Pest Management Plans for Major Crops
in China Agricultural Technology Transfer Project Area of
Hunan

POCAD of Hunan
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Part One: Provincial-level Pest Management Plan

1 Pest Management in Hunan Province and Current Situation of Pest Control

1.1 Organazitions, Functions and Relative Laws and Regulations

1.1.1 Pest Management Organizations as well as Their Functions

At the national, provincial, county, township, village level, there have established different crop pest/disease management institutions which have their own specific functions of being responsible for the pest/disease management, pesticide management or safety production of farming products at their own level.

National Level: the ministry of agriculture is the institution for agricultural production management. The agricultural technique extension center of MA is responsible for the crop pest/disease management. The pesticide identification and evaluation institute of MA is responsible for the registration of pesticides. The national development and reform committee is responsible for the management of pesticide production. The concerned departments have issued a series of regulations such as “The Regulation of Pesticide Management”, “The Implementation Methods for Regulation of Pesticide Management”, “The Methods for Pesticide Production Management” etc., in order to standardize the management of pest/disease control and pesticide management. At the same time, there have drawn out series of standards or regulations for farming product production, in which the pest/disease control and pesticide management have been strictly and clearly specified.

In order to solve the problem of the high residue of pesticide in farming products from sources, especially the vegetables, fruits and tea. The MA, on the basis of strengthening the registration of five kinds of highly toxic organic-phosphorus pesticide such as methamidophos, has stopped the reception of the application for highly toxic, extremely toxic pesticides, and canceled the registration of highly toxic pesticide for uses in some crops. The prohibited pesticides, and the highly toxic pesticides restricted in vegetables, fruit, tea, medicine herbal are as followings:

The prohibited 18 kinds of pesticides:
BHC DDT camphenchlor dibromochloropopane galecron ethylene dichloride nitrofen aldrin dieldrin mercury preparation arsenic preparation lead preparation saikuzuo fluoroacetamid gliflor tetramine sodium monofluo fluoroacetate silatrane. 19 kinds of pesticide not allowed use in vegetables, fruit tea and Chinese’s medicine herbas: methamidophos parathion methyl parathion monocrotophos phosphamidon phorate isofenphos terbufos phosfolan-
methylsulfotep, demeton, carbofuran, aldicarb, ethophosphos, phosfolan, coumarin, fosfonos, isazofos, fenamiphos. Two kinds of pesticide, dicofol and fenvalerate, are restricted use in tea. Any pesticide product is not allowed in use beyond the permitted scope of registration.

**Provincial Level:** Hunan province is a big agricultural province as well as a serious pest-stricken area, for which pest control is especially important. The plant protection station of Hunan agricultural committee is responsible for the prediction and forecast of pest/disease occurrences, recommendation of pesticide varieties and control methods. The Hunan pesticide identification and evaluation institute is responsible for the registration of the pesticides within the province. The petrol-chemistry industry association of Hunan Province is responsible for the management of the pesticide production. The concerned departments have issued series of standardized regulations and rules such as “The Implementation of Pesticide Management Methods in Hunan Province”, “The Management Methods for Non-polluted Farming Products in Hunan Province”, “The Regulation for Protection and Conservation of Agricultural Ecology and Environment in Hunan Province”, “The Technique Regulation for Production of Non-polluted Farming Produces”, “The Quality Safety Standards for Non-polluted Farming Produces”.

**County Level:** The plant protection station of the county agricultural bureau is responsible for the prediction and forecast of pest/disease occurrences, and recommends the controlling methods and related pesticide species, and the sales of some pesticide at the same time. The county also set up law enforcement team, responsible for management of pesticide markets. Some counties have drawn out the production standards of agricultural products for some specific crops. Due to the lack of adequate budget, the prediction and forecast of pest/disease at the county level is not satisfactory.

**Township or Village Level:** there have set up agricultural technique extension stations at every township of the whole province, including some villages, which is responsible for the investigation of pest/disease occurrences within the township and village, the recommendation of controlling methods etc., also the sales of some pesticide products at the same time.

### 1.1.2 The Situation of Pesticide Production

The pesticide production is managed by the petrol-chemistry industry association and carried out by individual pesticide factory in accordance with the regulations mentioned above. There are hundreds pesticide factories all over the country, among which the following factories enjoy a large scale and high-quality products: the Nanjing red sun groups, Jiangshan of Jiangsu province, Huayang of Shandong province, Xianghua and Hengyang Hongwei chemical plants in Hunan province.

