Guangxi Rural Poverty Alleviation Pilot Project

Pest Management Plan

Guangxi Foreign Capital Poverty Reduction Project Management Center

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1 Project Overview

Guangxi Rural Poverty Alleviation Pilot Project aims to increase income generation opportunities through demonstration of value chain development models in selected poverty counties of Guangxi involving 10 Counties, i.e. Ping Guo, Tian Dong, Tian Lin, Le Ye Counties in Bai Se City and Dong Lan, Ba Ma, Feng Shan, Da Hua, Du An and Yi Zhou (county-level city) Counties in He Chi City, including 54 Townships and 117 Administrative Villages.

The Project comprises four components. The project component 1a Cooperative Development Fund aims to strengthen the weak parts such as breeding, processing and marketing of agricultural production to enhance the establishment and development of cooperatives. Involved plants include Dragon Fruit, Mulberry, Mango, Bamboo, Camellia Oil, Kiwi Fruit, Tea Leaves, Walnut, Mulberry, Wild Grape, Orange and Mandarin, and Mushroom, etc.

According to the related requirements of the World Bank safeguard policy Pest Management OP/BP4.09, Pest Management Plan (PMP), which combining with occurrence status of pests in the project areas and some new problems which may be brought by the project, is compiled. PMP improves the agricultural products quality and safety through encouraging farmers to adopt environmentally friendly agricultural practices and Integrated Pest Management (PMP) technologies, and providing farmers technical assistance, training, equipment procurement, monitoring and assessment.

The project design uses a framework method. At the project preparation stage, the exact location, scale and subproject owner are not determined. During implementation, through review and approving proposals prepared by specialized farmer cooperatives, the project will provide fund to a cooperative to carry out specific activity. Hence during the project preparation an environmental and social management framework (ESMF) was prepared, the PMP is part of the ESMF. It shoud be noted that the project primarily intends to build cooperatives’ organizational efficiency and competiveness. The crops involved are local species and other species than above-mentioned types may be proposed by the cooperatives. The cooperatives’ proposals will include how to do pest management and how to develop green or organic products. The PMP will be updated and supplemented, including monitoring and training aspects.

The major focuses are as follows:
(1) Introducing and promoting PMP technologies in the project areas (communities and cooperatives), establishing Pest Motoring and Controlling Plan, increasing the pest forecasts.
(2) Using new varieties of microbial pesticides, botanical pesticides as a substitute for harmful chemical pesticides prevention and control approaches in the project areas, so as to reduce adverse effects of chemical pesticides on the environment and human health.
(3) Improving farmers’ practical operation skills and training farmers to master the skills of integrated pest management by production skills training and on-site training for farmers.

(4) Offering training for technicians of Technical Extension Station, pesticide sellers, community administrators and assists, and County Project Office staff to raise them the integrated pest management (PMP) awareness.

(5) Strengthening ties with quality supervision departments, and enhancing the supervision of the selling and using of pesticides in order to comply with related requirements by the World Bank “OP/BP4.09” and other international conventions and standards for pesticide using.

In order to implement the plan effectively, the project office of the Guangxi autonomous region, the cities and the counties shall assign persons to be in charge of the implementation and management of the plan.
2 Project Background

2.1 Project Objective

The development objective of the project is put forward the pilot demonstration industry chain development model in the selected project area to increase farmers’ income. Sub-project One Cooperative Development Fund will involve perennial economical crops with local characteristics, promoting the production of pollution-free, green (Standard A) and organic food (Standard AA), increases the yield and improves the quality to increase the added value of products. The biological and physical means shall be mostly used to prevent and control the occurrence of pests, and the use of pesticides is strictly controlled, which not involves the use of insecticides in large scope and scale.

Integrated Pest Management (IPM) is the core principle and the significant measure on pest control. It is also the requirement mentioned by Pest Management of the World Bank Operational Policies (OP 4.09). Since 1975, Chinese government has also adopted the IPM.

When implementing IPM, not only economic benefit, but also ecological balance and social safety should be taken into consideration. On this basis, pest control should put the prevention first, put agronomic measures as the basis, make full use of the nature on pest control factors and create disadvantaged conditions for pest growth according to pest biological features and habits, strengthen early warning, forecast and hazard monitoring, apply biological, physical and chemical measures together appropriately, which is suiting local conditions, avoid killing or harming pest natural enemies and polluting environment, and control pest damage under the tolerable level as possible. Biological control is taken first. Unless it is with little effect and pest damage is severe at the same time, chemical pesticides with high effect, low poison and low residue can be applied. Meanwhile, safe chemical pesticide application should be adopted for the sake of reducing pesticide residue in soil or waters.

2.2 Project Supportive Crops’ Pests and Diseases

The whole crop pest harm degree in 2014 in Guangxi is medium or slightly serious. Its occurrence area is 18.453 million hectares and control area is 19.097 million hectares, accounted for the occurrence area of 102.3%, which retrieves the loss is about 11.51 million tons, and the actual loss is about 1.52 million tons after preventive treatment. The crops supported by the project are mango, bamboo, pitaya, mulberry, kiwifruit, oil tea, tea, walnut, wild grape, orange, edible fungi, which planting areas are scattered, and the frequency of pest diseases is about 1~2 times/year. Common problems of major diseases and pests see table 2.2-1.
<table>
<thead>
<tr>
<th>Project Supportive Crops</th>
<th>Main Diseases</th>
<th>Main Pests</th>
</tr>
</thead>
<tbody>
<tr>
<td>mango</td>
<td>anthracnose, powdery mildew, bacterial black spot, bleeding disease, sooty mold</td>
<td>Chlumetia guttiventris WaLke, Erosomys mangiferae Felt, Deporaus marginatus Pascoe, Idiscopus incertus(Baker), Lawana Imitata Melichar, Rhytidodera bowrinii White, Oraesia emarginata etc.</td>
</tr>
<tr>
<td>bamboo</td>
<td>arthriniumphaeospermum</td>
<td>bamboo moth, Hippotiscus dorsalis( Stal.)</td>
</tr>
<tr>
<td>pitaya</td>
<td>scab, pitaya canker, bacterial soft rot, fusarium wilt, stem blight</td>
<td>termite, red and yellow spider, scale insect, aphid, cockchafer, snail, noctuid etc.</td>
</tr>
<tr>
<td>mulberry</td>
<td>sclerotinia blight of mulberry, mulberry yellow awarf</td>
<td>mulberry small weevi, mulberry sorosis gall-midge, apripona germari, Porthesia xanthocampa Dyar</td>
</tr>
<tr>
<td>kiwifruit</td>
<td>Pseudomonassyringaepv.actinidiaeTakikawaetal, Phytophthora root rot, Fusarium solani, brown blotch disease, alternaria leaf spot, Septobasidium bogoriens, root-knot nematode disease</td>
<td>scale insect, scarabaeidae, stinkbug, leaf roller, Lycorma delicatula, leafhopper etc.</td>
</tr>
<tr>
<td>oil tea</td>
<td>Agaricodochium camellia, Camellia anthrax disease</td>
<td>Andraca bipunctata Walker, Sawfl, Metaceronema japonica Maskel, Bacchisaatritarsis(Pic), Biston marginata Shiraki, Bacchisa a tritarsis Pic, Curculio chinensis etc.</td>
</tr>
<tr>
<td>tea</td>
<td>Gloeosporium theae-sinensis Miyake, tea red scab, tea blister blight</td>
<td>Empoasca pirisuga Matumura, Aleurocanthus spiniferus Quaintance, Curculio chinensis, Euproctis pseudoconspersa Tea caterpillar, leaf roller, Ectropis obliqua etc.</td>
</tr>
</tbody>
</table>
2.3 Application Situation of Chemical Pesticides

At present, the chemical pesticides against diseases and pests used by farmers in the project area are mainly low toxic or non-toxic chemical pesticides which are introduced by county plant protection stations, see table 2.3-1.

Table 2.3-1 Chemical Pesticides Application Situation of Main Crops

<table>
<thead>
<tr>
<th>Crop Name</th>
<th>Pesticides</th>
</tr>
</thead>
<tbody>
<tr>
<td>walnut</td>
<td>alternaria leaf spot, Gloeosporium rufomaculans (Berk.) thum., Cytospora juglandicola Ell. Et Barth. Phylloxera notabilis pergande, Anoplophora chinensis, Zeuzera leuconolium Butler, Cossus cossus Linnaeus, Batocera horsfieldi, Apriona germari Hope, Jewel beetle, Holotrichia tilanis, fish line silkworm, Limacodidae, Colasposoma dauricum (auripenne) Mannerheim, Eriophyidae</td>
</tr>
<tr>
<td>wild grape</td>
<td>downy mildew, gray mold, Powdery mildew, Giapevine fanleaf, Grapevine Leafroll Disease grape red spider, Lygus lucoum, Erythroneura apicalis Nawa, Xylotrechus pyrrhocleres Bates, Seudyra subflava Moore, Ampelophaga rubiginosa Bremer et Grey etc.</td>
</tr>
<tr>
<td>orange</td>
<td>anthracnose, oranges canker Dacus dorsalis(Hendel), scale insect etc.</td>
</tr>
<tr>
<td>edible fungi</td>
<td>brown rot, bacterial rusty spot disease, bacterial canker disease, damping-off disease, fusarium wilt, Mushroom Deformity, no budding disease, edible fungi bag softendisease, edible fungi burnt disease Mite, sorosis gall-midge, lycoriella pleurati, phoridace, slug etc.</td>
</tr>
</tbody>
</table>
2.4 Current Situation and Existing Problems of Crop Pest Management

So far, most counties and cities of Guangxi, such as Bama, Du'an, Leye, Pingguo, and Tiandong counties etc., have established the system of monitoring, forecast, prevention and control on main plant pests and animal epidemic diseases. Others are isolated cases. For example, Donglan County only has plant protection station station. They can only control some common pests and epidemic diseases. For some explosive and epidemic pests and diseases prevention, they still plays a passive role and falls into the plight of taking stop-gap measures. Their prevention way is single, not widely covered and its...
effects are unstable. The overall prevention and control capacity still need improve.

