ANHUI YELLOW MOUNTAIN NEW COUNTRYSIDE DEMONSTRATION PROJECT

Pest Management Plan

(For Appraisal)

Huangshan New Countryside Project Management Office

June 2013
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1 General Information

1.1 Project Overview

(1) Project Name: Demonstration Project for New Countryside Construction by WB Loan of Huangshan in Anhui.

(2) Constructed by: Project Office for New Countryside Construction by WB in Huangshan City.

(3) Construction location: The project construction site distributes in 3 Districts, 4 Counties and 68 villages in Huangshan City, including 3 villages in Tunxi District, 8 villages in Huizhou District, 12 villages in Huangshan District, 20 villages in Shexian County, 7 villages in Xiuning County, 6 villages in Yixian County and 12 Villages in Qimen County.

(4) Construction contents includes: such infrastructure construction projects as rural road traffic, rural water supply and drainage works, small-scale water conservancy facilities and tourism supporting facilities; cultural heritage protection and utilization project; characteristic industry construction project and capability construction project

(5) The total planned investment estimate for this project is of RMB 917,660,000. The project period is of 5 years.

1.2 Agricultural industry base construction project

This characteristic industry parks involve 28 villages, 12377 mu industry park and 9 products such as Chinese medicine, Vegetable, water product, tea, rape, flower, fruit tree, seeding and bamboo, which are described as follows:

(1) Chinese medicine

The Chinese medicine industry involves one village and 85 mu new Qishu base will be built.

Lixi village: construct newly Qishu base, which is 85 mu Qishu standardized planting base.

(2) Vegetables
Vegetable industry: it involves 4 villages, 1800 mu Vegetable bases.

Xinjiang village: reconstruct and upgrade 200 mu Vegetable bases.

Baiguo tree village: reconstruct and upgrade 150 mu Vegetable base and 50 mu new Vegetable base will be built.

Longshan village: construct 500 mu Vegetable base.

Fuhe village: reconstruct and upgrade 700 mu Vegetable base and construct 200 Vegetable base.

(3) Aquatic products

The aquatic industry involves a village.

Tianli village: repair 50 abandoned fish pools, totally 2500m².

(4) Tea

Tea industry: it involves 13 villages, 4882 mu tea garden and 6300 m² tea processing plant, which is described as follows:

Longyuan village: construct 100 mu Taiping Houkui tea demonstration base.

Chaoyang village: reconstruct 357 mu tea base.

Zhongdun village: reconstruct 400 mu tea garden base.

Shuxi village: reconstruct 300 mu tea garden base.

Sanhe village: reconstruct 600 mu tea garden base and construct 30 mu tea nursery base.

Shitan village: construct 400 mu white tea seeding base and 200 mu ecological organic tea garden base.

MiaoLam Tsuen: construct 200 mu good seed standard nonsexual tea garden, reconstruct old tea garden and construct 800 mu standard tea garden.

Shenchong village: reconstruct 600 mu tea garden base.

Huansha village: construction 215 mu organic tea base.

Luxi village: reconstruct 280 mu Ancha base.

Maan village: construct 400 trapezia tea garden.
(5) Flower
Flow industry: it involves 3 villages and 330 mu new flower base, including bonsai, rose and azalea.
Rao village: construct 50 mu new flower base, including Anhui bonsai Quemei and plum blossom, etc.
Xing village: construct 200 mu new flower base, including rose and Damashigeshan.
Longshan village: construct 80 mu new flower base, including cuckoo, Xiajuan, Majuan and Gaoshan cuckoo.

(6) Rape
Rape industry: it involves 1 village and construct 1063 new rape base.
Guo village: construct 1063 mu new rape base, variety is rape.

(7) Fruit tree
Fruit tree industry: it involves 5 villages and 1045 mu fruit wood base, including orange and peach. It is described as follows:
Liu village: blueberry garden 52 mu.
Xingcun village: construct 170 mu new fruit wood base, variety is orange.
Jiekou village: construct 273 mu fruit wood base, variety is orange.
Taoyuan village: construct 50 mu fruit wood base, including Zao Xiangyu, Wu Changtao and Yanhong.
Xiangtan village: construct 500 mu fruit wood base, variety is orange.

(8) Seeding
Seeding industry: total construction area is 2806 mu, including:
Yongfeng village: it includes 300 mu seeding base and 2447 mu barren hill
Liu village: chinese yew garden 59 mu.

(9) Bamboo
Bamboo industry: total building area is 562 mu, including:
Liu village: 50 mu bamboo base

Xinfen village: 212 mu bamboo base

Hongqin village: 300 mu bamboo base

The agricultural and forest characteristic industry project is mainly divided into three types. First, most projects aim to upgrade and reconstruct existing vegetable base and tea garden, e.g. Xinjiang village vegetable base reconstruction project and Chaoyang village tea garden base reconstruction project. Secondly, most projects aim to change the plant type on the old plating land into vegetable base, rape base, flower base, fruit wood base and seeding base, e.g. Longshan village new vegetable base project and Jiekou village new fruit wood base project. Thirdly, individual projects are for different purposes. E.g. Qishu base construction project of Longxi village involves partial barren land reconstruction garden plot (about 40mu), construct the ecological organic tea garden base of Shitai village involves 200 mu barren slope reconstruction of tea garden, bamboo base of Xinfeng village involves 212 mu barren reconstruction of forest, the seeding base project of Yongfeng village involves 300 barren land which is reconstructed as the forest land. The barren hill forest reconstruction project of Yongfeng village involves 2447 mu barren land forest reconstruction.

According to Letter on Pre-trial Comment for the Anhui Huangshan New Village Construction Demonstration Project Land Financed by WB Huangshan Natural Land Resource Bureau, the project land meets the national land supply policy and General Plan for Huangshan land Utilization (2006-2020).

1.3 Contents and Purpose of the Report

This Pest Management Plan (PMP) is developed as required by the World Bank's business policy, "Integrated Pest Management" (OP 4.09), and aimed to facilitate pest monitoring and control for “Anhui Yellow Mountain New Countryside Demonstration Project Utilizing WB Loans”.

This report contains: investigating the background and significance of the project, investigating pest and disease problems related to the flowers and nursery stock industry, investigating China and World Bank policies on pest management and pesticide use, identifying goals of pest management for this project, developing pest management plans and pesticide usage, making clear assessment objectives and implementation plans, proposing monitoring and evaluation programs, estimating
capacity building for pest and disease control and explaining the funding resource to ensure that all management actions can be implemented.

1.4 Concept of Integrated Pest Management

In agricultural terms, Integrated Pest Management is a pest control strategy implemented in three phases that are closely linked: prevention, monitoring and intervention. This strategy uses a series of complementary control methods, such as agricultural, physical, ecological and chemical methods. It is a managerial approach involving ecology, and its goal is to cut back on or not to use pesticides at all to reduce the pollution of the natural environment and ecological environment as a result of using chemicals.

This project supports Integrated Pest Management (IPM), which involves the following aspects:

pest management is meant to prevent pests from causing financial damage, rather than eliminate pests and diseases;

Whenever possible, non-chemical measures shall be used to contain the pests and keep them at a minimum level;

Where pesticides have to be used, such pesticides and their usage shall be made as harmless as possible to beneficial organisms, human beings and the ecological environment.
2 Main Plant Diseases and Insect Pests, Control Measures and Current Management Situation

2.1 Current situation on distribution and main control method for diseases and pests in agriculture and forestry

2.1.1 Current distribution situation and damage of main diseases and pests

The data provided by Huangshan Plant Quarantine and Plant Protection Station shows that the actual losses of grain, oil plants, fruiter, vegetables and other commercial crops caused by diseases, insect pests, farmland weeds and rats in various districts and counties of Huangshan in 2011 were of 4366.6 t, 466.7 t and 315.4 t, 1734 t and 796.8 t respectively. Among these districts and counties, Xiuning County accounted for actual maximum loss in grain to be of 1525.1 t; Huizhou District accounted for actual maximum loss in oil plants and vegetables, while Shexian County accounted for actual maximum loss in fruit trees.