### 1.1.3 The Situation of Pesticide Distribution
The sale of pesticide in Hunan province is mainly conducted by the individual private sellers, assisted by plant protection station, agricultural technique extension station and the agricultural material companies, which forms a sale network. Generally, the pesticide factories or agents wholesales the pesticide to the retailers such as the individual private sellers, plant protection station, agricultural technique extension station and the agricultural material companies, and then sold to the farmers. Only those pesticides with three certifications can be sold in the market.

1.2 The Damages by Major Pest at the Project Area

**Rice:** The diseases are rice blast, rice sheath blight, rice false smut, rice kernel smut, rice bacterial leaf blight etc. The pests are mainly stem borer, leaf roller, plant hopper thrips etc. The sheath blight often occurs. The leaf blight varies in different years. The rice blast only damages the rice in some parts of Hunan province, but once it occurs, it will cause a great loss. This year the rice kernel smut causes a great effect on the rice and hybrid rice in Hunan province, leading to the reduction of rice grain in some areas by 10%. The occurrences of strip leaf blight are increasing year by year. The increasing damage of stem borer leads to the reduction of rice grain by 10%. Plant hopper and rice leaf roller usually occur at large scale in rain years. The weed in paddy field are barnyard grass, needle spikesedge, *Monochoria vaginalis* etc, which also cause a great harm to rice.

**Citrus:** The diseases are mainly powdery mildew, rust, canker and anthracnose. The pests are mainly coccids aphid noctuid hawkmoth, red spider, butterfly and kinds of beetles. Due to the high humidity, citrus rust and canker are very serious in Hunan province in recent years, especially in 2003. Coccid causes a bad look on citrus, which directly influences sale.

**Vegetable:** Include Changsha non-polluted vegetable project, Shaoyang green cucurbits and fruits project and Qidong hemerocallis fulva project. The disease are mainly downy mildew, blight, phytophthora wilt, root rot, powdery mildew, bud wilt, *Ascochyta pisi* rust etc., such as, downy mildew of cucumber, bight of peppers and nightshade family cucurbits, rust of hemerocallis fulva and root rot of pumpkin, which occurred often in recent years. Besides, diseases caused by bacteria like bacterial soft rot of vegetables, bacterial wilt of nightshade family vegetables and all kinds of bacterial diseases are also rising. Pest are mainly aphid, moth, caterpillar, soybeen fly, pea leafminer etc.

**Forest:** Include Changde triploid of Populus tomentosa Carr project, Chaling oil tea project and Xinhuang borneol camphor project. The diseases are mainly canker, anthracnose, ring spots, brown spots, which don’t have great influence on the wood production in Hunan province. The pests are mainly moth, coccid, beetles and butterflies. Relatively speaking, the harm caused by Henosepilachna sparsa orientalis Dieke, Lasiocampidae, Cerambycidae and some lepidopterids feeding on leaves is greater.

1.3 The Situation of Pest Control in Project Area.

**Rice:** rice, the main crop in Hunan province, has no pest-resistant varieties, so the chemical control of pests is prevailing.
The management of pest/disease/weed is carried out by farmer’s households themselves of buying and spraying agrochemicals. The cost for management is about 40-70Yuan/mu due to many times and overdoses of sprayings, for instance, 5-6 times, and mixing uses of 3-4 products for whole period of rice growing. The prevention is about 60%-80%, which resulted in low efficiency and increases of pest-resistance to agro-chemicals. The agrochemicals used are mainly Dimehypo triazophos and fipronil, and Weedicide is often used for weeds.

**Citrus:** Citrus are all non pest-resistant and disease-resistant varieties, so the chemical control is also prevailing besides some agricultural control method. The control is carried out by farmer’s households themselves of buying and spraying agrochemicals. Agrochemicals are sprayed once in winter, then once after buds and leaves grow, and then once every other thirty days during the period of fruition. The cost for management is about 100-150 yuan/mu, and the prevention is about 80%. The agrochemicals for citrus are Pojie and Beta–cypermethrin.

**Vegetable:** Spray agrochemicals like phoxim and Beta–cypermethrin according to the growth period and weather condition. Basically control the pests/disease, artificial removal of weeds.

**Forests:** pest/disease occurs occasionally, and the pests/diseases included in our project can be generally controlled.