(1) Lack of information on occurrence and prevention of animal diseases and plant pests
Farmers have few access to acknowledge the occurrence of animal diseases and plant pests, and the application of pesticides for prevention, mostly, they get the information through watching TV programs on agriculture or reading technical books and application guides on pesticides. Although the local agricultural administrations have held some training courses, technicians from counties or towns have provided some consultancy, and the manuals and textbooks of crop protection technology have provided methods on the occurrence of animal diseases and plant pests and the application of pesticides for prevention, most farmers still have difficulty in obtaining relevant accurate information on animal breeding, plant cultivation and prevention of animal diseases and plant pests on time.

(2) Lack of knowledge on using alternative for chemicals and common sense on safety use of chemicals
When choosing prevention methods of pests and epidemic diseases, farmers consider mainly their effectiveness on generating maximum profits. They prefer chemical prevention methods of quick and better effectiveness. The alternative for chemicals will only be applied when they can bring more net incomes. Thus, it is significant to let farmers realize the advantages and disadvantages of all optional methods, and to change their conventional concept on animal and plant protection through encouraging them to cultivate high-valued green and organic food.

Under normal field conditions, farmers rarely wear protective clothes, helmets, masks or gloves when spraying pesticides manually or automatically. Due to lack of self-protection awareness, they are vulnerable to acute pesticide poisoning and chronic pesticide residues over-accumulated within their body. In Guangxi, chemicals can be easily purchased from agricultural material shops and crop hospitals in almost all counties and towns. Farmers purchase chemicals at will at any time and the rest, which is stored randomly, can easily cause accidental poisoning.

(3) Lack of unified prevention awareness for prevention strategies
From strategic perspective, little attention is paid to prevention so that the abrupt occurrence of pests and epidemic diseases will caught people unprepared. Besides, little attention is paid to unified prevention. Moreover, localized application of pesticides for each household is difficult to control the situation of the whole affected area. Reasons as follows, the PMP conception hasn't been widely accepted by households; the pest forecasts are often delayed; massive prevention and control are not widely covered; farmers over-reliance on chemical application, which results to increase chemicals amount gradually. The area of chemical application is enlarging, which further deteriorates the economic environment. Pesticide resistance increases evidently because chemical pesticides have quick and stable effects, and it is easier to control the
occurrence and damage of pests and diseases. And pollution-free agricultural products with higher quality don’t have a higher price; therefore, farmers don’t want to use biological pesticides and other alternatives to chemical pesticides.

(4) Prevention system need to be improved
From prevention system's perspective, the fund is very limited and the system itself has obvious blind sides. Localized and scattered prevention is the mainstream and control techniques are not widely accepted by households. Reasons as follows. Local agriculture technique extension centers have insufficient funds and technicians. Pest prevention can be only focused on pests and diseases with severe damages. The whole system is in urgent need to be improved, so is the technique. The technicians of all levels are in shortage, and the research and extension of biological and physical prevention technology are in a slow pace. Simple prevention measures lead to less success. The project has totally stopped the use of chemicals with high toxicity and residues. However, households are still lack of prevention awareness and they select inappropriate methods and timing, which causes more application of pesticides with more frequency and more costs. The gradual pollution of agricultural area source and wastes is disadvantageous to the sustainable development of agriculture.

2.5 Possible Environmental Impacts and Risks after Implementation of the Project

The planting industry of this project is dominated by perennial economical crops with local characteristics, encourages and guides the cooperatives to plant pollution-free, green (Standard A) and organic food (Standard AA), and helps poverty-stricken peasant households increase incomes via improving the quality and increasing the added value of products. Therefore, biological and physical means are mostly used in this project to prevent and control the occurrence of pests. More use of commercial organic fertilizer or farm manure reduces the impact on the project area environment, and also helps change farmers traditional idea on farming in the project area, which avoids using insecticides or fertilizers in large scale and scope. The using amount of insecticides or fertilizers is strictly controlled while they must be used. The impact could have is as follows:

2.5.1 Possible environmental risks caused by pesticides
Once pesticides enter into the environment, it has a chemical reaction in the environment, which results in the air, water and soil pollution.

The possible environmental impacts and risks caused by pesticides include:
(1) The impact on atmosphere: normally, when the pesticide spraying, some pesticides float in the air in particle shape and are resolved through photodecomposition, thereby affecting the atmosphere;
(2) The impact on soil: the amount of pesticide residues and their derivatives in soil increases, pesticides are not easy to be decomposed by microorganisms and can keep stable in acid and heat environment, less volatile and difficult to dissolve in water.
Therefore, residual can stay in the soil for a long time, especially in the clay and organic soil for the longest period;

(3) The impact on living things and human beings: The majority of pesticides fall into the soil, and then into the environment, which do harm to aquatic organisms, terrestrial organisms, livestock, and human beings. Some pesticide ingredients can concentrate in the body of living things, and then enter into food chains.

2.5.2 Possible environmental risks caused by fertilizers
The possible environmental impacts and risks caused by fertilizers include:

(1) The eutrophication of rivers and lakes: the reason of eutrophication is that the content of nitrogen and phosphorus in water is increased, which makes the alga and other aquatic plants grow too many;
(2) The soil is polluted and the soil physical property is worse. Long term excessive and simple application of chemical fertilizers makes soil acidification. The amount of organo-mineral complex ammonium ion in the soil solution and soil microaggregate increases and takes place of Ca2+、Mg2+ etc., which makes soil colloidal particle disperse, soil structure destroy, soil harden, and influences the cost of agricultural production and the yield and quality of crops;
(3) The increase of nitrogen oxides in the atmosphere: Considerable amounts of nitrogen fertilizer applied to the field evaporate from the soil surface into the gas and enter into the atmosphere directly. And there is another considerable part of the organic or inorganic nitrogen into the soil. Under the action of microorganisms in the soil, they become nitrogen and nitrogen oxides from nitrogen, which is in an in dissolvable, adsorptive and water soluble state, and enter into the atmosphere.

Therefore, it is necessary to use PMP strategies for pest management, if the potential problem of chemical fertilizer and pesticide pollution need to be solved in the project area. The project works out PMP programs, which are widely used pest integrated management technology, and shall promote resistant varieties and apply for biopesticides with high effect, low poison and low residue, so that the ecological environment of farmland in the project area will be effectively improved.

2.6 Assessment of Existing Policies and Systems

2.6.1 Existing Policies and Systems
A set of relevant laws, regulations, standards, measures, rules and guidelines have been promulgated and implemented successively by national and local governments. With its enforcement, PMP was further promoted to better application.

(1) Law of the People’s Republic of China on Quality and Safety of Agricultural Products (the Standing Committee of the National People’s Congress, April 2006);
(2) Regulations of the People’s Republic of China on Pesticide Administration (the State Council, January 2001);
(3) Implementing Measures for Regulations on the Control of Agricultural Chemicals (Order No. 9 of the Ministry of Agriculture, December 8, 2007);

(4) Provisions for Quality and Safety of Pollution-free Agricultural Products (Ministry of Agriculture and the State Administration of Quality Supervision, Inspection and Quarantine, April 2002);

(5) Standards for Safety Application of Pesticides GB4285-1989 (The National Bureau of Environmental Protection, September 1986);

(6) Standards for Safety Application of Pesticides GB8321.2—1987 (The National Bureau of Environmental Protection, September 1986);

(7) Green Food Pesticide Application Guideline NY/T393-2000 (Ministry of Agriculture, March 2000);

(8) National Food Safety Standard—Maximum Residue Limits for Pesticides in Food GB2763-2005;


(10) Guideline for Safety Application of Pesticides GB/TB8321.1-8321.8;

(11) Regulations on Plant Quarantine (the State Council, revised and promulgated on May 13, 1992);

(12) Detailed Rules for the Implementation of the Regulation on Plant Quarantine (Agriculture Part) (Ministry of Agriculture, May 1995);


Through the implementation of these standards and guidelines, pesticide research, production, application, monitoring and management service system has been established in China. Regulations on the Control of Agricultural Chemicals issued by the State Council on May 8th 1997 is the first legally binding administrative regulations for pesticide management which signifies that pesticide management has entered the track of standardization, legalization and internationalization. Measures for the Implementation of the Regulations on Pesticide Management revised in January 2008 has played a good role in the protection of Regulations on the Control of Agricultural Chemicals.

In the ten security policies of the World Bank, the one that applies to this assessment is "OP/BP4.09" Pest Management.

Under the implementation of relevant policies in our country, the integrated management of plant diseases and insect pests (IMP) in the project area has been advanced.
2.6.2 Animal and Plant Protection Policy and Principle in China

The prevention and control policy on animal diseases and plant pests in China aims at controlling the hazardous degree of animal diseases and plant pests to the lower level and promoting agricultural quality and sustainable resource use under the PMP concept, that is to protect agricultural resources and eco-environment. For years, national animal and plant protection policy has kept emphasizing the principles of Prevention Priority, Scientific Prevention, Governing by laws and Promoting Health, puts a high premium on animal and plant quarantine for preventing further attack and spread of diseases and pests, lays more stress on biological control to chemicals and attaches more importance to the production of pollution-free, green (Standard A) and organic food (Standard AA).

