzoquat
Dimethoate
Dinobuton
Diquat
Gamma-HCH
Guazatine
Haloxyfop
Heptachlor
Imazalil
Imidacloprid
Iminoctadine
loxynil
loxynil octanoate
Isoprocarb
Lambda-cynalothrin
Mercurous chloride
Metaldehyde
Metam-sodium
Methacrifos
Methasulfocarb
Methyl isothiocyanate
Metolcarb
Metribuzin
Molinate
Nabam
Naled
Pyroquilon
Quinalphos
Quizalofop-p-tefuryl
Rotenone
Sodium fluoride
Sodium hexafluorosilicate
Spiroxamine
Suiprofos
Terbumeton
Tetraconazole
Thiacloprid
Thiobencarb
Thiocyclam
Thiodicarb
Triazamate
Trichlorfon
Tricyclazole
Tridemorph
Vernolate
Xylylcarb

(common name) - Permissible under IPM

Acephate
Acetochlor
Acifluorfen
Alachlor
Allethrin
Ametryn
Amitraz
Azamethiphos
Bensultap
Bentazone
Bromofenoxim
Butroxydim
Chinomethionat
Chlormequat (chloride)
Chloracetic acid
Chlorthiamid
Copper hydrixide
Copper oxychloride
Cucloate
Cyhexatin
Cymoxanil
Cyproconazole
Dazomet
Desmethryn
Dicamba
Dichlormid
Dichlorbenzene
Dichlorophen
Dichlorprop
Diclofop
Dienochlor
Diethyltoluamide
Difenoconazole
Dimepiperate
Dimethachlor
Dimethamethryn
Dimethipin
Dimethylarsinic acid
Diniconazole

Table 5. Technical grade active ingredients of pesticides unlikely to present acute hazard in normal use (Common name) -Permissible

Acephate
Acetochlor
Acifluorfen
Alachlor
Allethrin
Dinocap
Diphenamid
Dithianon
Dodine
Empenthrin
Esrocarb
Etridiazole
Fenothiocarb
Ferimzone
Fluazifop-p-butyl
Fluchloralin
Flufenacet
Mecoprop
Mecoprop-P
Mefluidide
Mepiquat
Metalaxyl
Metamitron
Metconazole
Methylarsonic acid
Metolachlor
Myclobutanil
2-Napthyloxyacetic acid
Nitrapyrin
Ametryn
Amitraz
Azamethiphos
Bensultap
Mecoprop
Bentazone
Bromofenoxim
Butroxydim
Chinomethionat
Chlormequat (chloride)
Chloracetic acid
Chlorthiamid
Copper hydrixide
Copper oxychloride
Nuarimole
Octhilinone
N-octylbicycloheptene
Dicarboximide
Oxadixyl
Paclobutrazol
Pendimethalin
Pimaricin

Fluoroglycofen
Flurprimidol
Flusilazole
Flutriafol
Fomesafen
Furalaxyl
Glufosinate
Hexazinone
Hydramethylnon
Iprobenfos
Isoprothiolane
Isoproturon
Isouron
Malathion
MCPA-thioethyl
Mecoprop-P
Mefluidide
Mepiquat
Metalaxyl
Metamitron
Metconazole
Methylarsonic acid
Metolachlor
Myclobutanil
2-Napthyloxyacetic acid
Nitrapyrin
Ametryn
Amitraz
Azamethiphos
Bensultap
Pirimiphos-methyl
Prochloraz
Propachlor
Propanil
Propargite
Pyrazoxyfen
Pyridaben
Pyridaphenthion
Pyridate
Pyrifenox
Quinoclamine
Quizalofop
Resmethrin
Sethoxydim
Simetryn

Annex 6: Draft Monitoring and Evaluation Indicators

1. Indicators to be Monitored Locally

Extent of Adoption of Non-Pesticide or IPM Control Measures:

- Number of farmers per sample adopting non-pesticide or IPM control measures
- Total area of farms adopting non-pesticide or IPM control measures
- Number of farmers using pest resistant varieties
- Number of farmers able to recognize natural pest enemies
- Number of farmers involved in community action programs related to IPM

Pesticide Use Pattern:

- Number of pesticide applications per crop/ha cropping season
- Types/quantity/volume of pesticides used per crop/ha/cropping season (checking for use of WHO

Class I or non-registered chemicals)

- Cost of pesticide applications per crop/ha/cropping season
- Amount of any pesticide subsidies
- Number of farmers practicing safe pesticide handling and application procedures (e.g. safe
- storage, use of protective clothing, etc)
- Incidence of excessive pesticide residues on crop produce
- Number of complaints on pesticide residues on crop produce
- Number of trade rejections because of pesticide residues on crop produce
- Incidence of pest resistance
- Incidence of pesticide poisoning in humans
- Incidence of other forms of environmental poisoning or contamination in domestic animals, wildlife, honey bees, water pollution, soil pollution, other.

Crop Production:

- Crop yields per hectare, fluctuation in crop yields from season to season
- Profit per hectare, profit fluctuation from season to season.

Agro-ecosystem:

- Number and type of pest outbreaks per crop/year
- Number of insect predators, parasitoids per unit per sampling area
- Abundance of beneficial insects (e.g. honeybees per unit sampling area) in terms of numbers and diversity

Other Indicators:

- Frequency of visits of agro-chemical salespersons to the project area
- Frequency of media (TV, radio, newspaper) agro-chemical advertisements
- Number of pesticide brands on display in retailer outlets in the project area
- Number of acceptable types of pesticides on display
- Number of small-scale businesses related to pesticide sales or IPM (e.g. production of natural enemies, etc)
- Number of business operations dependant on clean environment (e.g. fish production).

The above monitoring should be done by RPPQS staff on a sample of project households in the project area in each district. Early supervision missions should assist the RPPQS to establish an appropriate monitoring system, sampling procedure, and provide training in implementation and analysis of the monitoring system. Once the monitoring system has been fully designed in collaboration with the RPPQS, a detailed budget, work plan, and responsibilities should be prepared.

2. Activities Requiring Monitoring during Supervision

Pesticide Registration:

- Spot checks of chemical supply stores and project farmers pesticide cupboards to determine if
- unregistered pesticides are being sold/used in project areas
- Inspection of pesticide registration lists to check on new pesticides being registered.
- Use of Class I Pesticides:

- Spot checks of chemical supply stores and project farmers pesticide cupboards to determine if
- WHO Class I pesticides are being sold/used in project areas

Policy Issues:

- Extent of government subsidies for pesticides
- Assessment of effectiveness of grants application system in controlling use of on approved pesticides.
- Local government policies and regulations on pesticide use and promotion of IPM approaches.
- Implementation of the local monitoring program:
- Assessment of the implementation of the local monitoring program in rayons visited by the supervision mission
- Assist local staff to resolve any implementation problems with the local monitoring program
- Provide on-going training to local staff in monitoring procedures, data analysis, and interpretation of results in terms of project actions to be taken to rectify unsatisfactory pest management practices.

Supervision mission inputs should be conducted 2 times per year, preferably during periods of high pest control activity to observe field implementation of pest management practices. This supervision work should be undertaken by an Agriculture Specialist and Environmental Monitoring Specialist.