### 2. The Recommended PMP at Project Area

#### 2.1 The Recommended New Method for Prevention of Pest

Due to the complex constitution of pest/disease of the four crops concerned in this project, we should formulate concrete control strategies according to the concrete situation. Taking the integrated adjustments of farming field ecology as main body, and making full use of the natural regulation of factors within the system, the management of pest/disease/weed can conduct some artificial control properly. In artificial control, it is necessary to optimize the system structure of farming field, select good resistant varieties, to modify the cultivation techniques for healthy production. On the basis of precise prediction and forecast, the chemical controls can be carried out appropriately. The specific techniques adopt vegetable quarantine, agriculture control, selecting and planting pest-resistance and disease-resistance varieties, biological prevention, physical and manual prevention and chemical prevention.

The specific techniques are as followings:

- On the basis of the pest/disease systematic monitoring station of local plants quarantine, the establishment of highly credible predict-and-forecast systems with 90% accuracy.
- The Selection resistant crop varieties (pest-resistant and disease-resistant)
  
  Proper management of water and fertilizer; increasing application of organic manure for promoting plant healthy growing.

  Full exploitation of natural enemy, optimization of eco-environment such as growing grass in orchard, growing beans on field bank so as to nurture and enhance the capacity of the natural enemy and reduce the doses of pesticide sprayings.

  Strengthen the agronomic control of pest/disease and weed.
Active extension of bio-agro-chemicals such as jinggangmycin, polyxin, Nongkang120 etc.
Rational application of highly effective, low toxicity and residual pesticide, and prohibition of highly toxic and residual ones.

2.2 The Approved Pesticides at Project Area

**Rice:**
- fipronil
- triazophos
- imidacloprid
- buprofezin
- jinggangmycin
- tricyclazole
- diniconazole
- propiconazole
- pyrazosulfuron-ethyl
- bensulfuron methyl
- butachlor
- oxadiazon.

**Citrus:**
- imidacloprid
- avermectin
- azadirachtin
- endosulfan
- calcium polysulfides
- Beta–cypermethrin
- *Beauveria*

**Vegetable:**
carbendazim
- diniconazole
- phoxim
- Beta–cypermethrin,
lambdacyhalothrin
- tribenuron-methyl
- isoproturon
- fenoxaprop-p-ethyl.

The pesticides above free of the prohibited or restricted products are highly effective, low toxicity and residuals, and in accordance with the specification of pesticide management issued by concerned departments. The pesticides above are also the recommended products in regulations and standards for specific crop production.

2.3 The Proposed Organizations of Pest Management at Project Area

2.3.1 The Predict Group

The prediction is the premise and basis for chemical control. Therefore, in order to grasp main varieties and development of local pest/disease timely and to make a good middle-to-long term trend predict and short-term alarm, over 10 stations will be set up in Hunan project area for systematic monitoring (periodic and site-specific observation) of the pest/disease/weed occurrences at all sub-project areas, and enhance the training of technicians of predicting for higher accuracy.

2.3.2 Implementation Group

In order to fully implement project pest/disease control, provincial-level expert group of pest/disease/weed management will be established in Hunan province, controlling the sub-project pest/disease control in the whole province, instructing the conduction of sub-project. The group will comprise of the specialists from the plant protection station of Hunan Academy of Agricultural sciences, Hunan Agricultural university and Hunan plant protection chief station. The corresponding county- level expert groups for drawn-out and implementation of pest/disease/weed management at every sub-project area also will be set up for all sub-project area, consisting the specialists from the technique supporting unit, the county plant protection station, agricultural extension station and other invited experts.
2.4 The Trainings of Pest/Disease Management Techniques

2.4.1 The Content and Materials for Trainings
Organize experts to compile books concerning the pest/disease control for rice, citrus, vegetable and forest and the technique pamphlets of detailed pest/disease management techniques. Train farmers, telling them the occurrence rule of pest/disease, prevention method and the usage of pesticide. Make sure that each farmer has a copy.

2.4.2 Training Plans
A systematic training will be conducted at the beginning of project. Then the control technique of pest/disease for specific crop will be carried out before growing, and simplified training at the key control time of every pest/disease so as to help farmers understand and master basically the occurrences and control methods of pest/disease.