Chinese government has paid great attention to food safety. According to animal and plant protection principles of “prevention first and comprehensive prevention and control”, biological-oriented measures will be gradually adopted. Rapid development of green and organic food market stimulates the food price change with less or even none application of chemicals. In order to promote the production of green and safe agricultural product and the authentication of green and organic food, the Green Food Development Center of the Ministry of Agriculture publicized a Pesticide Application Rules on Organic Food Production to guide the production of Green food (Standard A) and Organic Food (Standard AA).

Regulations on Pesticide Administration and Regulations on Administration of Pesticides have been promulgated by the State Council, Standard for Safety Application of Pesticides by Ministry of Agriculture to encourage the high-effective use of pesticides with low toxicity and residue. All producers of pesticides must abide by the regulations, rules and standards as above during production. These documents clearly stated:

——Strict limits on application of pesticides for preventing animal diseases and plant pests during agricultural production (It is prohibited to use highly dangerous and toxic pesticides, such as quinalphos, monocrotophos, phorate);

——Agricultural products with excessive residues of the pesticides are prohibited to sell out;

——Methods on safe application of pesticides include: forms of pesticides, safety and appropriate using methods, normal and maximum doses, extreme application frequency in one year, and time period from last application to harvest.

The Pesticide Testing Institutes of Ministry of Agriculture of China and of all provinces are responsible for monitoring farm products and pesticide residue (vegetables, fruits, grain crops, chicken, eggs and meats in particular).
2.7 Institutional Framework for Pest Management

PMP pest management regulatory agencies comprise pesticide regulatory agencies, pest management agencies and pesticide testing organization. Table 2.7-1 shows the roles and responsibilities of different departments in pesticide market management, production and postpartum of agricultural products after the implementation of the project.

**Table 2.7-1 Roles and responsibilities of different departments**

<table>
<thead>
<tr>
<th>Project</th>
<th>Government</th>
<th>Agricultural Technology Department</th>
<th>Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pesticide market monitoring</td>
<td>Organize the cooperation of industry and commerce and agricultural law enforcement unit to carry out regular inspection of agricultural materials market, prevent counterfeit sales and prohibit the sale of highly toxic pesticides in the vegetable and fruit production areas.</td>
<td>Assist the government departments in carrying out the investigation of pesticide market and conducting field investigation of farmers.</td>
<td>Purchase pesticides and reduce the number of highly toxic pesticides under the guidance of local technical personnel.</td>
</tr>
<tr>
<td>2. Management in the agricultural production process</td>
<td>Release, validate and modify the prohibited and banned registration list of highly toxic pesticides according to the standards of World Bank, FDA and EU; Establish a more strict regulation on the use of pesticides, strictly prohibit the use of highly toxic pesticides on vegetables and fruits; Reduce the registration and approval of highly toxic pesticide production enterprises and varieties; Strengthen the monitoring and inspection of forest and crop seed seedling interprovincial allocation.</td>
<td>Strengthen farmers' training and guidance of daily pest control and guide farmers to take advantage of low-toxicity chemical pesticides, bio-pesticides and other control methods to control plant diseases and insect pests.</td>
<td>Participate in agricultural technical training and carry out pest control in accordance with the guidelines provided by agricultural technicians. Resolutely put an end to the application of highly toxic pesticides on crops</td>
</tr>
<tr>
<td>3.Management after the listing of agricultural products</td>
<td>Implement agricultural product recall system; Strengthen market monitoring and inspection of pesticide residues in agricultural products; Encourage farmers to produce green food, pollution-free food and IPM food and establish the sustainable agricultural market system of competitive prices to drive the farmers to adopt IPM technology by the advantage of the competitive prices; Encourage leading enterprises of agricultural products and farmers to establish order system.</td>
<td>Encourage farmers to adopt IPM technology to produce agricultural products and help farmers to apply for registration of green food, pollution-free and organic food.</td>
<td>Join in farmers association and production base of leading enterprises or apply for registration of green food, pollution-free and organic food. Make active use of IPM measures to produce higher value-added agricultural products.</td>
</tr>
</tbody>
</table>

Pesticides used in the project area must comply with national standards, industry standards or enterprise standards and pesticide packaging, transportation and storage is
an essential part of the production and use of pesticides. Pesticide packaging should comply with relevant provisions of the three national standards issued by State Bureau of Technical Monitoring such as GB3796-85 General Rules of Pesticide Packaging, GB4838-84 EC Pesticide Packaging and GB5736-85 Plastic Calcium Corrugated Box. The transportation of pesticide has followed the national standards of “Antitoxic Regulations for Storage-Transportation, Marketing and Use of Pesticides” and the storage of pesticide shall follow the overall requirements of the third article in Regulations on Safe Use of Pesticides.

Laws and regulations on pesticide production, packaging, storage, transportation, sale and use in China have great difference with those in the international level. Like other provinces, pesticide management in Guangxi Autonomous Region has inadequate monitoring. Farmers there still use highly toxic pesticides, make excessive use of pesticides and fail to comply with the national provisions of spraying intervals.

To address the risk of plant diseases and insect pests that may arise in the implementation of the project and to help farmers not only effectively control pest damage without increasing the environmental and agricultural product pollution in the project area, the joint efforts of government, technicians and farmers are required.

**Pesticide Monitoring and Administration Institution:**

**Responsibilities of various departments:**
Department of Agriculture: Responsible for local agricultural development planning and management of related agricultural affairs.
Industrial and Commercial Administration: Responsible for the management of pesticide market

Bureau of Quality Monitoring: Responsible for the management of pesticide production processes.

Institute for Drug Control: Responsible for pesticide registration application, use, monitoring and administration. Develop or participate in the formulation of safe use of pesticides, pesticide product quality and pesticide residues in the national or industrial standards and other related matters.

Agricultural Law Enforcement Agencies: Responsible for market monitoring and quality management of agricultural chemicals.

Township Agricultural Comprehensive Technical Service Center: Assist and coordinate with the relevant law enforcement and technical departments to carry out the promotion, training and guidance of pesticide management and pest management in the local area.

**Pest Management Agencies:**

**Responsibilities of various departments:**

Department of Agriculture: Responsible for region’s agricultural and animal husbandry work, the province’s agricultural departments at all levels and the
organization of plant diseases and insect pests prevention and control.

Regional Plant Protection and Quarantine Station: carry out plant quarantine inspection; regularly issue the long-term, mid-term and short-term prediction on plant diseases and insect pests; emergency prevention and control of major plant diseases and insect pests and the sustainable control; the promotion and safe use of new pesticide and machinery. Promotion for the plant disease and insect pest control technology and provide corresponding training.

Regional Agricultural Technology Promotion Station: assist the agricultural department in the management; be responsible for the promotion for the technology.

Regional Commercial Crops Work Station: be responsible for the planting plan for vegetables, fruit trees, traditional Chinese medicine of the province, as well as the technology promotion and plant disease and insect pest management.

City and County (Region) Agricultural Technology Promotion Center: be responsible for the promotion for the agricultural technology in the areas under its jurisdiction; be responsible for the organization, planning, coordination, monitoring, decision-making and work management of the prevention and control of plant diseases and insect pests.

City and County (Region) Plant Protection Station: be responsible for the organization, management, guide and monitoring of prevention and control of plant diseases and insect pests of the areas under its jurisdiction. Assist and coordinate related law enforcement and technology departments to carry out the technology promotion, training and guidance on pesticide management and integrated plant disease and insect pest management technology.

Township Agricultural Technology Promotion Center: be responsible for the monitoring and prediction of major plant diseases and insect pests within the areas under its jurisdiction and implement in-time Prevention and control measures.

Agricultural Cooperatives and Farmers Association: organize and carry out local prevention and control of plant diseases and insect pests.

**Pesticide Residue Test Organization:**

![Diagram](image)

**Responsibilities of various departments:**
Regional Quality and Safety Test Center of Agriculture Products: be responsible for the quality and safety monitoring and management of the agricultural products in the province, and guide the safety and quality monitoring works in all cities and counties (regions).

Quality and Safety Test Center (Station) of Agriculture Products of all Counties and Regions: be responsible for the quality and safety monitoring and management of local agricultural products.

Wholesale Market of Agricultural Products and Supermarket Quality and Safety Test Center: be responsible for the access quality test to the market (supermarket) for agricultural products.

Quality and Safety Test Center of Agricultural Production Base: be responsible for the quality test for the agricultural products coming out of the production base.
3 Integrated Pest Management Plan

3.1 Project Objective and Focuses

The development objective of the project is to put forward the pilot demonstration industry chain development model in the selected project area to increase farmers’ income. Sub-project One aims at improving the poverty-oriented value chain, its planting industry dominated by perennial economical crops with local characteristics, pays attention to the production of pollution-free, green (Standard A) and organic food (Standard AA), increases the yield and improves the quality to increase the added value of products. The major focuses are as follows:

(1) Introducing and promoting PMP technologies in the project areas (communities and cooperatives), establishing Pest Motoring and Controlling Plan, increasing the pest forecasts.
(2) Using new varieties of microbial pesticides, botanical pesticides as a substitute for harmful chemical pesticides prevention and control approaches in the project areas, so as to reduce adverse effects of chemical pesticides on the environment and human health.
(3) Improving farmers’ practical operation skills and training farmers to master the skills of integrated pest management by production skills training and on-site training for farmers.
(4) Offering training for technicians of Technical Extension Station, pesticide sellers, community administrators and assists, and County Project Office staff to raise them the integrated pest management (PMP) awareness.
(5) Strengthening ties with quality supervision departments, and enhancing the supervision of the selling and using of pesticides in order to comply with related requirements by the World Bank “OP/BP4.09” and other international conventions and standards for pesticide using.