Table 2.1-1 Loss condition of various agriculture and forestry crops caused by disease, pest and weeds in various districts and counties

<table>
<thead>
<tr>
<th>Administrative Division</th>
<th>Grain</th>
<th>Oil</th>
<th>Fruit Trees</th>
<th>Vegetables</th>
<th>Other Commercial Crops</th>
<th>Grain</th>
<th>Oil</th>
<th>Fruit Trees</th>
<th>Vegetables</th>
<th>Other Commercial Crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>26893.9</td>
<td>2820.7</td>
<td>1925.5</td>
<td>8530.7</td>
<td>4066.8</td>
<td>4366.6</td>
<td>466.7</td>
<td>315.4</td>
<td>1734.0</td>
<td>796.8</td>
</tr>
<tr>
<td>Tunxi District</td>
<td>823.2</td>
<td>28.85</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Huangshan District</td>
<td>2560.0</td>
<td>374.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Huizhou District</td>
<td>1720.3</td>
<td>470.7</td>
<td>11.2</td>
<td>7444.0</td>
<td>1374.3</td>
<td>527.8</td>
<td>151.7</td>
<td>5.5</td>
<td>1290.9</td>
<td>226.6</td>
</tr>
<tr>
<td>Shexian County</td>
<td>7189.7</td>
<td>773.5</td>
<td>1413.0</td>
<td></td>
<td>1512.8</td>
<td>784.2</td>
<td>81.2</td>
<td>159.2</td>
<td>196.7</td>
<td></td>
</tr>
<tr>
<td>Xiuning County</td>
<td>10556.8</td>
<td>710.2</td>
<td>0.0</td>
<td>11.7</td>
<td>24.0</td>
<td>1525.1</td>
<td>36.2</td>
<td>0.0</td>
<td>3.05</td>
<td>5.0</td>
</tr>
<tr>
<td>Yixian County</td>
<td>2804.9</td>
<td>183.0</td>
<td>273.3</td>
<td></td>
<td>405.7</td>
<td>518.7</td>
<td>42.0</td>
<td>63.8</td>
<td>153.6</td>
<td></td>
</tr>
<tr>
<td>Qimen County</td>
<td>1239.0</td>
<td>280.0</td>
<td>228.0</td>
<td>1075.0</td>
<td>750.0</td>
<td>603.0</td>
<td>110.0</td>
<td>87.0</td>
<td>440.0</td>
<td>215.0</td>
</tr>
</tbody>
</table>

According the investigation and interview, rice in Huangshan city are mainly plagued by rice planthopper, rice leaf roller, Chilo suppressalis, Rice blast, rice stripe disease, black streaked dwarf, rice false smut etc. Corn are mainly plagued by rough dwarf
disease, aphid, laodelphax striatellus, thrips, rust disease, corn borer, cutworm etc., rapes are mainly plagued by sclerotinia rot.


Flowers and seedlings in Huangshan city are mainly plagued by: (1) infectious diseases, anthracnose, blight, rust, powdery mildew, leaf spot and gray mold caused by fungi, bacteria, viruses, nematodes and other pathogens; (2) harms inflicted by insects, mites and molluscs, including Lepidoptera, moths and butterflies, Homoptera aphids and scale insects, and Coleoptera beetles and ladybugs, as well as ants and red spiders.

2.1.2 Current Pest Control Measures

The investigation into the current situation shows that farmers have little knowledge about diseases and pests prevention and control, mainly relying on chemical control, which is slow at the monitoring of diseases and pests, and the controlling begins only after large area of pests; they have little knowledge about the use of chemical pesticides, protective measures, environmental pollution and the harm to the human body, and their disposal of chemicals and waste package is casual. No use of pesticides banned by the state has been discovered. Investigation reveals that florists at project areas mainly use three methods to prevent and control diseases and pests of flowers and plants:

(1) Garden Planting Prevention and Control

Current garden planting prevention and control measures in the project area include: timely watering, maintaining the sanitation inside the greenhouse, improving environment condition, deep plowing in winter, timely trimming, disposing infected plants, adjusting sowing time, reasonable rotation, selection and cultivation of insect
resistance breed and other simple protective measures.

(2) Physical and Mechanic Prevention and Control

Physical measures to prevent and control diseases and pests in the project area used by the florists are also very few, mainly simple unarmed pests killing or clear, labor removing infected branches or plants, rarely related to the more contemporary light, heat, electricity and radioactivity, temperature, humidity, sound waves, and other physical diseases and pests control measures.

(3) Chemical Prevention and Control

Chemical prevention and control measures are most widely used in the project area, mainly large-scale usage of chemical pesticides, which is highly dependent on chemicals, and blind medication, failure to grasp the best spray timing and lag in control technology are existed.

Control Measures for Pests and Diseases and Current Status of Pesticides Usage in the Project Area are presented in Table 2.1-2.