2.4.3 The Estimation of Budget
See the detailed investment of pest/disease management plans in sub-projects

2.5 The Evaluation and Reports of Implementation of the PMP

2.5.1 The Goals of the Project
Insisting on the guideline of taking the priority to prevention and combining prevention with cure, it is to aim at the increase of yield, efficiency and ability of ecological adjustment, reduction of loss resulted from pest/disease/weed damages, doses of pesticide application, and impact to environmental pollution. The goals of the project are as follow:

- The integrated control will occupy more than 90% of the project area during the implementation of IPM technique
- Increase the accuracy of predict and forecast for major pest/disease from 70% to 90%;
- Reduction of losses from 10% to 5% caused by pest/disease/weed;
- The resilient balances of economic, social and ecological efficiency by conducting sustainable control over whole period during the prevention of pest/disease/weed.

2.5.2 The Monitoring of the Implementation Results
The monitoring team will be set up at provincial level and sub-project level for inspecting the implementation processes of pest/disease control, finding out and correcting problems, summarizing and exchanging experiences on time. By the end of the crop growth or year, the results of pest/disease control should be summarized.
2.5.3 **The reporting of project implementation**

By the end of Dec. each year, all sub-projects will submit the annual report to general project group. The final reports will finished by the end of March of second year for evaluation of the expert group.

3. **The detailed Measures for Extensions**

3.1 **Enhancement of the Pest Predict and Forecast**

The enhancement of pest/disease predict and forecast by the mutual supporting of sub-subject and local sectors agricultural technique extension and plant protection.

3.2 **Strengthen the Management of the Pesticide**

The local governments of some sub-project area will draw out related policy and rules to eliminate the sales of the prohibited pesticide products. The uniform purchase and sales of pesticides at the project area will be initiated. On the basis of predict and forecast, the uniform prevention and control of pest/disease/weed also will be carried out. The construction of agricultural law enforcement personnel will be enhanced for uplifting the level of law enforcement. The periodical inspection of the law enforcement teams and the hot-line set-up for the reporting of sales of prohibited pesticide. Some awards will be distributed to the people who report the actual sales of prohibited pesticide so as to reduce the sprayings of prohibited pesticides by mutual supervision.

3.3 **Training of Farmers**

There have lot of training of farmers at sub-project areas. The IPM technique is a substantial content of training contents for every sub-project. The aim of the training is to increase the farmer’s awareness of environment, control skills of pest/disease/weed control, and to reduce the doses of pesticide spraying self-conscientiously.

3.4 **The Compensation For the Losses of the Farmers**

In order to encourage the farmers to apply IPM technique, reduce pesticide doses, some sub-project will subsidize the farmers for the losses after the elimination of highly toxic and residual pesticide during the execution period. At the same time, the price increase of the rice via IPM techniques will also enhance the farmer’s incomes, and promote the farmers to apply IPM technique voluntarily.

3.5 **Strengthen the IPM Research**

The IPM technique is of developing and perfecting technique. The pest/disease of crop changes with the changes of the farming land ecological community. Therefore,
it is necessary to enhance the IPM research for the sake of real IPM. The more emphasis will be put on the research of natural enemy such as spider and frog etc while controlling the crop pest/diseases. In addition, it must put more attention on the research of hi-tech application in IPM. The whole mastering of the dynamics of the biology community in the farming field will help control the pest/disease specifically and reduce the losses.

Part Two: Pest Management Plan for Triploid of Populus Tomentosa Carr. in Changde, Hunan Province

1. Current Situation of Main Crop at the Project Area

Triploid of Populus Tomentosa Carr. Project in Changde is constituted by Seed reproduction and raw material forest base. The project area administers seed base in west Dongting management area, Wangjiachang Town in Lixian County, Shuangqiaoping Town in Dingcheng District and raw material forest base in Shimenqiao Town.

1.1 The Cultivation Structure of Main Crop at the Project Area

The project area occupies 376,800 mu totally, among which west Dongting management area 165,800 mu, three towns as raw material forest bases 211,000mu. Among the 165,800-mu Dongting management area, there are 84,800mu arable lands, where crops like rice, cotton, sugarcane, soybean and cole are planted by multiple cropping (like rice-rice-cole and cotton-cole-soybean) and rotation cropping (like cotton-sugarcane). The binary structural proportion between grain crop and cash crop is 1:1. Among the 211,000-mu three towns’ raw material forest bases, there are 98,900mu arable lands and 112,100mu lands of other types like dissected lands and mountains and flood discharge areas. Crops like rice, cotton, sugarcane, soybean, cole, peanuts, broomcorn and corn are planted there by multiple cropping (like rice-rice-cole and cotton-cole-soybean), with peanuts, soybean and corn planted between them. The binary structural proportion between grain crop and cash crop is 1:0.8.