3.2 Project Contents

The PMP of Guangxi Rural Poverty Alleviation Pilot Project will use of agricultural, physical, biological and chemical control and other comprehensive measures as much as possible to control pests and diseases aimed at different projects, different communities and cooperatives of specific crops in order to reduce the dependence on synthetic chemical pesticides in agricultural production.

3.2.1 Conception on PMP (Integrated Pest Management Plan)
PMP is the implementation of pest integrated management, aims at controlling pests, improving the level of safety of agricultural products, protecting the ecological environment, improving the quality of the farms. Reducing dependence on chemical synthetic pesticides, and controlling pest activities under the level of destroying economy. Its core is:
(1) Prevention and control of pests rather than eradication of pests;
(2) To rely on non-chemical measures to keep the number of pests at a low level as much as possible;
(3) To choose and use pesticides which have the minimum impact on crops, human beings and the environment when insecticides have to be applied;
(4) To establish an standardized PMP technology system of the regional characteristics, to combine agricultural control, biological control, ecological control, physical obstacle damage and trapping technology, to reduce or instead of use of chemical pesticides to maximize, through which to avoid killing natural enemies and polluting the environment, to control the plant diseases and insect pests within an acceptable level.

According to the different biological characteristics and habits of pests, PMP takes the first consideration of using quarantine, biological, physical and mechanical methods, and cultivation techniques to prevent and control pests. Only in the case of the above methods can not be successful in preventing and controlling animal and plant diseases and insect pests, high efficiency and low toxicity of chemical pesticides can be used. In PMP methods, giving priority to the use of chemical pesticide alternatives. To follow the successful experience of using natural enemies and the application of biological pesticides is a good choice, For example, feeding trichogramma and flying them and then using insect nematode pathogens to control in a variety of fruits and snacks heart worm and stem boring pests, Moreover, some biological pesticides, such as BT insecticide and beauveria bassiana, have been developed. At present, biological pesticides and biological control technology have been applied in the production of some crops in Guangxi.

When the project area has a large plant diseases and insect pests, the chemical method is unavoidable. Pesticide spraying times shall be different according to the types of plant diseases and insect pests and crop condition.

3.3 PMP Technologies on Main Crops

All counties in the project areas have different natural conditions and plant crops, but their pest control measures are essentially similar, including agricultural practices, physical,mechanical, biological,ecological and chemical prevention measures.

3.3.1 Agronomic cultivation prevention
Main measures:(1) breeding and planting disease-resistant varieties;(2) strengthening the management of water, fertilization, tillage and weeding; (3) paddy-upland rotation. The study shows that: breeding and planting disease-resistant varieties are the most important way of preventing and controlling animal diseases and plant pests. Appropriate fertilization, irrigation, tillage, weeding and rotation measures can improve crop resistance to pests and cut down pest ability and density. The measures of selecting disease-resistant varieties and implementing appropriate water and fertilization for pest prevention and control can be applied to project crops like mango, bamboo, pitaya,
mulberry, kiwifruit, oil tea, tea, walnut, wild grape, orange, mulberry planting and silkworm raising, and edible fungi.

3.3.2 Physical and mechanical prevention
It is commonly used for pest control because (1) low cost: no need to purchase chemicals, due to cheap labor; (2) effective: very effective to preventing some animal diseases and plant pests; (3) safe: non-pollution, environmental and predator safety. Mechanical and physical methods can cut down a great deal of pest population and lower pests' resistance to drugs. Physical and mechanical methods can artificially decimate many plant pests like longhorn beetle, phalaenae, caterpillar and scarab on mango, bamboo, pitaya, mulberry, kiwifruit, oil tea, tea, walnut, wild grape, oranges, mulberry planting and silkworm raising, and edible fungi, which can effectively reduce pest population and mitigate pest damage.

3.3.3 Biological Prevention
It mainly takes advantage of pest predators and microorganism inoculants to prevent and control animal diseases and plant pests in a friendly way for human beings, animals and the environment. At current, microorganism inoculants are more widely applied to project plants. Because fruit trees are the most crops in the project areas, microorganism inoculants, including antiseptic (trichoderma, streptomycin), pesticides (bacillus thuringiensis--Bt, beauveria bassianna), insecticides (matrine, rotenone), can also be applied there. However, the effect of bio-prevention is not as quick and stable as that of the chemical pesticides, and its cost is also higher. In this case, many households prefer chemical pesticides to biological prevention methods.

3.3.4 PMP measures on project supportive crops
(1) PMP measures on mango
① anthracnose
Disease-resistant varieties shall be selected. Field shall be cleared in winter, sick branches and leave shall be cut off and burned, and Baume lime sulphur shall be sprayed once. It should spray pesticides once every 10 to 15 days during sprouting to flowering stage, and can choose 500 times liquor of 50% carbendazim wettable powder, 500 to 800 times liquor of 60% to 75% zineb, 800 times liquor of 75% to 80% captan powder, 1000 to 1500 times liquor of 75% to 80% methyl thiophanate wet powder. It should spray pesticides once every month during fruit growth periods, and can choose equivalent 1% to 3% Bordeaux agentia. After harvest, fruits shall be soaked in hot water for 51 to 55 degrees for 10 to 15mins, or in the special solution of 52 degrees of 500~1000mg/kg benomyl for 3 to 5mins.
② powdery mildew
It is popular at the temperature of 21 to 22cc. In the period of onset, using the following agentia to spray once every 7 to 10 days for continuous two to three times: 150-400 times liquor of 45 Hu suspension agentia, 500 times liquor of 40% miebingwei, 800 to 1000 times liquor of 25% Triadimefon, 1000 times liquor of 75% thiophanate, and It
③ bacterial black spot
Do a good job in orchard sanitation. Remove leaves and fruits with diseases, rot stem and scraping gum. Coat with Bordeaux (1:1:10). After Typhoon the whole tree shall be sprayed Bordeaux (2:2:100) or 2000 times liquor of 88% oxytetracycline hydrochloride soluble powder, or 300 times liquor of 30% copper oxychloride SC with 3000 times liquor of 72% streptomycin wet powder.

④ bleeding disease
Nursery shall be chosen in a ventilated and dry place to keep budding dry. Take buds from healthy trees. After budding survived and unbound, nursery stock shall be in a ventilated and pervers to light place. Spray 1000 times liquor of 70% thiophanate twice. Paint orchard tree trunk white. Spray regularly 1% lime times the amount of Bordeaux, or 600 times of 30% copper oxychloride. Remove susceptible branches and burn them. Apply 10% Bordeaux mixture thoroughly.

⑤ Chlurnetia guttiventris Walke
Cut off the dead wood and burned. In winter, brush bark crack, coat with lime water (3:10) for trunks and central branches. Spray in the splitting period of fruit tips or leaf buds. Spray once every 10 days for 3 to 4 times, until the panicle length becomes 20cm. Agentias can choose: 500-800 times liquor of 90% butylate, 1000 times liquor of 80% DDVP, 0.2% carbaryl solution, 1000 times liquor of 2.5% deltamethrin EC, 1000 times liquor of 20% Sumie kill Ding EC, 1000 times liquor of 10% cypermethrin.

⑥ Erosomyia mangiferae Felt
Pay attention to pruning, maintain good ventilation, clean orchards and loose soil in time. Destroy its pupation. When new shoot leaves sprout, spray once every 7 to 10 days, spray 1 times 20% speed destroy kill Ding, 10% an emerald, 1000 times liquor of 2.5% decis, dimethoate 40% and 800 times liquor of 90% trichlorfon. Combine with the soil application of 3% methyl ISO or 5% Carbendazim when it is more severe.

(2) PMP measures on bamboo
① arthriniumphaeospermum
Do not choose vegetables, pine, and fir land for nursery. Basal dressing needs maturity. Nursery with a 2-year-old healthy bamboo. Find bamboo with rotten tip shoots, and cut off from the base immediately. After emergence (or early onset) ,spray more than 50 times of wave solution or potassium permanganate, once every 10 days until seedling robust growth.

② bamboo seedling blight
Do not choose vegetables, pine, and fir land for nursery. Apply urbasulfl or organ arsenic pesticide in the dosage of 3.4kg / hm2 and mix in the proportion of 1:200 to 300 with fine soil, pad on the seedbed on multiple cropping, or mix Dexon 0.3 ~ 0.5kg / hm2 and 20 ~ 30kg fine soil for cropping. After the emergence of the early onset of spread on the bed.Apply0.2% tuzet or 0.2% to 0.3% organoarsenic pesticide of seed weight, or 0.5% of the enemy Nixon mixed with l0 ~ 15 times fine soil, then sow the seed dressing.

③ bamboo shoot blight
Clear pathogens: combine cut-off and hook-tip, cut the infected strains or shoots cut
down the sick bamboo, shoot and burned promptly. Do not use sickness bamboo for fence and so on. During the main period of disease in July and August, strengthen investigation and if find new dry yellow leaves, or brown blotches on bamboo joints, cut under 1 to 2 sections of the sick parts to avoid the disease continuing to spread, which causes the whole bamboo forest dead. Spray once every 15 days since new leaves unfold with 50% carbendazim WP or 70% thiophanate WP 1:1000 times liquor, or 1% Bordeaux mixture. Strictly quarantine, Do not transported mother bamboos from the ward.