<table>
<thead>
<tr>
<th>Trees and Flowers</th>
<th>Main Pests and Diseases</th>
<th>Control Measures and Current Staus of Pesticides Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camellia sinensis</td>
<td>Major diseases are tea anthracnose, Cercospora theae Breada De Haan, tea algae leaf spot, tea grey blight, tea gall, tea netted blister blight, Coccochorina hottai Hara, tea bud blight, Meloidogyne sp., lichen and moss. Major pests are tea Empoaasca leafhopper, mites, aleurocanthus spiniferus, Euproctis pseudoconspersa Strand, Dasychira</td>
<td>Use pesticides in strict accordance with the indicators of prevention and treatment instead of rushing to them as soon as pest or disease is discovered. Where density of pests exceeds the control indicators, for instance, 5% of the plants are damaged by Polyphagotarsonemus latus, 20% are affected by mite eggs, or one mu has 7,000-9,000 caterpillars or 10-15 lesser green leaf hoppers, pesticides can be used safely and reasonable in line with the national standard for the production of pollution-free tea. Pesticides with high toxicity and high residual, such as methamidophos, methyl parathion, fenvalerate and dicofof are prohibited. Use the right pesticides with proper concentration and safe intervals in a proper way. If Bt preparations 300-500 times solution are used against Euproctis pseudoconspersa, Ectropis oblique, Dasychira baibarana Matsumura and Adoxophyes honmai, the safety interval is 3-5 days. If 0.2% matrine 1000-1500 times solution is used against Euproctis pseudoconspersa, Dasychira baibarana Matsumura and Adoxophyes honmai, the safety</td>
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<tr>
<td>Trees and Flowers</td>
<td>Main Pests and Diseases</td>
<td>Control Measures and Current Status of Pesticides Usage</td>
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</tr>
<tr>
<td>baibarana, Matsumura, Mylocerinus aurolineatus Voss, Ectropis oblique, Homona menciana Walker, Adoxophyes honmai, tea stem girdler, Caloptilia theivora, Clania minuscula Butler, Chalioides kondonis Matsumura, Iragoides fasciata Moore, Zeuzera coffeae Nietner, Casmara patrona Meyrick, Andraca bipunctata Walker, Aeolethestes induta Newman, Ceroplastes ceriferus Anderson, Aspidiotus destructor, Pinnaspis theae, Icerya purchasi, Chlorops theaelelroy, Toxoptera aurantii Boyer, Dendrothrips minowai Priesner, Poecilocoris latus Dallas, and termites.</td>
<td>interval is 5 days. The safety interval for phoxim is 10 days. Pesticides should be used alternately, with each pesticide used only once during the tea picking season. This is to prevent pest resistance and reduce residual.</td>
<td></td>
</tr>
<tr>
<td>Sweet Osmanthus</td>
<td>Major diseases include Cercospora leaf spot, rot spot and anthracnose that affect leaves of sweet-scented osmanthus. Major pests include cup moth, mites, scale insects, whitefly,</td>
<td>Common disease control measures: Spray 50% Carbendazim WP 1,000 times solution or 50% Benomyl WP 1,000 to 1,500 times solution. In disease stricken areas, seedlings need to be disinfected by immersion in 1,000 times potassium permanganate solution after removed from the nursery. Common pest control measures: Spray 20% Fenvalerate 2,000 times solution or 90% trichlorfon crystal 1,000 times solution or 40% Dimethoate EC 1,000 times solution.</td>
</tr>
<tr>
<td>Trees and Flowers</td>
<td>Main Pests and Diseases</td>
<td>Control Measures and Current Status of Pesticides Usage</td>
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<tr>
<td></td>
<td>cream moths, bag moths, plant hoppers and Atractomorpha locusts.</td>
<td>Powdery mildew control method: pay attention to nursery hygiene, thin out seedlings and remove and burn any diseased plant whenever discovered. If symptoms are obvious, spray 0.3-0.5 degrees Baume lime sulfur once every 10 days for continuous 3-4 sprays, or 70% thiophanate-methyl wettable powder 800 to 1,000 times solution. Leaf roller control method: kill larvae by spraying 40% dimethoate 200 ~ 300 times solution, and also weeding and ridging when larvae are pupating in large numbers. Leaf roller control method: spray 40% dimethoate 200 ~ 300 times solution. Mesoneura rufonota Rohwer control method: spray 90% trichlorfon or 50% malathion emulsion 2,000 times solutions. Orthaga achatina Butler control method: spray 90% trichlorfon 4,000 to 5,000 times solution. Caligula japonica control method: spray 10% cypermethrin 800-1,000 times, or 50% malathion EC 800-1,000 times solution, or 65% trichlorfon emulsion 500-800 times solution, which has better insecticidal effect.</td>
</tr>
<tr>
<td>Camphor tree</td>
<td>Major pests and diseases are powdery mildew, leaf rollers, Mesoneura rufonota Rohwer, Orthaga achatina Butler and camphor silkworms.</td>
<td></td>
</tr>
<tr>
<td>Elaeocarpus</td>
<td>Elaeocarpus rarely suffers from disease, and the main problem is pests. Main pests are leaf-eating insects, Anomala corpulenta Motschulsky and soil pests, grubs and cutworms.</td>
<td>In preventing or killing Anomala corpulenta Motschulsky, shake them off and kill or set light traps at night, or use 50% dichlorvos emulsion 800 times solution. In controlling grubs, cutworms and other soil pests, pour 0.125% -0.167% solutions of dichlorvos or methamidophos EC into the holes dugged with bamboo sticks in the bed surface.</td>
</tr>
<tr>
<td>Prunus cerasifera</td>
<td>Diseases are by black spot, bacterial shot hole and sooty mould caused by aphids. Pests mainly include spider mites, slugs and bag moths.</td>
<td>Use 50% Carbendazim WP 800 times solution, or 70% thiophanate-methyl superfine WP 1,000 times solution for prevention. In case the disease has already occurred, spray 40% omethoate EC 1,000 times solution.</td>
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<tr>
<td>Trees and Flowers</td>
<td>Main Pests and Diseases</td>
<td>Control Measures and Current Status of Pesticides Usage</td>
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</tr>
<tr>
<td>Metasequoia</td>
<td>Major pests and diseases are damping-off (Rhizoctonia solani), metasequoia red blight, Choristoneura fumiferana and Odontotermes formosanus.</td>
<td>Damping-off (Rhizoctonia solani): in the autumn after the leaves have fallen, remove the fallen leaves and spray to the ground 3-5 Be calcium polysulfide. Metasequoia red blight: immediately after the rainy season, spray the tree tops with 1% Bordeaux mixture once every 10-15 days for 4-5 times, and the disease can be prevented. Choristoneura fumiferana: the period immediately after the larvae wake up from hibernation hazard (early and middle April) is the best time for prevention and treatment. Use 50% fenitrothion, 40% dimethoate, 80% DDVP and pyrethroid agents. In the dry season (July and August) when outbreak occurs, manually remove the larvae and burn them (with bags), or spray 1,000 times fenitrothion to kill the larvae. Odontotermes formosanus: the most effective way to prevent is spraying mirex between May and June, or use 3% carbofuran (U.S.), 10-15g per plant. Avoid rain or exposure to sun during administration in order that the efficacy may stay longer.</td>
</tr>
<tr>
<td>Taxus chinensis</td>
<td>Main pests and diseases are damping-off, stem rot, Sclerotium rolfsii, Phytophthora mildew, spider mites, aphids and scale insects.</td>
<td>Common disease control measures: Spray 50% Carbendazim WP 1000 times solution or 50% Benomyl WP 1,000 to 1500 times solution. Common pest control measures: Spray 20% Fenvalerate 2,000 times solution or 90% trichlorfon crystal 1,000 times solution or 40% Dimethoate EC 1,000 times solution.</td>
</tr>
<tr>
<td>Podocarpus</td>
<td>Main diseases are leaf spot and anthracnose. Pests include scale insects, spider mites and Cryptothelea Variegata Snellen.</td>
<td>For leaf spot and anthracnose, spray 50% thiophanate-methyl wettable powder 500 times solution. For pests, use 40% omethoate EC1,500 times solution.</td>
</tr>
<tr>
<td>Magnolia</td>
<td>Common pests and diseases are anthracnose, leaf spot, Antheraea pernyi, Ceroplastes rubens Maskell, Icerya purchasi Maskell, spider mites, Cryptothelea</td>
<td>Anthracnose control methods: in early stages, spray 84.1% Haoduobao WP and 77% Kocide WP or 1:2:200 Bordeaux mixture solutions once every 15 days for 2-3 times. Spray 75% chlorothalonil WP 600-1000 times solution, 70% thiram 500 times solution, 65% Zineb WP 500-800 times solution, 50% Carbendazim WP + 75% Chlorothalonil WP 800 times solution, 50% sulfur flowable formulation 500 times solution, and 70% thiophanate-methyl ultrafine WP 1500 times solution.</td>
</tr>
<tr>
<td>Trees and Flowers</td>
<td>Main Pests and Diseases</td>
<td>Control Measures and Current Status of Pesticides Usage</td>
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<tr>
<td><strong>Trees and Flowers</strong></td>
<td><strong>Main Pests and Diseases</strong></td>
<td><strong>Control Measures and Current Status of Pesticides Usage</strong></td>
</tr>
<tr>
<td>Loropetalum chinense var. rubrum</td>
<td>Major diseases are anthracnose and damping-off. Major pests are aphids, geometrid moths, Ophiusa tirhaca, Pantheahonei, cutworms and beetles.</td>
<td>Common disease control measures: Spray 50% Carbendazim WP 1000 times solution or 50% Benomyl WP 1,000 to 1500 times solution. Common pest control measures: Spray 20% Fenvalerate 2,000 times solution or 90% trichlorfon crystal 1,000 times solution or 40% Dimethoate EC 1,000 times solution.</td>
</tr>
<tr>
<td>Prunus persica f. atropurpurea</td>
<td>Pests are aphids and spider mites. Diseases are mainly white rust and leaf curl.</td>
<td>For pests, spray 40% omethoate EC 1,000 times solution. For white rust, spray 50% Carboxin WP 2,000 times solution. For leaf curl, use lime sulfur.</td>
</tr>
<tr>
<td>Pine</td>
<td>Pests and diseases are rust, oriental arborvitae tussock, and spider mite.</td>
<td>Rust: bacteria invade shoots and form gall clusters on twigs. Leaf will turn yellow and the twigs die. Control methods: spray Bordeaux mixture 100 times solution on the trunk once every 10 days for 3 times between July and August. Use 1 - 3 degrees lime sulfur between March and April. Oriental arborvitae tussock: After the occurrence of pests, spray dicofol 1,000-1,500 times solution.</td>
</tr>
<tr>
<td>Cypress</td>
<td>Prone to spider mites, damping-off and dead-arm.</td>
<td>To control spider mites, alternately spray 20% Mitrac EC 3,000 times solution and 1.8% abamectin EC 5,000 times solution, or 15% triazine EC 3000 times solution. In the early stages of blight, water with 70% thiophanate-methyl WP 700-800 times solution. To control dead-arm, spray 50% Tuzet WP or 70% chlorothalonil WP 1000 times solutions.</td>
</tr>
<tr>
<td>Ligustrum</td>
<td>Leaf spot, sooty</td>
<td>Leaf spot: 80% Dithane WP is effective. Alternatively, spray</td>
</tr>
<tr>
<td>Trees and Flowers</td>
<td>Main Pests and Diseases</td>
<td>Control Measures and Current Status of Pesticides Usage</td>
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</tr>
<tr>
<td><em>lucidum</em> Ait</td>
<td>mould, fusarium wilt and mealybugs</td>
<td>25% carbendazim WP 500 times solution, or 70% thiophanate-methyl 1000 times, 80% Zineb 500 times, or 75% chlorothalonil WP 600 times solutions. Sooty mould: in the peak period, spray 70% thiophanate 800-1000 times solution or 50% carbendazim 1000 times solution to contain the disease. Fusarium wilt: spray pesticides in later May in disease prone areas for prevention. Water with 70% thiophanate-methyl 500 times, 40% carbendazim SC 600 times or 75% chlorothalonil WP 500 times solutions, once every month between May and August at the beginning of the month and once every half month if signs of the disease appear. Mealybugs: In the period of nymph to adult, spray 40% Supracide 1500-2000 times, 10% imidacloprid 2000 times or 40% omethoate 1000 times solutions. If nymphs are serious, use Supracide or imidacloprid mixed with omethoate for better effect. Spray continuously 2-3 times depending on the result.</td>
</tr>
<tr>
<td>Rose</td>
<td>Major pests are similar to those of <em>Rosa chinensis</em>, including noctuids, beetles, and black cutworm.</td>
<td>Leaf insects can be killed with spray of 10% imidacloprid WP + new lipid membrane 800 times solution. Root pests can be killed with spray of fenitrothion and quinalphos EC + new lipid membrane 800 times solution. For other pests, refer to control measures for <em>rosa chinensis</em>.</td>
</tr>
<tr>
<td>Rhododendron</td>
<td>Diseases are mainly root rot, leaf spot, black spot, leaf blight, iron-deficiency chlorosis. Pests are spider mite, <em>Stephanitis nashi</em> Esaki et Takeya, bag moths, terminal bud rollers and terminal bud leaf rollers, and geometrids.</td>
<td>Leaf spot: in the late and early flowering phase, spray thiophanate 800 times solution once, increase low-light illumination in the morning and afternoon, improve ventilation, and burn sick plants and leaves. Stem rot: improve ventilation and administer potassium in the morning and afternoon when the sunshine is good to enhance resistance to disease. In May, apply thiophanate 200 times solution to the trunk once every 7-10 days for several times. Spider mite: after the pest appears, spray Dimite 1000 times solution or 40% dimethoate 1500 times solution, once every 7 days for 3 times. In winter, clean the field by burning dry branches and fallen leaves. <em>Stephanitis nashi</em> Esaki et Takeya: in the active period, spray dimethoate 1500 times solution or dichlorvos, and eliminate overwintering parasites and fallen leaves in the winter. Bag moths: capture the kill. Spray trichlorfon crystal</td>
</tr>
</tbody>
</table>
### Trees and Flowers

#### Plum blossom

**Main Pests and Diseases**
- Major pests and diseases are anthracnose, gummosis, and scale insects, aphids, spider mites and leafhoppers.