1.2 Current Situation of Plantation and Irrigation Ways

The farmer’s household contract production is the major form of Populus Tomentosa Carr. cultivation and ground irrigation is the major form of irrigation.

2. The Analysis of Main Disease, Pest and Weed at the Project Area

2.1 The Composition of Main Disease, Pest and Weed in Populus Tomentosa Carr. Cultivation
2.1.1 Pest

Pests are mainly Apripona germar, Batocera horsfieldi, Zeuzera coffeae Nietner, Clostera anachoreta and Pine Moth.

2.1.2 Disease

Diseases are mainly leaf rust, canker, anthracnose and brown spot.

2.2 The Damage of Major Disease/Pest and Loss

By controlling, the loss caused by pest disease can be limited below 15% of the permitted economic level. Forests are mainly damaged by some stem-eating pests like Apripona germar, the damage rate reaching 1%.

2.3 The Existing Prevention Methods and Evaluation

Assisted with physical control and biological control, the current prevention methods give priority to the agronomic control and chemical control. Meanwhile, quarantine and observe and predict are well conducted; field management and the selection and plantation of anti-disease and –pest varieties are improved. All these method have a great effect. The insecticides used by farmers are mainly isocarbophos bichonglin, avermectin, copper sulfate, carbendazim, thiophanate-methyl, diniconazole etc. The above agro-chemicals used are high effective, low toxicity and residue and in accordance with the specification of pesticide management issued by concerned departments, free of the prohibited or restricted products. Farmers should use them according to the concrete situation.

3. The Design of Integrated Control of Disease/Pest at Project Area

3.1 Control Principles

The principle of prevention first and then integrated control will be adopted, attaching importance on the harmonious unity of social benefits, economic benefits and ecological benefits. Strengthen the carrying out agronomic, artificial, physical and biological control of disease and pests; establish the prediction system of pest/disease occurrences so as to grasp the latest development, to enhance quarantine and to prevent the invasion of pest and disease. Reduce the rate and times of agro-chemical applications; well timing of application and choose of varieties of agro-chemicals; Priority use of biological origin and environmentally friendly products with effective, low toxicity and residual. The residues will be kept under the allowable limit.

3.2 Control Methods

3.2.1 Agronomic Control

Select and plant high-yield, anti-disease and anti-pest varieties, Sanitize seeds, destroy the young plants with disease, enhance irrigation and field management, and improve the anti-disease and anti-pest ability of the plants themselves.

3.2.2 Physical Control
Mainly adopt light trapping and artificial killing. Most of the species like moths and plant hoppers have tendency to black light, and the use of the shift-frequency light will be economic and environmental protection.

3.2.3 Biological Control

Adopt the methods such as protecting beneficial birds and beneficial insects to reduce the dosage and times of agro-chemicals as much as possible, and popularize agro-biologicals such as controlling pests with bacteria and curing disease with bacteria.

3.2.4 Other Methods

Dispose stalks of crops, weeds and fallen leaves in the woods timely. In order to reduce the harm of Cerambycidae to the woods, Papermulberries and mulberries in the neighbourhood, which are the hosts of cerambycidae, should be removed.

3.2.5 Reasonable Use of Agro-chemicals

Agro-chemicals used should be high effect, low toxicity and residue. Consistency and times should be controlled so as to prevent environmental pollution and to protect the natural enemies of pests.

3.2.5.1 The List of Applied Insecticides at the Project Area:

The insecticides are mainly trifluorocypromethrin, Kaiwei188 oil, Thiophanatemethyl. The all agro-chemicals used are high effective, low toxicity and residue and in accordance with the specification of pesticide management issued be concerned departments, free of the prohibited or restricted products.

3.2.5.2 Controlling Pesticide Dosage

Make a good prediction, inform farmers with pest/disease information according to the predict result, so that the farmers at the production base can make prevention or cure timely and properly. Make sure to use low toxic, low consistency and biological pesticide as much as possible, on the basis of not surpassing the permitted economic loss level. Promote advanced spraying technology, instruct farmers on the reasonable use of pesticide, at the same time, reduce the frequency and dose of pesticides.

