ANNEX 3: Pest Management Plan

Background

The Pest Management Plan (PMP) provides a framework for the development of Integrated Pest Management (IPM) program for tree nurseries and field operations in the Project to identify, study and manage pest problems. The purpose is to reduce human and environmental health risks associated with pesticide use, and protect ecosystem by conserving beneficial agents such as natural enemies of pests and pollinators to increase productivity. The PMP would also enable the communities to critically analyze issues related with introduction of alien invasive species, pesticide residues, and other pesticide use externalities.

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).

Seedling stock production (mono-cropping) is highly prone to insect and disease outbreaks and pest damage can occur quickly over a large area. This damage can occur randomly throughout the nursery, and if temporally segregated, be undetected and untreated until late in the rotation. Therefore, in practice it is common that preventive methods are used before any pests have been identified. In this work, the interdisciplinary expertise and experience of nursery staff are of high importance.

As a result of a forest fire extensive amounts of dead wood is left to the burned area and this environment is favorable for many trunk pest species to spread. Some of such species may also spread to dead trees of the near-by unburned forest areas.

Intact forests with densely growing trees (especially if trees are of one species and same age) are vulnerable to mass occurrence of e.g. *Tenthredinidae* family (*Diprion pini* L) and *Neodiprion sertifer* pests and major damage. Vigorously growing trees and thinned forests are not as vulnerable. However, it is impossible to effectively control mass occurrences of pests by using certain forest management solutions.

The occurrence of pests in the Irtysh pine forest and in the Aral seabed is described in details in the separate reports compiled by the Environmental Component of the project. The main pests and diseases have been identified and appear well known in Kazakhstan and in adjoining parts of Russia. It is evident that severe pest and disease events are natural to the species across its vast range and they tend to be cyclic in occurrence. In Kazakhstan, the recent pest and disease events have been exacerbated by the recent bad history of wildfires and poor forest health due to overstocking.

15.1 Pest Situation in the Irtysh Pine Forest

The main pine forest pest is a pine moth (silk moth) (*Dendrolimus pini* L). Its caterpillars have caused severe damage over the period 2000-2002, but the moth population is currently at a low level. Like all forest pests, its occurrence fluctuates in a cyclic pattern. The occurrence of more dangerous pest - pine beauty (*Panolis flammea*), appeared in 2001. Also cankerworms (*Geometridae* family) and tube-builders (*Tortrizidae* family) are common.

The outburst of pine moth population occurred within the former Semey forestry in 1997. In a short time the pest damaged 35,000 ha of forest. The mass occurrence of the pest existed for 8 years. The plantations in Kashtak, Talitsk and Baryshevsk forestry were completely destroyed over this time. Also sawflies-weavers (*Pamphilidae* family) have destroyed saplings in nurseries of the Irtysh region.

Negative impact on the condition of coniferous forest belts of the eastern-Kazakhstan oblast is made by the burned areas of the past years, where populations of trunk secondary pests are common (*Scolylidae*). In a typical situation, mass occurrence of needle-gnawing species of *Ocneria*, *Geometridae*, *Totricidae* and *Tenthredinidae* (sawflies) seriously impair the pine and promote the secondary pests settling in the trunk. These are mainly *Coleoptera genus* beetles, which eventually destroy the trees. The total square of such territories is 56,618 ha.

In January 2005 there were 71,275 ha forest affected by pests. From those areas, measures of extermination were decided to be taken in 65171 ha. The CFH has allocated 96.6 million tenge in order to take measures on extermination in the area of 36,000 ha.

Pine moth	*Dendrolimus pini*	17,648 ha
Pine beauty	*Panolis flammea*	52,747 ha
Sawflies-weaver	*Pamphilidae*	880 ha
Total		71,275 ha

The extermination of pests in 2003 can be used to demonstrate the process. The National Committee on making forest-pathological inspection on the territory of Semey Ormany and Ertis Ormany SD SFNP confirmed the necessity of taking measures on extermination of pine moth population.