**Control Measures and Current Status of Pesticides Usage**
- 1500 times solution to kill the larvae.
- Terminal bud leaf rollers: remove the buds infected by the worm and kill larvae and pupae by spray dimethoate and dichlorvos 1500 times solution.
- Aphids and spider mites: upon onset, spray 80% dichlorvos 1500 times solution, or dicofol 1000 times solution.
- Longhorn beetles: inject 80% dichlorvos EC 30 times solution into the wormholes, or plug the wormholes with dichlorvos poisoning mud, or, during the peak of emergence, spray the branches with 90% crystal trichlorfon 1000-2000 times, or 50% of the phoxim emulsion 1000-1500 times, or 50% malathion emulsion 1000-1500 times solution. For pest control, dimethoate pesticides are prohibited in order to avoid phytotoxicity causing leaves to fall.

#### Sago cycas

**Main Pests and Diseases**
- Major pests and diseases are scab, anthracnose, red spot disease and white spot disease.

**Control Measures and Current Status of Pesticides Usage**
- Scab: in the early stages, spray 1: 1:200 Bordeaux mixture or 75% chlorothalonil WP 600 times solution once every 10 days spray or more frequent, depending on the severity of disease. Anthracnose, also known as red spot disease: when leaves are coming out, spray 27% lipid membrane 150 times solution. When infected, spray thiram 500-800 times solution once every 7 days for 2-3 times.
- White spot disease: in the early stages, spray 70% thiram 500 times or 50% carbendazim 500 times solution. As cycas leaves contain keratin, 0.1% adhesive should be added to the solution for better effect.

### 2.1.3 Overall Assessment of Current Pest Management in the Project Area

At present, the flowers and plants in the project area are mainly planted by individual investors with less specialized, intensive and large-scale planting. They mainly use chemical control method supported by agricultural or horticultural control and simple physical and mechanical prevention measures with weak sense of integrated management of pests and diseases.

1. Surveillance and prevention of diseases and pests lags behind, monitoring mainly relying on the investigation of the florists; the communication with superior diseases and pests regulators is untimely; the monitoring of diseases and pests is not accurate; the investigation, surveillance and prevention of the diseases lags behind.

2. Pest control methods are mainly dominated by chemical control methods, highly relying on chemicals, with a wide usage of chemical pesticides. There are phenomena
such as blind medication and failing to grasp the best time, large amount of pesticides and few varieties of the pesticides.

(3) Have little knowledge about the use of chemical pesticides and its protective measures, environmental pollution, harm to the human body and be casual to the disposal of chemicals and waste packages. There is a big hazard of environmental pollution. No use of pesticides banned by the state is discovered.

(4) Have comparatively low knowledge on the integrated management of diseases and pests, merely based on chemical control method and supported by agricultural or horticultural control and simple physical and mechanical prevention measures, lack advanced knowledge on diseases and pests prevention and control such as prevention first, combining prevention with control, suiting our measures to differing conditions in terms of locality and time and integrated usage of various prevention measures.

2.2 Policies, Management Structure and Institutional Capacity

2.2.1 Pest Management Policies

- Major legislation and regulations on management of forestry development and diseases and pests management in Anhui province and China are outlined as follows:
  - Forestry Law of the People's Republic of China (promulgated by NPC Standing Committee on January 1, 1985);
  - Seed Law of the People's Republic of China (promulgated by NPC Standing Committee on August 28, 2004);
  - Regulations on Plant Quarantine (promulgated by State Council on May 13, 1992);
  - Regulations on Forest Pest Control (promulgated by State Council on December 18, 1989);
  - Regulations for the Implementation of Forestry Law of the People's Republic of China (promulgated by State Council on January 29, 2000);
  - Rules for Implementation of Regulations on Plant Quarantine (promulgated by the State Forestry Administration on July 26, 1994);
  - Forest Pest Prediction and Forecast Management Method (promulgated by the
State Forestry Administration on July 18, 2002);

- Measures for Administration of Production and Operation License of Forest Seeds (promulgated by the State Forestry Administration on December 15, 2002);

- Regulations on Approving and Supervising the Quarantine of Introduced Forest Seeds, Seedlings and Other Propagating Materials (promulgated by the State Forestry Administration on May 30, 2003);

- Measures for the Treatment of Unexpected Harmful Forest Biological Events (promulgated by the State Forestry Administration on July 1, 2005);

- on March 1, 2004);

- Administrative Regulations of the People’s Republic of China on Pesticides (promulgated by State Council on November 29, 2001);

- Regulations on Safe Use of Pesticides (promulgated by Department of Agriculture, Herding and Fishery and Department of Heath on June 5, 1982);

- Implementation Methods on Administrative Regulations on Pesticides (promulgated by Department of Agriculture on January 8, 2008);

- Pesticide Safe Use Standard GB4285-89 (promulgated by State Environmental Protection Administration in September 1989);

- Implementation Measures for Forest Plants Quarantine in Anhui Province (People’s Government of Anhui Province , June15th,2012);

- Notice on Issue of Control Plan for Major Disease and Pests in Province Crops in 2012 (WNZ No.[2012]49 );

- Notice on Issue of Supervision Work Program for Pesticide Market of Anhui Province in 2012 (WNZH No.[2012]212);

- Notice on Issue of Activity Plan for Pesticide Supervision and Legal Construction Year in 2012 (WNZH No.[2012]291 );

- Notice on Issue of Activity Plan for developing Law Enforcement and Supervision for Special Agricultural Capital Project in Spring (HN No. [2012]25 );

- Notice on Issue of Control Plan for Major Disease and Pests on Rice, Tea, Rape, Corn in Huangshan City in 2012 (HN No. [2012]30 );
Notice on Earnestly Fulfilling the Supervision and Control Work for Plant Quarantine Pest Epidemic (HN No.[2012]64);

2.2.2 Regulatory Framework and Institutional Responsibilities

(1) Diseases and Pests Control and Management
Huangshan Agriculture Committee is a department that Huangshan District Government of Huangshan City is in charge of agriculture and rural work, comprising such divisions as Rural Operating Management Division, Agricultural Products Quality Safety Supervision Division and Agricultural Industrialization Guidance Division, etc. to be responsible for protection and management of agricultural living species resource and new species of plant and animal as well as organizing the epidemic prevention, internal inspection of plant and animal, issuing and exterminating epidemics; the Agricultural Technology Extension and Training Center under jurisdiction is allocated with Huangshan Agricultural Technology Guidance Station, Huangshan Plant Protection And Inspection Station, Huangshan Tea Technology Guidance Station, Huangshan Gardening Technology Guidance Station, Training Department of Huangshan Agricultural Technology Popularization Training Center, Huangshan Soil and Fertilizer Workstation, Huangshan Agricultural Environmental Monitoring Station, Huangshan Agricultural Comprehensive Laboratory, Huangshan Silkworm Technology Guidance Station, etc., their main functions are to organize the introduction, test, demonstration and popularization of new agricultural species, new technology, new materials, executing plant quarantine according to law, take charge of land capacity, soil moisture monitoring within whole city and quality safety inspection of agricultural production, gathering and transmitting information on scientific and technological achievements in agriculture.

(2) Pesticide Supervision and Administration Department

Agricultural administrative authority: Agriculture bureaus of all levels are responsible for agricultural development planning, comprehensive management activities related to agriculture; for the implementation of policies, legal rules and regulations relating to crop and plant cultivation, animal husbandry, agricultural mechanization and rural economic development; for the research, planning and implementation of agricultural and rural economic development strategy and middle and long term development; draft the development plan of agricultural research, education, technology promotion and team construction; the implementation of
developing agriculture with the education and science; organize the selection and implementation of key agricultural research and technical promotion projects; give guidance to the construction of high-yield and high-quality agricultural bases, agricultural education and agricultural skills development.