3.2.5.3 Using Pesticide Correctly

Mainly select anti-fastness agro-chemicals, such as 2.5% imidacloprid, which has the characteristic of fast effect, strong penetrability, high activity, broad spectrum, low toxicity, low residue and safety, 100ml per bottle preventing and killing Apripona germaria and other stem-eating pest. It can be diluted by 30 to 40 times; if preventing leaf-end pest, it can be diluted by 2000 to 3000 times. This pesticide is suitable to cottons and vegetables.

The main components of 20% Kaiwei188 oil are perchloride and sulphide, having the characteristic of high-effect, low toxicity and broad spectrum. 180g per bottle. It can be used to inject into wormhole to prevent steam-eating pests after
diluted by 30 times. If preventing leaf-end pest, it can be diluted by 2000 times. This pesticide is suitable to crops.

Fixed use the above pesticide can improve effect. Mix 20% Kaiwei188 oil with 2.5% alpha-cypermethrin. Dilute them by 30 to 40 times if they are used to prevent Apripona germaria and other stem-eating pest. Dilute them by 3000 times if used to control leaf pests. At the same time, it can prevent the anti-pesticide ability. During the oviposit period, injecting the solution diluted by 40 times into the trough can kill pest eggs and larva.

70% Thiophanate-methyl wettable powder is broad spectrum fungicides. And it can control some disease of triploid of Populus tomentosa Carr. like leaf rust, brown spot, anthracnose and canker. Spray after diluted by 1000 time. During the first days of disease, spray once every seven days. This kind of agro-chemical is especially used for controlling disease.

The above agro-chemicals used are high effective, low toxicity and residue and in accordance with the specification of pesticide management issued by concerned departments, free of the prohibited or restricted products. Farmers should use them according to the concrete situation.

4 The Technique Regulation for the Integrated Control of Major Disease/Pest at Different Stages

**Tasks at the First Quarter**

Make a good investigation of pest situation after winter: clarify the death rate, distribution location and density, formulate the control plan for the whole year on the basis of the above information, at the same time, clear the woods environment, prune branches infected with disease or pest, begin to inject medicaments to control. Due to the low resistibility of the after-winter generation of stem-eating pests, the effect of lower consistency medicaments will be the same as that of higher ones.

**Tasks at the Second Quarter**

The second quarter is the critical period of controlling pest and disease. An active work done during this period will lay a good foundation for the work in the whole year. In this period kinds of Cerambycidae begin to get eclosion, so it is a favorable period to control imago. A female imago can lay over100 eggs; therefore, killing a female imago is equal to king 100 larvae. And the cost is relatively low. The method of controlling Apriona rugicollis imago: firstly, to remove Papermulberries and mulberries within 200 metres around Populus sp. Woods; secondly, to spray Cypermethrin to the burgeon of Papermulberries and mulberries during the egg-laying period when imago need supplement nutrition, for example, green Weilei(70% Cypermethrin suspension agent) diluted by 200 times or Rigao (2.5% Cypermethrin)
diluted by 200 times can kill imago; thirdly, catch imago at the dusk, collect them and destroy together.

Leaf-eating pest rarely occurs on triploid of populus tomentosa carr. It’s hard for them to cause harm. But attentions should be paid in the area where black poplars are distributed. Kill them immediately by medicament as long as a few are found.

High humidity and high temperature cause the second quarter a peak time of disease, so this quarter is also a main period of controlling disease. Diseases are mainly anthracnose, brown spot, canker and root cancer. Measures should be adopted at the beginning period of disease. Firstly, pay attention to discharge water, preventing waterlogging; secondly, clear dry branches, fallen leaves and weeds; thirdly, from March to June, spray high-effect and low-toxicity bactericide every 10 days; fourthly, pay attention to the choice of intercrops, between woods planting cotton and soybean instead of tomatoes and potatoes.

**Tasks at the Third Quarter**

This quarter is the peak time of the pest occurrence. July is the spawn peak period of Apriona rugicollis, in which we should concentrate manpower and material to control them and other stem-eating pest. Organize a special team for pest control, adopt the method of injecting medicament while investigating to prevent eggs and larva in the grooves, try all best to kill them before they enter xylem. In order to reach the goal of both pests-killing, low cost and being friendly to environment, use triflurorocypromethrin pesticide as much as possible, due to its high effect, low toxicity and residue. The dosage and consistency should be controlled at the lowest level.

Hot and dry summer is also the peak time for the reproduction of leaf-eating pest. We should grasp the pest development timely guided by the principle of control at an early stage.