The forest-pathological inspection was made when the pests were in a chrysalis stage. The number of chrysalises was 3-5 times more than the critical level for major forest damage. Extermination was also carried out in the areas affected by a pine silk worm. Chemical pesticide treatment of the areas affected by a pine moth was implemented in due time and according to the Resolution of the Akim of EKO № 66, 2003. In this process, an emergency situation was declared, competitive bidding documentation was prepared and the selection of contractor was made from a number of interested firms according to the Law RK on State Purchases. The spraying was carried out and the forest-pathological inspection verified that it was successful.

15.2 Integrated Pest Management

Integrated Pest Management (IPM) is an ecological approach to suppressing pest populations (i.e. weeds, insects, diseases, etc) in which all necessary techniques are consolidated in a unified program, so that pests are kept at tolerable levels in effective, economical, and environmentally sound methods. IPM includes planned use of a variety of preventative, suppressive, or regulatory tactics and strategies.

Environmentally sound control methods include strategies and prescriptions that provide a desired result at reducing the impact of pest populations. These strategies are chosen based on the selection criteria to ensure minimal impact on the general environment and non-target organisms.

Since pest problems are often symptomatic of ecological imbalances, the goal is to attempt to plan and manage ecosystems to prevent organisms from becoming

pests. IPM is a decision making process that uses a combination of techniques to suppress pests and includes the following elements:

- Planning and managing ecosystems to prevent organisms from becoming pests;
- Identifying potential pest problems and assessment of IPM program needs for project sites;
- Monitoring populations of pests and beneficial organisms, pest damage and environmental conditions;
- Using injury thresholds in making treatment decisions;
- Reducing pest populations to acceptable levels using strategies that may include a combination of biological, physical, cultural, mechanical, behavioral and chemical controls;
- Using an ecological approach to vegetation and pest management that strives to reduce reliance on pesticides as well as integrate preventative measures and alternative control technology;
- Emphasizing the prevention of pest problems through site design;
- Consider community values in pest management;
- Evaluating the effectiveness of treatments.

The specific objectives of the planning are the following:

- Involve authorities and research institutions for development of IPM program for the project;
- Design and delivery of training program for specialists and project personnel on IPM activities;
- Promote ecological approaches for foresters to study, test, select and implement IPM options for reducing pest losses while promoting biodiversity monitoring to serve as early warning systems on pest status, alien invasive species, beneficial species, and migratory pests;
- Establish linkages to develop a national IPM policy to promote IPM and compliance with international conventions and guidelines on pesticide use;
- Design a monitoring program and evaluate the benefits of IPM including its impact on food security, the environment and health.

The control products and methods include herbicides, fungicides, and insecticides, but also biological agents such as bacteria and viruses that are used to control pests. Some genetic varieties of trees are more resistant to pests and this provides natural protection for such stocks.

There is a list of chemical and biological agents of pests control, plant diseases and weeds, defoliants and plant growth regulators, authorized to be used in agriculture and forestry of Republic of Kazakhstan for 1997-2001.

15.3 Chemical Pest Control

The most important principle of pest control is to use a control method only when necessary to prevent unacceptable levels of damage. Even though a pest is present, it may not be necessary to control it. It may cost more to control the pest than to cover damage or losses. Before making management decisions, managers should evaluate potential pest impacts within the context of the ecosystem in which the organism occurs, as well as the population dynamics of the organism.

Integrated pest management promotes utilizing the best strategy to address a specific pest problem, which also includes using pesticides when necessary. Banning pesticides would reduce the number of management tools and also prevent the use of most biological agents that have received national and international

approval. There are various toxicological differences between pesticides available for use. Since some products are less toxic than others, the proposal is to use the WHO ranking system to group pesticides into categories. This ranking system would facilitate the elimination of toxic products to be replaced with products that are environmentally compatible and less toxic.

The use of the highly hazardous pesticides (WHO classes Ia, Ib, II) should be banned. It is required that such chemical pesticides will not be financed under the proposed Project. There are national lists of hazardous and banned agrochemicals in Kazakhstan and also the WHO classification includes details of chemical pesticides in the markets.