**The industry and commerce administrative authority:** The industry and commerce administrative authorities of all levels are responsible for the management of the pesticide market; for market supervision, management and administrative law enforcement; for the standardization and maintenance of operational order in various markets in accordance with law; for registration and supervision of market entities; for the management of trademark registration; for advertising supervision and management.

**Quality and technology supervision authority:** Quality and technology supervision authorities at various levels are responsible for the supervision and management of pesticide production and products quality; for carrying out the national and provincial policies relating to the supervision of quality and technology; for the unified management, organization and coordination of quality and technical supervision work in the administrative area; for the supervision of the behavior of quality authentication agencies and the use of authentication marks; for quality and technical supervision and administrative law enforcement.

**Agricultural administrative authority:** Agricultural administrative authorities of all levels are responsible for the quality supervision and management in agricultural chemical markets; for the supervision, administrative penalty and administrative compulsion in agricultural resources and environment protection, the supervision of quality and safety of agricultural products and agricultural intellectual property rights protection in accordance with laws and regulations; for the investigations and punishments of agricultural foreign-related cases and important case cross provinces and cities as well as the cases submitted or should be avoided by junior agriculture departments; for provincial crackdown on fake agricultural products, the supervision of quality and safety of agricultural products, agricultural resources and environment protection and agricultural intellectual property rights protection.

**Safety and environment protection supervisory authority:** Agricultural resources and environment protection stations of all levels and environment protection bureaus are responsible for the supervision and management of agricultural environment
protection; for the guidance to build agricultural resources and environment protection mechanism; for the supervision and management of the prevention of pollution caused by three industrial wastes to agricultural environment and pollution from the overuse of fertilizers and pesticides; for the provincial agricultural environment appraisal and the construction of agricultural environment pollution comprehensive prevention and control demonstration areas.

**Plant protection departments and agricultural technique centers:** Be responsible for monitoring, quarantine prevention and control of diseases and pests; for drug and equipment management; for drug registration; for the demonstration tests, development and promotion of new technology, new pesticide and new equipment; for the training, supervision and management of professional techniques such as pesticide use.

**Professional agencies of pest disease prevention and control:** Be responsible for professional prevention and control of major diseases; for the publicity and training of pest prevention and the safe use of agricultural chemicals.
Figure 2.2-1 Pesticide Supervision and Management Authorities
2.2.3 Pesticide Management and Distribution Systems and the Use of Pesticides

(1) Pesticides Management

In accordance with the *Pesticide Management Regulations of the People's Republic of China and Pesticide Regulation Executive Method* issued by the Ministry of Agriculture in December 2007:

The Ministry of Agriculture is responsible for national pesticide registration, use and supervision; for the making or taking part in making national or industrial standards for the safe use of pesticides, the pesticide quality and pesticide residue.

The department of agriculture administration under the State Council shall be in charge of national pesticide registration and supervision. The competent administrative department of agriculture in provinces, autonomous regions or municipalities directly under the central government shall help the department of agriculture administration under the State Council to do national pesticide registration and supervision. The department of agriculture administration at the county level, in a city divided into districts and autonomous prefecture shall in charge of pesticide supervision within their own administrative areas.

The various levels of people's governments at or above the county level shall be in charge of pesticide supervision within their own administrative areas.

Institute for the Control of Agrochemicals under the Ministry of Agriculture shall be in charge of pesticide registration. Pesticide verification institutions under the competent administrative departments of agriculture in provinces, autonomous regions or municipalities directly under the central government shall help with the pesticide supervision within their own administrative areas.

(2) Pesticide Operation (Distribution Systems)

The following agencies can sell pesticides: The agricultural production material business unit under the supply and marketing cooperatives, plant protection stations, soil fertilizer stations, agricultural and forestry techniques popularization institutions, forest pest control agencies, pesticide production enterprises and other units specified by the State Council.

According to the principle of direct supply, the agricultural production material
business units under agricultural reclamation system and agricultural techniques popularization institutions can sell pesticides; the business units which specially provide pesticides to grain depots and stations can sell pesticides for storage grain, such as storage and trade companies and storage companies under food security system.

Any unit and individual must get business license before getting involved in pesticide production and selling.

（3）Use of Pesticides

The use of pesticides and matters needing attention are mainly dependent on the promotion by media and the pesticide business units as well as farmers’ self-learning through the instructions, lacking of professional training and the education in environment, health and safety.

We shall make full use of radio, television, network and tabloid magazines to broadcast laws and regulations, supervise work progress and effectiveness and expose illegal cases and illegal business pesticide behavior.

While selling pesticides to farmers, the business units shall be in charge of providing pesticide use technology and matters needing attention to ensure safe use.

*Good Agricultural Regulation* issued in 1982 includes the content of the purchase, transportation and storage of pesticides, the matters needing attention to ensure safe use, the choice of spraying personnel and individual protection. However, this regulation is relatively backward, lacking professional training and education, and it does not correspond with the current stage of the pesticide use.

2.2.4 Description and Evaluation of Pest Management

In recent years, with the need of Huangshan city agricultural department, several regulations were carried out so as to regulate local pesticide management, promote agricultural techniques and improve pest management ability. However, since there are limited number of technical personnel in agricultural technology promotion departments at various levels, the research and promotion process of physical and biological control technology goes slowly, and physical and biological control technology are simple and the effect is not satisfying. What’s more, a survey has showed that biological comprehensive prevention and control technology is not
widely promoted and used. Although some work has been done to prevent pests, the prevention system of pests is imperfect in the project area and people are not fully aware of the danger of pests. As a result, the area is unable to achieve the effective and comprehensive prevention and control. Specific aspects are as follows:

**Comprehensive prevention and control technology lags behind:** Growers are mainly local farmers who are lack of professional pest prevention and control technology. Drugs are employed blindly, missing the best time for using, and prevention and control technology are lagging behind.

**Promotion for pest prevention and control training is not enough:** There is no sound pest prevention and control authority and the upper supervision authorities are not doing enough promotion, education and training about pest prevention and control measures and the safe use of pesticides.

**Poor knowledge for pest disease supervision:** The flowers and trees are mostly planted by retail investors and the supervision depends mainly on the growers who have poor knowledge of pest disease supervision. As a result, pests monitoring accuracy is not high and the investigation, monitoring and prevention always lag behind.

**Pest control technology lags behind:** Financial shortage deficiency results in insufficient attention on pest control and little focus on scientific research. The lack of basic research of biological and ecological characteristics of pest diseases leads to poor knowledge of the occurrence law of pest diseases and the lagging behind of pest control measures. Pest supervision authority is unable to make effective, easy, environment friendly and integrated pest management technology.

**Pest control system is not perfect enough:** There is no perfect pest prevention and control authority and the upper supervision authorities are not doing perfectly to introduce advanced supervision and integrated prevention and control measures, promote the demonstration effect and organize the corresponding training. People are not fully aware of the danger of pests. As a result, the plant diseases and insect pests in this area cannot be controlled comprehensively and effectively.
3 Integrated Pest Management

Through integrating scattered fields of farmers, and the intensification, standardized operation of the companies and rural cooperatives and other forms, the specialty agriculture and forestry industry develops the agricultural products to be organic, harmless, ecological, reduces the dependence of agricultural products on pesticide and the usage amount of chemical agents, thus protecting the environment as well as the quality of the agricultural products.

Thereinafter, there are the objectives of pest management, priorities of pest management, measures for integrated pest management, and specific IPM measures of familiar disease and pest.

3.1 Objectives of Pest Management

The overall goal of the Project is to control the damages on flowers and nursery stocks caused by pests and to reduce the need for chemical pesticides. (1) To improve the government’s capacity in terms of popularization of integrated pest management method and to enhance the awareness, realization and utilization in terms of integrated pest management for flowers and nursery stocks; (2) Demonstrate and popularize the integrated pest control technology, introduce the non-chemical control technology and lessen the dependency on agro-chemicals gradually; (3) Promote the capacity of safe usage and management of chemicals, and train the pesticide sellers and florists regarding integrated pest management method and enhance the florists’ ability to use the pesticides scientifically; (4) Strengthen the management on selling and usage of chemical pesticides and prohibit the florists to use chemical pesticides which are high toxic and violating the regulations and policies of the State.