At the late stage of the occurrence of every pest, the effect of bactericide isn’t obvious any more. Under such circumstances, except using bactericide spray for the specials, usually, we can adopt the method of clearing stricken branches and leaves to reduce the room for the reproduction of pathogenic bacteria.

**Main Tasks at the Fourth Quarter**

Continue to inject medicament to kill the left Apriona rugicollis, laying a good foundation for the elimination of pest in the next year. Try all best to maintain the rate of stem-eating-pest-stricken plants less than 1%. After entering winter, clear the stricken stems and fallen leaves in the woods, pruning stricken branches. Make a good investigation of the pest that will live through the winter. Summarize the experience and lessons in the whole year, train forest-protection personnel, and improve control level step by step.
4. The Content of Project Construction and Implementation

4.1 The Organization of Project Implementation

Establish the expert group of pest/disease control, which will be responsible for the draw-out and implementation of measures for controlling pest/disease/weed, and instruction, training of the farmers at the project area how to control pest/disease/weed as well. The group consists of specialists mainly from plant protection institute of Hunan Academy of Agricultural Sciences, Hunan Agricultural University, Changde City Plant Protection Station, and Agricultural Technique Extension Stations at the county level. Vice chief manager Mr. Zhang Xianwen takes charge of the carry-out of overall control of pest/disease. The company will send professional technicians to instruct farmers, one person in charge of 500 mu. A control team will be set up at each village, responsible for the implementation of pest/disease controls such as the distribution of pest/disease occurrence predication, agro-chemicals and spray machinery, and the inspecting of the control effectiveness. The teams at the township and village will be supported with certain amount of spray apparatus and communication facilities.

4.2 The Establishment of the Predication System for Pest/Disease Occurrences at Project Area

The company will establish Populus Tomentosa Carr. research institute at the seed reproduction base, build laboratory equipped with excellent technological talents and advanced equipments. Professor Zhu Zhiti will be the superintendent of this institute, and pest/disease control experts Professor Chen Huasheng, Professor Li Zhenyu, inheritance/cross breeding/forestation experts Professor Lin Huibin, and doctor tutor Kuang Xiangyang are hired. All these technological personnel will actively develop seed production and demonstrate pest/disease control, giving technological instruction to farmers face to face regularly. Establish County-Commune-Village multi-level forecast network, equipped with multi-level technician with professional control knowledge, engaging in the investigation of pest situation and the instruction of control methods. Establish survey and report management method and data file management system so as to analyze and distribute the occurrence and development of pest/disease timely.

4.3 The Training of Technicians at the Level of County and Commune, and the Farmers at Project Area

For the technicians dealing with examination, predict, and control and the farmers at project area, two trainings each year is needed, about 100 persons each time. The training fees are paid out from training and examination investment. And the focus of
these trainings is the prevention and control of the pest and disease of triploid of Populus Tomentosa Carr.

4.4 The Arrangement of Pest/Disease Control Investment

The arrangement of pest/disease control investment is mainly constituted by the following two aspects: one aspect is 100,800 yuan for the pest/disease control pay, including 51,000 yuan paid by the World Bank, and the other aspect is about 300,000 yuan for the agro-chemicals, on the company’s own account.

4.5 The Demonstration and Extension of New Techniques

Fully expand the extension of new comprehensive-control technology. The extension area is about 40,000mu, and the extension expense is paid out from the training and examination investment.

5 The Monitoring and Evaluation

Upon implementation of project, the following goals will be reached at the Populus Tomentosa Carr. demonstration area:

· The 30% reduction of agro-chemicals application rate over the beginning of project or non-project area, 10% reduction for each production season.

· The damage extent of pest/disease at the project area will be below 10%, including less than 5% for 50% project area. 30%-50% decreases of damages over the non-project area.

· 100% extension of highly-effective, low toxicity and residual of agro-chemicals over the project area.

· 30% cost reduction of pest/disease control. The biodiversities will be realized at the project area. The community of pests’ natural enemy increases markedly. The frequency and damage decreases, compared with non-project area.

· 100% of new technique extension, 90% of the access and application of new technique for fruits-growers, the enhanced awareness of environmental protection.

Through the execution of PMP at the project area, train farmers as planned, use agro-chemicals safely, improve spraying technology, enhance pests monitoring and predict, select high-effective, low-toxicity and residue agro-chemical varieties, establish and enhance safety production technology guarantee system, agro-chemical residue monitoring system, non-environmental pollution agricultural products standard system to ensure the environment quality and safety at the project area.