④ bamboo smut disease
Strengthen the management of the bamboo forest. Fell bamboos appropriately in order to promote the growth of the bamboo forest, and reduce the incidence chances. As a small number of bamboo get disease in the bamboo forest, cut all disease bamboos promptly (best in front of the black powder dispersion), and burn branches with black powder to avoid it spread off.

⑤ bamboo moth
In autumn and winter of the busy year, dig soils to decrease the amount of cocoons, which will survive in the winter. Set black light to trap or to destroy moth in the adult stage. In the young larva boom, inject bamboos with 20% imidacloprid, or in the larvae boom, spray 80% DDVP to control.

⑥ Hippotiscus dorsalis (Stal)
Apply 500 to 800 times liquor of Cypermethrin MC onto dried bamboo base, which is no less than 80 cm high in April each year, before nymphs climb onto the bamboos.

(3) PMP measures on pitaya

① anthracnose
Balance fertilization, add a variety of trace elements, spray Cabrio Top, Stroby, chlorothalonil and Myclobutanil, thiram, Tricyclazole and zineb and other therapeutic and protective agentia, 7 days for a course of treatment, 3 course of treatment in total. The sick branches need to be pruned out and destroyed.

② canker
The main cause is Bactrocera, which is a pest with eating utricles. Adult Bactrocera usually spawn on the surface of pitayas. After the larvae hatch, they can go into the fruit to be fed. After feeding, pitayas will become rotten, which influence the quality of pitayas. For baby Bactroceras, it is better to spray pyrethroid pesticides for the whole trees at night. For adult Bactroceras, use brown sugar, rice wine, vinegar, white worm enemy which mixed in the average ratio thoroughly in a dish, and then put it under fruit trees in the evening to lure the adults emerge and allow to be killed by trichlorfon. Of course, other odorless pesticide can be used to replace trichlorfon to kill adult Bactroceras.

③ necrotic spots disease
It forms mainly due to cactus anthrax bacteria. The spots influence fruit appearance. And when the picking season is coming, excessive pesticides can not be sprayed. Therefore, diluted agricultural streptomycin sulfate soluble powder with 3000 times captan Kang can be used to spray.
(4) PMP measures on mulberry
① mulberry yellow awarf
First, to eliminate the source of infection, strengthen seedlings quarantine, to prevent sick seedlings inflows. Secondly, if a diseased tree is found, it should be excavated immediately. All of the trees should be excavated and replanted if there are a lot of trees infected. Thirdly, strengthen the management of Hishmonus sellatus and Hishimonoides sellatifrons Ishihara.
② sclerotinia blight of mulberry
First, strengthen the management of orchard, including pruning and weeding and increase orchard permeability; Second, at the flowing phrase and larval stage, 1000 times liquor of carbendazim and thiophanate-methyl should be sprayed; Third, in the period of disease, artificial removal of diseased mulberry can control the spread of contagious disease effect is remarkable.
③ mulberry small weevi
One is in winter, prune dry piles, twigs, dead stem and burn them together before March 10th. In summer, cut at the base of fist-shape. The other is when mulberry weevil is found during the germination, use 1000 times liquor of 50% of fenitrothion emulsion or 1000 to 1500 times liquor of 80% DDVP to spray trees. When spraying the best is on a sunny day from 9:00 am to 5:00 pm ,which is the active period of mulberry small weevi.
④ mulberry sorosis gall-midge
First, strengthen the management of mulberry orchard, weeding, and enhance ventilation and breathability. Using the spring and summer rotation can inhibit the occurrence of this pest. Second, in March, after irrigation, using mulches between rows can prevent worms from eclosion and the mature larvae from buring, so as to reduce pest density, reduce the damage; Third, in the early spring germination of mulberry, mix 0.1kg 50% phoxim with 50kg fine cinder together, Sprinkle them into the soil to kill overwintering dormant pests; Fourth,at the phrase of young fruit, if pests are found, spray 500 times killing maggot chemicals to prevent; Fifth, at the phrase of fruit maturity, early pick up ripe mulberry, and timely remove the mulberries which are deteriorated and rotten is a good way to reduce secondary damage.

(5) PMP measures on kiwifruit
① root rot disease
Gutters in the plantations should be digged deeply to ensure that there is no ponding to reduce soil moisture. Minimize the mechanical damage at the base or roots of the plant. If there is damage, it should be promptly applied liquid disinfection for wounds; for the wound which are not handled timely results in being infected, the wound should be cut and disinfected. Make full use of the organic fertilizer which is rotten to maturity or organic material mixed fertilizer in order to better the soil. Spray harzianum, etc. onto the soil surface, so that it can effectively inhibit the development of Phytophthora and are not harmful to the kiwifruit.
② white root rot
Do a good job in orchard drainage to prevent ponding; pay attention to fertilization to
make trees strong; lighten the burden of trees though pruning; if the diseased plants are found, they should be promptly burnt, and disinfect the roots of the soil with lime; 800 to 1000 times liquor of 50% carbendazim powder or 1000 ~ 1200 times liquor of 50% thiophanate WP cab be used to kill the roots.

3 Pseudaulacaspis Pentagona (Targioni-Tozzetti)
Before trees are in the bud, clear the pests on the branches with rags or weeds; improve the cultivation conditions, pay attention to pruning, and improve the ventilation and light condition; choose suction-in pesticide, and in spawning period and nymphal stages, use 500 to 800 times liquor of 50% phosmet EC, 1000 to 1500 times liquor of 50% marathon EC. Protect its natural enemies, and the red ladybug is its natural enemies. Pay attention to protect the natural enemies is a continuous way to control the pest, which has a good effect.

4 scarab
Grow other plants which scarabs like to eat to reduce the damage to kiwifruit; manual or birds capture the pest; kill it by using its phototaxis; drug prevention: 800 times liquor of 80% dichlorvos EC, or parathion granules in the fall and winter to reduce the harm at the larva stage.

(6) PMP measures on oil tea
1 Biston marginata
Kill the pest moth on the soil surface through dig the soil in autumn and winter. Adult pest are weak in flying so that they can be caught and killed. Scrape the eggs on the back side of branches, tree trunks directly due to their loose adhesion. In the Camellia forest, cast Beauveria bassiana powder to prevent larvae under three instar, Prevent 3-4 instar larvae with 0.5 billion to 100 million spores / mL Bacillus thuringiensis. At the phrase of larvae, spray 800 to 1600 times liquor of 2% nicotine emulsion, or 800 to 1600 times liquor of 0.3% azadirachtin, or 400 to 700 times liquor of 5% bifenthrin.

2 Blue wings sawyer
Strengthen cultivation management, prune branches to control pests, and cut the sick branches under its diseased part. In the period of eclosion, pests can be artificial hunted in the morning or trapped by light. In the phrase from egg to larvae, cut spawning cortex with a knife to destroy the eggs and newly hatched larvae. Before larvae were drilled into the xylem, use the brush dipped in 500 times liquor of 40% Omethoate to apply them into cuttings and ring road of pest moving, and its insecticidal effect can reach more than 95%; or stuff Ambrosia fumigation with cotton dipped in Omethoate, and then block bore crossing with yellow soil; or inject vent with 50 times liquor of 50% fenitrothion, and then block with yellow soil, which has a good effect.

3 Curculio chinensis
Combine with deep plowing to eliminate larvae and pupae. Without affecting the germination of the premise, the proper pick early, place them together, so that the larvae climb out of fruit and let chicken eat them. Artificial hunting: during adult pest boom, shake off them and kill. Or a combination of chicken pecking the adult pests. Pesticide prevention and treatment can be adopted during adult pest boom. Mix 40% dimethoate and, 80% dichlorvos omethoate (1: 1) and make 1000 times liquor of it, and
then spray 2 to 3 times, which can effectively control pests.

4. Camellia anthrax disease
Growing the plants with good growth ability and high disease-resistant is a basic measure to prevent the disease, and it is suitable for scientific planning and intensive management. The excavation of diseased plants, with deep reclamation, deep buried diseased fruit, diseased leaves and branches of disease is the way to excavate disease when new shoot comes out, spray them with equivalent Bordeaux mixture (1:1:100), or with 500 to 800 times liquor of 50% carbendazol wet powder, 800 to 1000 times liquor of 50% tuzet WP on prevention and its cure effect is obvious.

5. Agaricodochium camellia
In winter, remove diseased leaves, branches and fruit, and eliminate overwintering bacteria to reduce infection source for the following year. Timely and appropriate prune so that plants are in a ventilate and pervious to light environment to reduce humidity degree, and the occurrence of disease chances. Strengthen the management, of organic fertilizer to increased disease resistance. In the early onset period, spray Bordeaux (1:1:100) mixture in a sunny day. The pesticide has strong adhesion, resistance to rain erosion, efficacy duration above 20 days, control efficiency 84.4% ~ 97.7%; or spray 600 to 800 times liquor of 50% WP tuzet and 500 to 600 times liquor of 70% thiophanate , which effect is better.

(7) PMP measures on tea

1. Tea caterpillar, Ectropis obliqua, leaf roller
The lighting way is using lights. A frequency vibration killing-pest lamp in tea gardens traps pests. It is only valid in the performance of large scale. It has an evident effect on killing Tea caterpillar, Ectropis obliqua and leaf roller. So it helps reduce the use of pesticides one or two times.

2. Myllocerinus aurolineatus Voss
The adult pest has the character of feign death. In mid- June, shake the trees under the canopy with dustpan or plastic film containing, so that the feign death of adult worms can be killed. Take the artificial pick-up measure for leaves with serious disease. Break the protect sac for moth in the rolled leaves. Strick off the cocoons of Iragoides fasciata Moore on the branches with a knife.