3.2 Priorities of Pest Management

Integrated Pest Management is a kind of strategy used to control pests. The implementation of this strategy covers three closely-related phrases: prevention, monitoring and intervention. This strategy makes use of a series of control methods
that can complement each other, such as agricultural method, physical method, ecological method and chemical method. It is a management method that involves ecology and aims at effectively reducing or disusing pesticides and thus decreasing the chemical pollution on natural environment and ecological environment. As the priorities of pest management, the prevention and intervention of pests are known collectively as Integrated Pest Management.

The prevention mainly involves three aspects: (1) To wipe out disease-carrying insect origin or reduce the base number of disease-carrying insect occurrence. For example, plant quarantine is an effective measure to prevent dangerous diseases and pests from spreading along with seeds and nursery stocks. Decreasing the base number of disease-carrying pest occurrence means to reduce the amount of germs and pests that live through the winter. (2) To worsen the environment where the pests breed and do harm. We can create or make full use of the conditions which are not conducive to diseases and pests to change or eradicate the conditions which are conducive. (3) Take prompt and effective measures to eliminate the diseases and pests before they occur with large quantities and do remarkable damages. For example, we can employ pesticides on a sound basis and take man-made and physical effective measures.

3.3 Measures for Integrated Pest Management

Based on agrotechnical control, in order to control and eliminate pests economically, conveniently, safely and effectively, IPM suits measures to different conditions in terms of locality and time, uses appropriately measures such as inspection and quarantine, chemical control, biological control, physical control, mechanical control and so on, gives full play to the positive roles of various control measures and integrates these measures organically which coordinate and complement each other. The pest control measures of the proposed project include such various measures as garden or agricultural prevention, physical prevention, chemical control and biological control and so on. According to situations of project areas, the combination of environment-friendly control measures such as plant quarantine, garden planting control, biological control, physical control, mechanical control and so on is
recommended to control flowers and nursery stocks diseases and pests comprehensively. The chemical control method prefers low-toxic, high-effective, low-residual pesticides that do little harm to environment and human body.

(1) Plant Quarantine
Covering three aspects-disease, pest and weed, the plant quarantine is a series of regulatory measures aiming at protect the agricultural production from alien invasion of dangerous diseases, pests and weeds. The plant product species that shall be quarantined and diseases, pests and weeds which are on the list of bringing-into and taking-out prohibition in accordance with Act shall be not allowed to be input or output, or can only be input or output after eliminating the quarantine objects by means of disinfection, if they are found containing quarantine objects. Plant quarantine is the key link to pest control. In particular, with the rather developed transportation and increasingly expanding communication with foreign countries, strengthening plant quarantine is extremely important. At the same time, the planting materials such as seeds, nursery stocks and so on, which are transported between districts in China, shall go through quarantine. The quarantine objects shall be shut out of another district.

(2) Garden Planting Control
Similar to agricultural control technology, garden planting control takes advantage of, in the process of flowers planting, a series of planting and management technology to purposefully change environment and conditions, and make them not conducive to the breeding of pests and spreading of diseases, but beneficial to the growth of flowers, to reduce or eliminate the occurrence of diseases and pests and enhance the quality of flowers. Functioning as a method to ensure the high yield of flowers, most agricultural measures also avoid the necessity of increasing extra manpower and material resources to pest prevention, which on the one hand accords with the economic demands and on the other hand has no such side effects as polluting environment, hurting and killing natural enemies and so on upon agricultural prevention. The specific measures of garden planting control cover: fertilizing adequately, watering appropriately, keeping the greenhouse clean, bettering
environment and conditions, turning up the soil deep during winter ploughing, timely trimming, dealing with injured plants, adjusting seedtime, rotating rationally, selecting and growing species with resistance to diseases and insects, laying the flower species out rationally and so on.

(3) Physical and Mechanical Control
Physical control is a kind of pest control measure which uses simple tools and all kinds of physical elements, such as light, heat, electricity, temperature, moisture, radioactive energy, sound weave and so on. It includes both the earliest and simplest measures, such as hunting or killing bare-handedly, artificially clearing away disease-carrying or insect-carrying branches and stems and so on, and the utilization of newest achievement in modern physics. The physical control is an ancient and young control measure. In addition, it also includes the following: artificially increasing or decreasing temperature and moisture, such as drying seeds, steeping seeds in hot water, treating the bamboo and its products in high temperature and so on, in order to go beyond the adaptation range of diseases and insects; Killing the insects by taking advantage of their phototaxis, and in recent years black-light lamp and high-voltage electric web bug-zapper have been applied widely; Killing the insects using atomic energy, that is, directly killing diseases or insects by radioactive energy or causing the insets to have inability to conceive by shining with radioactive energy.

(4) Chemical Control
Chemical control means preventing diseases and insects by drugs. It has the following advantages: good and quick control effect and simplicity of its method. However, it may pollute environment, bring in chemical damage and cause the germs and insects to have drug resistance after long-term use. Though chemical control is an essential part of integrated pest control, we should use pesticides scientifically and safely, pay attention to the human health and environment protection, choose the right pesticides, choose the pharmaceutical formulation rationally, use the pesticides timely, alternate and blend the drugs and so on. The Project won’t subsidize the purchase of agricultural chemicals. If the farmers want to use agricultural chemicals, it should be IPM justified. The agricultural chemicals which are listed by WHO in Ia, Ib and II
class is prohibited to use (The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification 2009).

(5) Biological Control

Biological control means controlling diseases and insects by using natural enemies. The natural enemies feed themselves on harmful insects or pathogenic bacteria. Under natural conditions, natural enemies prevail and control the damages caused by diseases and insects, especially by harmful insects. In conserving flowers, we should consciously strengthen the role that the natural enemies play, for example, burning the insect-carrying branches after placing for a few days, to protect the parasitic natural enemies which live within the body of insects, to create the environment that is beneficial for the survival of natural enemies and to increase the amount of natural enemies; we should introduce and protect insect-eating birds artificially to expand the control effect.
4 Management of Pesticides

4.1 Reasonable Use of Pesticides

4.1.1 Types of Prohibited Agricultural Chemicals

According to the annex of NNF[2010] No. 2 "Notice On Against the Illegal Manufacture and Sale of Riskiest Agricultural Chemicals & Regulating the Use of Agricultural Chemicals" issued by the Ministry of Agriculture, the Supreme People's Court, the Supreme People's Procuratorate, the Ministry of Industry and Information Technology, the Ministry of Public Security, the Ministry of Supervision, the Ministry of Transport, the State Administration for Industry and Commerce, the General Administration of Quality Supervision, Inspection and Quarantine, the All China Federation of Supply and Marketing Cooperatives on April 15, 2010, 23 kinds of Agricultural Chemicals Prohibited to be Manufactured, Sold and Used and 19 kinds of restricted agricultural chemicals used on vegetables, fruit crops, tea trees, Chinese herbs and other crops are listed.

List of Agricultural Chemicals Prohibited to be Manufactured, Sold and Used (23 Kinds)

Benzene hexachloride (BHC), DDT, toxaphene, dibromochloropropene (DBCP), chlordimeform, ethylene dibromide, nitrofen, aldrin, dieldrin, mercury compounds, arsenic class, lead (pb) class, Bis-A-TDA, fluoroacetamide, gliflor, tetramine, sodium fluoroacetate, silatrane, methamidophos, methyl parathion, parathion, monocrotophos, phosphamidon.

List of Restricted Agricultural Chemicals Used on Vegetables, Fruit Crops, Tea Trees, Chinese Herbs and Other Crops (19 Kinds)

Thimet, isofenphosmethyl, terbufos, posfolan-methyl, sulfotep, systox, carbofuran, aldicarb, ethoprophos, phosfolan, coumaphos, fonofos, isazofos and isazofos are prohibited on vegetables, fruit crops, tea trees, Chinese herbs. Omethoate is prohibited on cabbages. Dicofol and fenvalerate are prohibited on tea trees.
Daminozide is prohibited on peanut plants. Terbufos is prohibited on canes. Apart from health use and some dry corn seed coating materials use, fipronil is prohibited in other areas.

Each agricultural chemical product should be used in accordance with the approved application range of agricultural chemical registration, and the use of ultra-range is prohibited.

The agricultural chemicals which are listed by WHO in Ia, Ib and II class is prohibited to use (The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification 2009).

4.1.2 Method of Rational Use of Agricultural Chemicals

To achieve rational use of agricultural chemicals and improve the controlling effect, the following points should be noted.

(1) Suit the remedy to the case: different agricultural chemical has different performance, so the control objects are different. The stomach poison in the insecticide is effective to the insect pests with chewing mouthparts. However, it is ineffective to the insect pests with piercing sucking mouthparts. The contact insecticide is effective to the insect pests with mouthparts. Usually, the systemics is effective to the insect pests with piercing sucking mouthparts. Among all of the fungicides, the sulfur preparation is effective to a variety of powdery mildews, but ineffective to downy mildews; the copper compound is effective to downy mildews, but ineffective to powdery mildews. And among the herbicides, the MCPA is effective to dicotyledonous weeds but ineffective to most monocotyledonous weeds; the glyphosate has special effects on perennial root and leaf weeds (such as cogongrass). Antu has good effects on rattus norvegicus but has less effect on rattus. Therefore, each chemical has its effects on certain aspects, and the appropriate chemical should be chosen according to different control objects to achieve proper control effects.