Kazakhstan has rather well developed legislation on chemical control and the country has e.g. ratified the Convention on Persistent Organic Pollutants (POPs). Best practices and national legislation in the transportation and storage of chemicals should be followed. The community residents should receive a pre-notification of applications of chemicals and large warning signs should be placed to the site.

15.4 Biological Pest Control

Biological methods solve the problem of sustainability by creating conditions for proliferation of the pest natural enemies, such as:

- Pathogens - unicellular bacteria, protozoa, viruses and fungi;
- Parasites - other organisms, appearing at the one of life circle stage in the animal body, causing its death or significant reduction of life activity, as a rule, accompanying with the loss of reproduction ability;
- Predators - animals that prey on pests.

This method aims to replicate the natural conditions, where the pest population is maintained at the low level by predators, parasites and diseases. However, due to its relative complexity and novelty, the use of biological agents requires careful studies because their introduction (especially in case of microorganism import from other countries) can result in the unsuspected changes in eco-systems.

Although biological plant protection means are less hazardous for nature, they are very unreliable and require specialists with high qualification. Biological control can also be more expensive and time-consuming than chemical methods in a short term. However, in the long-term it brings tangible financial benefits due to much less frequent applications. The method of using viruses are widely and successfully used e.g. in northern European pine forest to control mass occurrences of pests of the *Tenthredinidae* family (*Diprion pini* L) and *Neodiprion sertifer.*

Microbiological methods also include the use of bacterial pathogens. The agents on the basis of the various immunotypes of *B. Thuringiensis* are the most widespread (for details see the report by Ishkov & Kastcheyev).

15.5 Pest Control Procedures

Ecosystem stressors and forest health should be monitored to provide early warning for assessment of whether any intervention is warranted. Pest management strategies will be coordinated with relevant jurisdictions and following Bank's principles. The need for intervention is not expected to be frequent and will consist of the following primary activities, among others:

- Increase the level of monitoring (e.g. insect trapping) of a potential disturbance in nurseries and in forests (including the DAS);
- Identify the pest problems and their cause;
- Determine action level by considering the acceptable damage tolerance levels; current infestation level; and the most effective timing for treatment(s).
- Review all possible treatment techniques to promote healthy vegetation and control pests and then select the most appropriate technique(s).
- Evaluate the IPM prescription's effectiveness.

Professional pest experts should make the selection of optimal pest control strategies. The criteria for selecting treatment tactics and developing pest management strategies include:

- Least disruptive of natural controls;
- Least hazardous to human health;
- Minimizes negative impacts to non-target organisms;
- Least damaging to the general environment
- Best preserves natural or managed ecosystems;
- Most likely to produce long-term reductions in pest control requirements;
- Effective implementation is operationally feasible;
- Cost-effectiveness in the short and long term.

15.6 Recommendations

The PCU will be responsible in the implementation of the PMP and estimated costs for the various activities under this program will be in the budget allocated for pest management. The PCU must also collaborate with the authorities and experts responsible for studying, controlling and inspecting the use of control methods, especially chemicals.

The IPM Plan should establish a framework to develop IPM programs in the forestry administration. It is also recommended that the Project includes education and preparation of educational materials on acceptable current and alternative pest management practices. The Project shall provide staff training to facilitate effective implementation of the IPM Plan.

The Project will directly address the fire management issues that have led to more severe insect attack as well as improving forest management. These measures are expected to result in a much less favorable environment for pest and disease development. The issue of improvement in methods of direct control of pest and disease outbreaks will be addressed in the following ways:

- A consultancy will be arranged to evaluate the opportunities for Integrated Pest Management in the both Project sites, provide training to local forestry staff in IPM and assist them to develop the IPM Plans [cost $ 40,000] ;
- The Project will support the development of a consultative mechanism to promote an integrated regional approach to pest and disease management a) with Russian forest managers in the Irtysh region, and b) with Uzbek forest managers in the Aral region [cost $ 4,000 a year for each year of the Project];
- Support will be provided for a suitable consultant to plan and implement a pilot demonstration of biological control of the pine defoliating moth using the natural control agent *Bacillus thuringiensis* [likely cost $40,000 including aircraft hire].