3. Gloeosporium theae-sinensis Miyake
Strengthen the daily management of tea garden. Make sure the tea is not short of water, or fertilizer. According to the actual situation of the growth, apply organic fertilizer properly. Pay attention not to apply nitrogen fertilizer too much. Do good jobs in drainage work. For the tea infected with the disease, choose 1200g/hm² 75% zineb, 1300g/hm² 20% Prochloraz, and 1300g/hm² 60% thiophanate methyl. Mix the above pesticides with 800kg/hm² water and spray to the infected tea tree.

4. tea red scab
In summer, strengthen the management of tea garden, including cultivation, watering. Mix 1500g/hm² 70% chlorothalonil, 2000 g/hm² 50% carbendazimand 600kg/hm² water to spray diseased plants.

5. tea blister blight
Mix 3000 times dilution of 20% Triadimefon WP (350g / hm$^2$), 600 times dilution of 70% chlorothalonil (1300g / hm$^2$), and water (1000kg / hm$^2$) and spray the trees with disease.

(8) PMP measures on walnut

① alternaria leaf spot
First, strengthen the cultivation management. The walnut tree, which is in the growth process, should be given enough organic fertilizer every autumn, and fertilized in a reasonable way. At the same time, clear the source of infection, after harvest, remove diseased branches, leaves and fruits and burn or bury them together. Finally, carry out the chemical prevention. Spray 3 to 5 degrees of lime-sulfur before germination, and spray Bordeaux mixture repeatedly after walnut tree leaves unfolded.

② Gloeosporium rufomaculans (Berk.) thum
First, pay attention to rational close planting, strengthen upbringing management, and keep the orchard ventilate and lighting to improve plant disease and cold resistance. Clear the diseased branches, diseased fruits to reduce the source of infection. Mix 1000 times liquor of 50% carbendazim WP, 600 times liquor of 75% chlorothalonil, and 500 to 1000 times liquor of 50% thiophanate before walnut flowering, in the young fruit phrase and in the period of rapid growing of fruits,

③ Atrijuglans hetaohei
From winter to next April, deeply plow the soil under trees, clear weeds and fallen leaves to kill or reduce overwintering pests. From mid-June to harvest, pick up fallen and diseased fruits and bury them deeply together to eliminate pests in fruits. In the mountains or inconvenient places, there are two prevention methods: on the occasion of rice turning slightly yellow, spray 2.5% Decis or 3000 to 5000 times liquor of $\lambda$-Cyhalothrin once every 10 days, for twice successively in total to protect fruits and control pests.

④ Agrilus lewisiellus Kere
One economic and effective way against the pest is: from mid-April to mid-May, or in the time of fruit harvest, completely cut off dried-up branches (with a few alive branches), and burned them together to eliminate pests in the branches.

⑤ Cossus cossus Linnaeus
From July to August, apply 30 to 50 times liquor of 2.5% Decis emulsion in walnut root where there are larvae invade holes to kill young larvae. When the young man moth are in the wood of trees, dig the soil at the the root, and remove feces in the hole, then injected 50 to 100 times liquor of 80% dichlorvos emulsion to the wormhole, or block the holes with cotton balls dipped in dichlorvos poisonous, and seal with wet soil to smoke-kill larvae.

⑥ Dictyoploca japonica Butler
Before April, kill eggs with small hammer or the back of axe to control pests. At the young larvae stage, spray 000 times liquor of 90% trichlorfon crystal or 3000 to 6000 times liquor of 2.5% deltamethrin emulsion to the trunk and crowns where pests live. From July to August remove cocoons and destroy them together for pest control.
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(9) PMP measures on wild grape
① downy mildew
The main damage is to leaves, young shoots and young fruit. Hazard characters are the growth of white mold on the back of leaves, which gradually expands, and results in leaves become brown and dry. Control methods: First, cut off the diseased branches, diseased fruits and burn or bury them together to wipe out the source of infection. Second, strengthen management, Tie tendrils, pinch, reasonable prune while growing season to ensure the frame surface ventilated and pervious to light. Increase using fertilizer with phosphor and kalium and organic fertilizer to improve plant disease resistance. Third, chemical control, spray with the same amount of Bordeaux mixture, which is the ideal protective agentia, before the onset- disease, In the period of disease, spray with 800 to 1000 times liquor of 58% of toxic mold MnZn WP, and each acre needs 100g.
② powdery mildew
It occurs occasionally in some years, but the impact on yield is big. It mainly does harm to fruit ears, shoots and leaves Control methods: First, timely clear diseased fruits to eliminate pathogens. The second is to strengthen the management of the branches and tendrils evenly distributed onto the frame surface, and having enough air and light. Third, chemical control, after the onset of disease, uses 1,500 to 2,000 times liquor of Score and 600 to 800 times liquor of Dacotech.

(10) PMP measures on oranges
① anthracnose
Adopt the combination of agricultural medical technology, which can prevent anthrax expansion effectively. Medicinal technology approaches: in the period of shooting, spray with 0.5% to 0.8% Bordeaux mixture, and spray with 500-600 times liquor of 80% Mancozeb WP when blossoms fall by 2/3 . It can effectively prevent anthrax.
② oranges canker
Mix 50 to 80ml 20% of thiodiazole copper suspension with50kg water, and spray them directly onto the inflected wounds, or use 40 to 50 ml 2% kasumin AS to reduce the damage degree of oranges fruits and leaves, thereby reducing canker repeatedly invaded times.
③ Dacus dorsalis (Hendel)
Take the measure of combination of ground and crown directions. In ground drug prevention, mix 50ml 52.25% Ray Le with 50kg water, and spray evenly around the tree plate; spraying crown is supplement if the ground treatment is not good enough. When oranges buds appear white, choose 50 to 60ml chlorpyrifos 40% EC to spray onto oranges trees. It can also control aphids and other pests.
④ scale insect
Mix 20 to 25 ml 40% scale EC and 15kg water to offer a comprehensive and even prevention and control in the way of mist spray.

(11) PMP measures on edible fungi
① brown rot
Overburden soils shall be strictly disinfected before going into the bed. If it is polluted
by Mycogone perniciosa magn, use pasteurization treatment (60 ℃) for one hour. Reduce initial inoculum source. Pay attention to the sanitation in and out of mushroom room and clear disability organs thoroughly. At the early stage of the disease, immediately stop water, and increase the amount of the mushroom room ventilation. Spray Bordeaux mixture (1:1:50 lime: copper sulfate: water) onto the mushroom bed to protect healthy mushrooms from infecting. In serious cases, remove the original cover soil, and replace the new soil; destroy the disease mushroom, and put all the tools in the 4% Formaldehyde Solution immersion to disinfect.

② bacterial rusty spot disease
Cultivation management prevention. Disinfect mushroom field, and purifier water; strengthen mushroom field ventilation, cooling, but avoid spraying with a lot of water; sow timely and avoid the high temperature and high humidity season. When using mushroom fields which are easily infected by this disease, select high disease resistant varieties in addition to timely treatment. In the early onset of bacterial rust, ventilate and reduce moisture the room. Spray 1% lime liquid or 0.2% bleach solution. In the severe cases, remove the infected mushroom, scrape off the yellow surface hyphae, and then spray 5% lime solution, or use a piece of strong chlorine disinfection tablets in 4kg water for 2 to 3 times.

③ bacterial canker disease
Use clean water. Appropriately control the water content of culture medium in hyphae period. In mushroom period, appropriately reduce the relative humidity of the mushroom room, enhance ventilation, and prevent the accumulation of water in the bag while water spraying. Diseased mushrooms shall be removed immediately once they are found in mushroom bags or beds, and stop water, prevent the spread of germs. Chemical control can refer to the control measures of bacterial rusty spot disease.

④ damping-off disease
The main way is to sterilizate for overburden soils with carbendazim or Topsin M (1:500).

⑤ fusarium wilt
When the sub entities appear to wither, first of all, make clear of the causes of the disease, and then take related measures. Avoid spraying pesticides in the mushroom room where mushrooms come out especially for oyster mushroom and phoenix mushroom.

⑥ Mite
Fumigation acaricidal: dip cotton ball in DDVP and put it on the base, then cover the bed surface with plastic films, the drug volatile and kill mites. Rapeseed trapping: lay in some wet cloth on the bed damaged by mites, sprinkle fried seeds onto the cloth, wait for mites gathering on the cloth, and then put it under water in a moment. It can kill mites. Sweet and sour liquid trap: mix acetate, water, and sugar in ratio of 1:1:0.1 and drop 1 to 2 drops of DDVP into the mixture. Use gauze or cotton soaking in the liquid and then put them on the bed surface, wait for mites gathering on them, remove pests and burn them into death. Repeat the operation until it is free of mites. Fresh bone trapping: put fresh pig bones on the bed. Put bones into hot water after they are all on the bones. Repeat the operation until it is free of mites. Spraying miticide: 1000 times
liquor of 50% dimethoate and, 1500 times liquor of dimethoatepyrethroid or 500 times liquor of propargite. Spraying 400 times liquor of washing powder for 2 to 3 times also have a good effect of killing mites. 
⑦ sorosis gall-midge, lycoriella pleurati, and phoridae
Adopt standard mushroom house or plastic greenhouse with gauze. The mushroom room should be cleaned thoroughly before use and then use the 800 times of dipterex or DDVP to kill pests. For outdoor cultivation, remove weeds around the site. Spray soil with trichlorfon solution of 200 to 300 times. Trapping adult pests. By making full use of their phototaxis, trap the pests with black light lamps or fluorescent lamps. Hang cotton balls or basins filled of DDVP around lamps. A small amount of honey or molasses can be mixed with DDVP. Pesticide prevention and cure (Mushroom room fumigation): in the airtight condition, every cubic meter of space with 2 to 3 pieces of aluminum phosphate fumigating to kill pests. Spraying 500 times liquor of trichlorfon or 500 to 800 times liquor of DDVP, 1000 times liquor of decis to kill pests; the above procedure only can be done after harvesting all mushrooms.