(2) The dosage should be appropriate: the concentration and dose of chemicals for different control objects are based on the results of efficacy trials. Overdoses will cause waste and increase the negative effects on the surrounding environment. Of
course, it should not be less than the required dose per unit area. Otherwise, for one thing, it will fail to control insect pests effectively; for another thing, because it can’t kill the insect pests, in turn, sometimes it will lead to insect pests resistance. Therefore, an appropriate dose will be economical and can achieve effective prevention and controlling purposes.

(3) Pay attention to application methods to improve the spraying quality of agricultural chemicals: because the type and dosage of the agricultural chemicals are different, the application methods are different, too. For example, the powders cannot be used for water spray and the wettable powders are not suitable for powder spray. And to the spray methods, due to different atomization methods and technical conditions, the fineness of the resulting droplets are quite different. The fineness of the droplets produced by the common dosage spray method is 150 to 1200 microns, and due to the excessive liquid, the droplets often drain, besides, the spray efficiency is also very low. Therefore, when use the appropriate dose per unit area and increase the concentration of the spraying, and carry out the fine droplets spray, if the fineness of the droplets produced by low dosage or ultra-low volume spray is less than 150 microns, there is no liquid drain problem, and it is easy to spray evenly, which can improve work efficiency and spraying quality.

(4) Use the agricultural chemicals at the proper time: the occurrence of various insect pests has certain rules, which has its weaknesses or critical period for damaging plants. For plant diseases, it’s necessary to control the diseases before the pathogenic bacteria invade the host; for insect pests, it’s necessary to control the young age period of the larva. Such as the pine caterpillar, the 4-age larva is small, has weak resistance to agricultural chemicals, is sensitive to the dose and still has little damage. Therefore, using the agricultural chemicals at the proper time can achieve good control effects. Meanwhile, the performance of the agricultural chemicals, its natural enemies and other factors also must be taken into consideration. So, try to avoid spraying at the peak of its natural enemies’ appearance to reduce the harms of the agricultural chemicals to natural enemies. For example, controlling the pine caterpillar in winter can achieve this goal.
Besides, the environmental conditions’ effect on the efficacy of the agricultural chemicals should be taken into consideration too, such as temperature. For most of the agricultural chemicals, within a certain temperature range, when the temperature rises, its efficacy increases too, Such as dichlorovos, dimethoate and other organophosphorus insecticides. But there are a few agricultural chemicals, on the contrary, when the temperature raises, its efficacy decreases. For example, deltamethrin, fenvalerate and other agricultural chemicals have better efficacy at the temperature of 20℃ than 30℃. The wind also has great influence. It is appropriate to carry out smoke or ultra-low volume spray when the speed of the breeze is within 1 m/s. When the wind is strong, spraying is not suitable. Humidity, rainfall, illumination, soil and other factors also have impacts on the efficacy, so pay attention to such factors when using agricultural chemicals.

In short, it’s necessary to monitor and forecast the diseases and insect pests and use the agricultural chemicals at the proper time on the basis of grasping the rules. Use the agricultural chemicals at the "edge" so as to obtain the best control effect.

4.2 Safe Use of Pesticides

4.2.1 Attention in Pesticide Use

(1) Pay special attention to the packing of the pesticide to prevent leakage when buying pesticide. Pay attention to pesticide’s name, effective content, production date, instructions and so on. Do not use pesticide that is difficult to identify or passes shelf life.

(2) In transportation process, check whether the packaging is complete, if leakage or breaking is found, repackage it with specified materials before transportation, and promptly and properly handle the contaminated ground, transportation tools and packing materials.

(3) Take and put the pesticide gently during transportation.

(4) Pesticides shall not be mixedly transported and stored with grains, vegetables, fruits, food, daily necessities and so on.
(5) During dispensing, the dispensing personnel should wear rubber glove, and they must measure drug solution or powder with measuring tool according to the prescribed dosage, which should not be increased at will. It is strictly prohibited mix pesticides with hands.

(6) During the mixing of seeds with pesticides, mix according to needs. Sow the mixed seeds with machines if possible. If the seeds are sowed by hands or sowed in holes, wear protective gloves to prevent poisoning through the skin.

(7) The rest of the poisoned seeds should be destroyed, they can not used as food or feeding stuff.

(8) Dispensing and seeds mixing should be carried out at safe places far away from drinking water and residential places, special persons should be sent to take care of the working places to prevent poisoned seeds from being stolen or mistakenly eaten by people, livestock and poultry.

(9) Spray with intervals when using manual sprayer. Do not spray at the right side and the left side simultaneously whether the sprayer is manual and mobile. Stop spraying in strong winds, at high temperature plants or at noon.

(10) Do not fill the drug barrel too full with drug liquids, so that the liquids will not be shaken out, and contaminate the body of the spraying people.

(11) Check carefully whether the machine’s switch, joint and nozzle before are screwed tightly, and whether there is leakage in the drug barrel to prevent leak medicine pollution.

(12) If clogging happens during spraying, rinse with water before handling faults. It is absolutely prohibited to blow and suck nozzles and screens with the mouth.

(13) Set up signs at places where high poison pesticide has been sprayed, grazing cutting grass, digging wild vegetables should be forbidden in such places for some time to prevent people and livestock from poisoning.
(14) Wash the sprayer clean in time after drug spraying work, take it back along with the remaining drugs to the warehouse for storage, and do not bring it home.

(15) Choose safe place to properly handle the contaminated cleaning water, must not splat it anywhere to prevent the pollution of drinking water and fish pond.

(16) Must not use packaging materials that had contained pesticides to contain food such as grains, oil, wine and water, or feeding stuff. Dispose collectively the empty boxes, bottles, bags and so on that had once been filled with pesticides. Wash and keep the jars and vessels used for seeds soaking collectively.

4.2.2 Selection of Spraying Personnel and Personal Protection

(1) Healthy youth are suggested to act as the spraying personnel, and they should be trained for a certain techniques.

(2) The following persons should not spray or stop spraying: the weak, the sick, the unrecovering patient suffering from skin disease and pesticide poisoning and other disease, women in the period of lactation, pregnancy and menstruation.

(3) Do not take children to the work site when spraying.

(4) When spraying when, the spraying personnel must wear a poison proof mask, long sleeve blouses, long trousers, shoes and socks.

(5) During operation, the spraying persons are forbidden to smoking, drink wine, drink water, eat food, and they can not use their hands to wipe mouths, faces, eyes, and mutual ejection for frolic is absolutely forbidden.

(6) After the daily work, wash face, hands and mouth thoroughly with soap before drinking, smoking and eating. Take a bath if conditions permit.

(7) Change and wash work clothes contaminated by pesticide timely.

(8) The spraying personnel’s spraying time every day shall not exceed six hours. When mobile knapsack sprayer is used, two people are needed for rotation. One day
should be arranged for rest if the personnel have continuously sprayed for three to five days.

(9) If the operators show such symptoms as headache, dizziness, nausea, vomiting and so on, they should immediately leave the scene, take off the contaminated clothes, gargle, scrub and wash the exposed parts of face and hands, and be send to a hospital in time for treatment.

4.3 Environmental, Occupational and Health Risks

4.3.1 Environmental Risks of Pesticide Use

(1) The major environmental risks of the project in the process of pesticide use include:

① The pesticide residue may lead to water quality deterioration, the potential risk is the reduction of the number of aquatic organisms (such as fish and aquatic insects);

② Spraying pesticides near the source of the drinking water or the leakage of chemical materials may lead to the pollution of the water source supply;

③ Non target species (birds, animals, the natural enemies of pests) may be affected possibly because of the using the highly toxic pesticides;

④ Drug resistance of insect and mice is increased because of the long-term excessive use of certain pesticides;

⑤ Soil quality is polluted through soil residue;

(2) Measures to reduce the above risks include:

① Train the country leadership, the flower farmers (men and women), flower and seedling operators and chemical dealers about the effects of certain chemicals on the environment, recommend better spray methods, instruments and equipments;

② Cooperate with county leaders, flowers operators and other personnel to monitor pesticide spray to ensure that no toxic pesticide is sprayed near the water source;

③ The project need to purchase safe spraying equipments as approved;
④ Chose high-efficiency low-poison pesticides;

⑤ Chose low-residue half-life pesticides;

⑥ Improve the promotion of biological control measures; try to reduce the use of chemical pesticides;

⑦ Apply series of comprehensive pest prevention and control means to ensure that the drug resistance of pest will not increase;

4.3.2 Professional/health Risk of Pesticide Use

(1) the main application of pesticide produces professional/health risks include:

① Body discomfort caused by the pesticide smoke sucked in when preparing chemical drugs density and by the gas sent out by pesticides when spraying without protective masks;

② Skin burns from pesticide sprays or leakage in the condition that protective clothes are not put on;

③ Drinking water pollution if pesticide spray places are near the drinking water source, or chemical leakage happened near the drinking water source;

(2) Measures to reduce the above risks include:

① Train the country leadership, the flower farmers (men and women), flower and seedling operators and chemical dealers about and make exhibition. Mainly included are: professional/health effects caused by some particular pesticides, operation and spraying method recommended; the approved instruments and their usage methods (such as sprayer, nozzle size, etc.); wearing safety clothing (long sleeve clothes, mask, hats, gloves, long trousers and shoes); spray in still condition (no wind); storing chemical substances safely in locked cabinets to prevent children’s contact; safety treatment of chemical waste and its packing through the deep burying or burning;

② Monitor the implementation of the above measures, and make further training if implementation is not satisfactory.
5 Integrated Pest Management Implementation strategy

5.1 Integrated Pest Management Implementation

5.1.1 Integrated Pest Management Framework

Integrated Pest Management Framework of the Agricultural and Forest Characteristic Industry Project is shown at figure 5.1-1.

Vegetable, tea, flower, and seedlings production is completed by the vegetable, tea, flower, and seedlings base, the planting farmers and vegetable, tea, flower, and seedlings association, and it will be reported to higher level units after summary.

The distribution process of vegetable, tea, flower, and seedlings is monitored by city’s agricultural product quality monitoring center and its subordinate market testing station, including agricultural products access quality testing and agricultural products of agricultural production base exporting quality testing.

Vegetable, tea, flower, and seedlings diseases and insect pests control work should be carried out together by the professional city and county diseases and insect pests control institutions, project office and planting farmers that are involved in the project, once diseases and insect pests are found, it must be immediately reported and handled.

Environment, professional and health risk are supervised and implemented by the related environmental protection agencies and forestry administrative law enforcement agencies.

Project offices at all levels shall be responsible to guarantee normal implementation of the regular supervision activities. In the high-risk period of diseases and insect pests, diseases and insect pests control agencies at various levels shall be responsible for the supervision and control.
Diseases and insect pests control agencies at various levels should be responsible to provide guidance, supervision and monitoring and training of integrated diseases and insect pests control technology and plan. Project offices and loans granting units at various levels are responsibility to timely find and report pest conditions so as to implement integrated disease and insect pests control plan according needs.

Disease and insect pest control agencies at all levels shall forecast and evaluate the disease and insect pest epidemic situation according to disease and insect pest monitoring results, make corresponding prevention and control measures, and provide professional technical support.
Figure 5.3-2  Schematic Diagram for Integrated Pest Management Framework
5.1.2 Key points of the Integrated Pest Management Implementation

Project will control the sale and use of pesticides through strengthening the construction of the basic infrastructure of diseases and insect pests control and implementing institutional monitoring on pesticides distribution and use. This project will be carried out through the following methods:

(1) Strengthening the training of forestry techniques popularization personnel and forest farmers by forest disease and insect pest control technical personnel and experts from the city or county (district);

(2) Preparing monitoring plans to make an assessment of diseases and insect pests control and adopting integrated diseases and insect pests management technology in the process of project implementation;

(3) The PMO will appoint a professional consultant to specifically supervise the execution process diseases and insect pests control measures;

(4) The operation of forestry techniques popularization institutions and professional diseases and insect pest control institutions will get government’s financial support;

(5) The project office will establish cooperation relations with Anhui Agriculture University, Nanjing Forestry Science University and other national insect pests research institutions to enrich diseases and insect pest control knowledge in the project area and improve the integrated diseases and insect pest management ability;

(6) Strengthening the exchange of the diseases and insect pest control technology and experience in the project area to share the fruit;

(7) Encouraging and supporting the leaders of the relevant district, county, township and village to promote and use the safe measures of disease and insect pest control and the integrated disease and insect pest management technology.

5.2 Training

The purpose of training is to strengthen the farmers’ safety and effective pest control ability, including how to identify pests, make proper management decision adopt
appropriate integrated control measures and use pesticides safely, scientifically and reasonably, etc.

Select from the project base the basic-level backbone agro-technique personnel, principals of the flowers and trees cooperation, big agricultural families. Hold 3 days trainings each quarter at agricultural colleges, research institutes, and demonstration bases. Gradually raise the basic-level agro-technique personnel’s business ability, improve the present situations of lagging in disease and insect pests monitoring and prevention and in pest integrated control technique, and enhance knowledge of reasonable, scientific and safe pesticides use.

5.2.1 Training contents

(1) Selection of fine flowers;

(2) Recognition of pest disease of flowers, the natural enemies of main pests;

(3) Damage and loss caused by different pests;

(4) Monitoring pest disease epidemic, sampling method of field survey;

(5) The control range and strength (threshold value of control, pest disease);

(6) Integrated control measures, including the comprehensive pest disease prevention and control techniques of garden, physics, biology and chemistry.

(7) Safe storage of agricultural chemicals and disposal of packaging waste of agricultural chemical;

(8) Usage methods of chemical pesticides and protective clothing;

5.2.2 Training objects

(1) The flower farmers, demonstration family and cooperations that play a leading role;

(2) The forestry techniques popularization personnel in township, town, county and city;
(3) Professional pest control and prevention units and the agencies;

(4) Pesticides dealers.

5.2.3 Training providing Units

(1) Service promotion units of districts, counties and towns trained;

(2) Pesticide dealers;

(3) Plants protection stations and etc of the provincial and municipal governing units;

(4) Other national and provincial organizations able to provide training;

5.2.4 Promoting Integrated Management Technologies and Reasonable Use of Pesticides

In addition to the above promotion measures, various forms and methods are adopted by PMO, such as blackboard newspaper, book data, leaflets, bulletin board, online community and experience exchange meeting, to promote integrated control technology and reasonable pesticide application and harms of chemical substances on human bodies, expand the use of low-poison and high-efficiency reasonable pesticides, reduce the adverse effects of pesticides on the environment of the regional groundwater, soil and etc.

5.3 Monitoring and Supervision

5.3.1 Pest Monitoring Contents

Monitoring on diseases and pests is the basis of pest managements. Only the correct monitoring on the disease and pest situations can make sure the correct formulation of integrated pest control measures.

During project implementation, it is required to conduct field monitoring of: (i) the implementation of this PMP, (ii) pesticide use patterns, (iii) product quality (growth of flower, seedlings, fishes, tea, and vegetable in comparison with the control groups), (iv) the dynamic population changes of the main pests and their natural enemies and
(vi) the environmental impacts after the project implementation. The specific procedures of the project monitoring are shown below:

Monitoring in the project area should be done by staff of local agricultural technical extension office, with support of technicians of pest prevention and control institutions at the city level.

![Figure 5.3-1 Pest Monitoring Contents](image)

### 5.3.2 Project Supervision and Management Contents

The Huangshan city PMO will hire a professional consultant team served as the project supervision and inspection team. The project supervision and inspection team should conduct twice project supervision and inspection annually, and it will generally be appropriate for this to be carried out in the high-risk period of disease and insect pest, which will be convenient for observing the implementation of disease and insect pest control at site.

The project supervision and inspection team should consist of experts in diseases and insect pests control, and the fees of the supervision and inspection activities should supported by the project.
During the period when the project supervision and inspection team will carry out project supervision, they will do the following work and implement site monitoring, the main monitoring indexes are:

(1) Survey the pesticide investigation situation through consulting the use of flower seedlings pesticide;

(2) Survey whether the pesticides of Type 1 have been used (high toxic pesticides) through checking the sales records of pesticide sales agency;

(3) Survey the implementation of the policy of integrated disease and insect pest control through visiting the farmers and hearing the disease and insect pest control work reports of the township government;

(4) Survey the implementation of the scene monitoring plan and the remedial measures for the analysis results through checking monitoring list.

5.4 Project Budget for Pest Management

The project’s disease and insect pest management budget amounts to RMB 1,835,700 yuan, mainly including 4 parts: disease and insect pest control training, the popularization of integrated disease, implement of the IPM measures and insect pest control and the management and supervision of disease and insect pest (Table 5.4-1).

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<th>Items</th>
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<th>Supervision units</th>
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<td>County PMO execution, agriculture committee of Huangshan city assistance</td>
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<td>Total (yuan)</td>
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