3.4 Principles for Using Biological Pesticides

The classification of pesticides by hazard degrees, which the WHO recommended, was approved by the 28th World Health Assembly in 1975. In order to deal with the new situation, WHO revised the classification (table 3.4-1) in 2009. Pesticide toxicity is mainly classified by the acute oral and dermal toxicity to the rat, since these determinations are standard procedures in toxicology.

The WHO GHS classification is as follows.

<table>
<thead>
<tr>
<th>GHS Class</th>
<th>Symbols</th>
<th>Oral LD50 (mg/kg)</th>
<th>Dermal LD50 (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ia</td>
<td>Extremely hazardous</td>
<td>&lt;5</td>
<td>&lt;50</td>
</tr>
<tr>
<td>Ib</td>
<td>Highly hazardous</td>
<td>5-50</td>
<td>50-200</td>
</tr>
<tr>
<td>II</td>
<td>Moderately hazardous</td>
<td>50-2000</td>
<td>200-2000</td>
</tr>
<tr>
<td>III</td>
<td>Slightly hazardous</td>
<td>&gt;2000</td>
<td>&gt;2000</td>
</tr>
<tr>
<td>IV</td>
<td>No hazardous</td>
<td>≥5000</td>
<td>≥5000</td>
</tr>
</tbody>
</table>

Table 3.4-1 WHO GHS Classification (2009)

Pesticide prevention must strictly follow the requirements on WHO Pesticide Classification
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Guidelines. Class I must be forbidden. Class III and IV are given priority to application. The recommended pesticide list sees Table 3.4-2.

<table>
<thead>
<tr>
<th>Crop Name</th>
<th>Diseases and Pests</th>
<th>Pesticides</th>
<th>Pesticide Classification (WHO)</th>
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</thead>
<tbody>
<tr>
<td>pitaya</td>
<td>scab, anthracnose, fusarium wilt, black rot stem wilt, spiny white fly, red spider, Geometridae, scarab</td>
<td>streptomycin sulfate, mancozeb, Mancozeb, thiacarbendazole, thiophanate methyl, acetamiprid, Imidacloprid, Avermectin, deltamethrin, Cyfluthrin, cypermethrin, deltamethrin</td>
<td>III, III, III, III, III, IV, III</td>
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<tr>
<td>mulberry</td>
<td>Sclerotiniosis, mulberry small weevil, Apripona germari</td>
<td>Chlorothalonil, thiophanate methyl, thiacarbendazole, Cyfluthrin, cypermethrin, chlorpyrifos</td>
<td>III</td>
</tr>
<tr>
<td>mango</td>
<td>Anthracnose, powdery mildew, bacterial black spot, excavate Butler, Chlumetia guttiventris WaLker, Erosomyia mangiferae Felt, Lawana lmitata Melichar, Rhytidodera bowrinii white</td>
<td>thiacarbendazole, thiophanate methyl, Propargite, Avermectin, acetamiprid, Imidacloprid, Esfenvalerate, pirimicarb</td>
<td>III, III, IV</td>
</tr>
<tr>
<td>oil tea</td>
<td>Anthracnose, sooty mould, soft rot Moth, Lasiocampidae, Parametriotes theae Kuznetzov, Geometridae</td>
<td>thiophanate methyl, cypermethrin, thiacarbendazole, Cyfluthrin, chlorpyrifos, cypermethrin</td>
<td>III</td>
</tr>
<tr>
<td>kiwifruit</td>
<td>Root rot, brown blotch, canker, powdery mildew, White scale insect, green leafhopper</td>
<td>Chlorothalonil, bromothalonil, thiophenate-methyl, mancozeb, streptomycin sulfate, Chlorpyrifos, deltamethrin</td>
<td>III, III IV</td>
</tr>
<tr>
<td>Plant</td>
<td>Disease/Insect</td>
<td>Recommended Pesticides</td>
<td>Toxicity Class</td>
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<td>--------------------------------</td>
<td>-------------------------------------------------------------</td>
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<tr>
<td>orange</td>
<td>Canker, Anthracnose, scab, black rot, Red spider, arrowhead scale</td>
<td>Tuzet, mancozeb, streptomycin sulfate, thiophanate methyl, thiabendazole, bromothalonil, propargite, chlorpyrifos, Avermectin</td>
<td>III</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>III</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>walnut</td>
<td>Canker, Black spot, walnut branch blight, canker, Geometridae, Dyscerus juglaus, leaf beetle, longicorn Red spider</td>
<td>Chlorothalonil, bromothalonil, thiophenate-methyl, Chlorothalonil, Tuzet, mancozeb, Zhongshengmycin, streptomycin sulfate, Chlorpyrifos, Cyfluthrin, cypermethrin propargite, Avermectin</td>
<td>III</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>III IV III</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>III IV</td>
</tr>
<tr>
<td>wild grape</td>
<td>scab, Anthracnose, Coniothyrium diplodiella, gray mold brown blotch Downy mildew Powdery mildew, clearwing moth, fruit-piercing moth, thrips, Lygocoris lucorum, mites, aphid, mealybug leafhopper</td>
<td>Chunleimeisu, azoxystrobin, validamycin, propamocarb hydrochloride, Chlorothalonil, thiophenate-methyl, Azoxystrobin, validamycin, propamocarb hydrochloride, Chlorothalonil, thiophenate-methyl, triadimefon, propiconazole Chlorpyrifos, Cyfluthrin, cypermethrin, Avermectin, deltamethrin propargite, Avermectin, acetamiprid, Imidaclorpid, cis</td>
<td>III</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>III IV III</td>
</tr>
<tr>
<td>edible fungi</td>
<td>mould mushroom mosquito, flies, mole cricket, maggot</td>
<td>Thiabendazole, Avermectin, deltamethrin</td>
<td>III</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>IV III</td>
</tr>
</tbody>
</table>

Based on the oral and dermal LD50 (mg/kg of body weight), WHO and Chinese government made the Acute Toxicity Classification Criteria respectively. WHO classified pesticide toxicity into IA: extremely hazardous, IB: highly hazardous, II: moderately hazardous, III, slightly hazardous, IV: no hazardous, which are equivalent to China's criteria from extremely poisonous, highly poisonous, moderately poisonous, slightly poisonous to no poisonous.

Table 3.4-2 lists the recommended pesticides, which are in accordance with WHO classification of pesticides by hazards and China's acute toxicity classification criteria. The listed pesticides all in category III: low poisonous and IV: no poisonous. What with ※ is belong to biological pesticides, categorized in no poisonous. The recommended pesticides totally abide by the requirements of relevant policy document of WHO and China. The pesticides in IA and IB category of WHO list and in the latest China's
Forbidden Pesticide List are entirely forbidden to apply in project areas.

3.5 Varieties and Dosages of Pesticides Allowed to Use

The project will give priority to use agriculture, physical (such as trapping), biological control measures or biological pesticides (like Bt) which have the equivalent prevention abilities to synthetic pesticides. This project mainly supports the biological measures of pest control, which do the least harm to the environment and human and livestock. In addition, the same crop will not be continuous, repeated applied for the same pesticide, in case to produce pesticide-resistance. The pesticides, which are applied, are all national registered products and are used correctly according to Guideline for Safety Application of Pesticides (national standard). For people and the target crop safety, the pesticides should be applied properly in accordance with the pesticide product labels and instructions (see Management Provisions for Labels and Instructions of Pesticides). It is written in Regulations of the People's Republic of China on Pesticide Administration that the regulations should be strictly obeyed by the people whoever produce, sell and apply pesticides within the territory of the people's Republic of China. There are detailed provisions in the Regulations for registration, production, operation and application of pesticides.

3.6 Management of Insecticides

3.6.1 Management of application of insecticides
(1) Local agricultural departments shall strengthen the guidance of how to use insecticides safely and appropriately. The departments shall formulate a plan of rotation use of insecticide according to local pest occurrence situation , and follow the plan to put off or relieve insecticide-resistance, so as to improve the prevent and control effect.
(2) Households shall abide by Safety Operation Regulations on Applying Pesticides while using insecticides, and do a good job in dispensing and applying insecticides, waste disposal and safety precaution to prevent accidents of insecticide pollution and poisoning.
(3) Households shall abide by state regulations on using insecticides safely and reasonably and apply insecticides in accordance with requested dosage, frequency, and method and safety interval, to prevent pollution of agricultural and sideline products.
(4) Households shall take care of the environment, useful and rare species while using insecticides, and it is strictly prohibited to use pesticides to poison fish, shrimp, birds, animals, etc.
(5) The agriculture technology departments shall strengthen the guidance of using insecticides safely and reasonably in Forestry, Gain Reserves, and Health Departments.
(6) Local plant protection stations shall make a timely and accurate record of usages of insecticides, and make a file of it.
(7) Households shall report the categories and names of insecticides to related staff of plant protection stations before using them, and the staff shall on-site inspect the using situation and provide guidance in time while households are applying for the
insecticides.
(8) Do not throw away the packages of pesticides arbitrarily. The Pesticide Packaging Recycling and Disposal Management Method, including packaging material management, recycling, transport and disposal should be implemented.
(9) To establish and improve a responsibility system for using pesticides is to prevent any injury accident. The formulating and spraying of insecticides shall be in a correct way, that is, the use of pesticides must be accurate, any re-spray, fault and missing spray and dosing in the field must be prohibited. A right wind direction must be chosen to avoid doing harm to adjacent crops.
(10) Local agriculture departments shall establish and perfect the management system of insecticides, make the keep records, clearly indicate insecticide names, manage the insecticides according to their categories, implement a strict in-and-out of storage room procedure, which means that insecticides only can be moved in or out of the room after technicians sign.

3.6.2 Accident rescue measures on using insecticides
(1) Call 110 or 120 immediately in case of an accident (such as fire, poisoning, etc.). People shall evacuate to safe area as quick as possible to prevent casualties for no reason;
(2) Immediately organize the rescue of the injured persons, organize the evacuation or take other measures to protect other persons in the area;
(3) Rapidly control the hazards, and detect, monitor, and determine the hazards of the accident area, the nature of the pesticides and the degree of harm;
(4) Quickly take the measures of sealing, isolation, decontamination, etc., according to the actual and potential harm to the human beings, animals and plants, soil, water and air.
4 Implementation Arrangement on Pest Management Plan

4.1 Arrangement and Responsibility of Project Management Offices

The project relies on the existing systems of disease and pests monitoring, forecasting and prevention and plant protection stations of Baise city, Hechi city and other 10 counties (cities).

- Project Management Offices (PMO) at autonomous region, city and county levels are responsible for pest management. The PMO of Guanxi Autonomous Region develops a general pest management plan, and guides and supervises the pest control on main industry of the project counties.
- The city PMOs are responsible for guiding and supervising the implementation of the pest management plan in all project counties.
- The county PMOs are in charge of guiding households to implement and complement the PMP according to the project’s real requirements, training agro-technicians and farmers on PMP practices, monitoring the specific implementation of PMP, and timely reporting problems and their solutions to the city and regional PMOs.
- The plant protection stations of the project county participate in the implementation and training and monitoring work of Integrated Management of Animal Diseases and Plant Pests.

4.2 Mechanism and Procedures of Pest Management

The purchase, storage and application of pesticides in project area shall strictly abide by relevant national laws and regulations. The county PMOs shall lead households to control and manage according to the following procedures.

4.2.1 Personnel Management of Pest Management Plan
Each level PMO project shall assign some people to be in charge of pest management and shall identify annual tasks, targets and responsibilities.

4.2.2 Cost Management
The procurement of pesticides should strictly follow the Operation Manual. Households should carefully keep the records of procurement, distribution and application in details for auditing procurement expenditures.

4.2.3 Implementation Management of Pest Management Plan
PMP joint meeting shall be regularly held with county PMOs, plant protection and veterinary stations, managers of the cooperative and household representatives, in order to summarize and report the actual implementation of PMP and to timely solve and adjust existing problems. Annual reports from County PMOs to regional PMOs should include the implementation of PMP and its relevant situations of training, performances, achievements and existing problems. The achievements of PMP implementation should
be widely publicized in different ways to accelerate the demonstration and extension of results.

4.2.4 Procurement, and application management of pesticides

(1) According to the actual and potential situation on animal diseases and plant pests during project industry development, the recommended procurement list of pesticides (see the table 2.3-1, 3.4-1, 3.4-2) should be compiled. The pesticides on the list must be issued with state product registration license and manufacturing license. Under the same condition, biological pesticides and products with low poisonous should be prioritized for procurement. Normally, the pesticides which are not on the list can not be purchased, applied and reimbursed. If it is necessary to purchase those, the specialist panel should be organized, and it must be approved by the PMO of Guangxi Autonomous Region.

(2) According to the actual situation of plant pests, households should list the needed pesticide names and dosages in annual work plan. Under the Operation Manual, households can purchase and use pesticides at their needs. The households should carefully keep the records of procurement, distribution and application in details for auditing and monitoring.

(3) Pesticides on the list must be purchased from companies with Business Licenses. The procurement procedure must meet the requirements of the Operation Manual.

4.3 Capacity Building

4.3.1 Training

The training contents mainly include:

- Relevant national and local laws and regulations
- The plan and implementation of integrated plant disease and insect pest management of the project
- Methods of safe procurement and application of pesticides
- The identification, prevention and integration management technology of main plant diseases and insect pests of the project

Training for application of pesticides safely:

- Provide special training for village cadres, farmer households and pesticide salesmen about the possible influence of pesticides on the environment, the recommended application methods for the pesticide and the equipment, etc.
- Provide training and demonstration for village cadres, farmer households and pesticide salesmen to enhance their understanding of the following problems:
  - Possible influence of all kinds of pesticides on the occupation/health
  - Recommended application and spraying methods
  - Approved equipment (such as: sprayer, spray nozzle, etc.) and application methods
  - Wear safety suits (shirt with long sleeves, masks, hats, gloves, long trousers, shoes)
  - Apply the pesticides in days with static wind
Keep and store the pesticides safely; lock the pesticides in the cabinets with locks where the children could not access to
- Get rid of the packing and wastes of pesticides in a safe manner; it is the best to bury them deep or burn them down

- Supervise the aforesaid operations. If there were any incorrect operations, the concerned people should be trained again.
- Implement the listed project management measures.

In the project, the instruments for physical and biological prevention and control should be purchased to apply multiple technologies for plant disease and insect pest prevention and control (agricultural/physical, biological, chemical), making sure the pests or the diseases do not form resistance to the pesticides.

4.3.2 Policy Implementation （Increase the awareness to implement the policies）

Through the implementation of the project, the awareness to implement integrated plant disease and insect pest management has been strengthened, which can be reflected through the following facts:
- Strictly follow the regulations on pesticide management.
- The application of unregistered pesticide in the project is prohibited.
- The application of I type pesticide defined by the WHO in the project is prohibited.
- The following laws and regulations should be strictly abided by:
  - FAO Behavioral Code of Pesticide Management, Sales and Application (or corresponding laws and documents in China).
  - FAO Guide for Pesticide Packing and Storage (or corresponding laws and documents in China).
  - FAO Instructions for Correct Labeling of Pesticides (or corresponding laws and documents in China).
- Abide by the related environment requirements on chemicals including pesticides by the National Environment Protection Department; the ecological model counties should also stick to the environment requirements on the ecological model county.
- Through discussing the providing the successful cases and outcome (especially long-term effects) of PMP, to encourage the governments of counties and villages to promote and support the PMP methods.
- Require the farmer households who apply to be part of the construction of model base to purchase permitted and registered pesticides.
- Providing fund support for the PMP study and promotion in this project should be regarded as the priority.

4.4 Supervision Management

Further implement the PMP through the following approaches:
● Train the promotion staff and farmer households in the counties and communities.
● Make a monitoring plan to evaluate the PMP technology and application in the plant disease and insect pest management in the project.
● Appoint one project management officer in charge of evaluating the organization and implementation of PMP methods in plant disease and insect pest management and provide certain financial support for PMP management organizations.
● Together with the Agricultural Technology Promotion Center of Shaanxi Province and other science and research institutes (such as the Agricultural Science Academy of Shaanxi Province), treat PMP as the focus for future study and promotion.
● Establish partnership with relevant organizations in the country and make a contribution to the PMP technology in this project.
● Enhance the relations among provinces, cities, counties, communities and cooperatives and solve the problems in time to facilitate the smoothing implementation of PMP.
● Promote the measures and methods to reduce the application highly-toxic pesticide. The private business owners are encouraged, especially those selling agricultural chemicals, to effectively apply PMP methods.

4.5 PMP Implementation Reporting

● The undertaking unit of the project has the obligation to submit the annual project progress report in time. The mid-term implementation report is required at the mid-term of the project and the implementation report is required after the completion of the project.
● The annual report and mid-term report of the project should include: the implementation date, the fund utilization condition, the project progress, the outcome, the difference between the actual outcome and anticipated outcome, the problems met during the implementation and its corresponding solutions, etc.
● After the completion of the project, the final report should include: the implementation date, the fund utilization condition, the latest progress of the project, the difference between the actual outcome and anticipated outcome, the problems met during the implementation and corresponding solutions, etc.; The project implementation outcome assessment is reflected by the application of technology which has been promoted in the project, the increase of the farmers’ income and the improvement degree of their living standards through the new technology, the quality and safety level of agricultural products, the influence on the ecological environment, the sustainability of the project, project organization and management, etc. By evaluating the outcome of the completed project, we can analyze the overall implementation achievements of this project.

4.6 Working Plan and Budget

The county PMO should develop the annual training plan and budget, which only can
be implemented after approval by PMO of Guangxi Autonomous Region. The annual training plan includes: training frequency, amount of participants, location, training plan and relevant materials. The attached budget shall describe training materials and training costs (per participants/per day). The payment is based on: (1) developed training materials; (2) training course records under monitoring (including amount of participants, trainers and duration records).

### Table 5.1-1 Training Plan and Budget

<table>
<thead>
<tr>
<th>Contents</th>
<th>Host</th>
<th>Trainee</th>
<th>Annual Trainee Amount *days</th>
<th>Total Trainee Amount *days</th>
<th>Schedule (yearly)</th>
<th>Estimated Cost (ten thousand Yuan/RMB)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Region/Province Level</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>(1) laws and regulations, Pest Management Plan</td>
<td>PPMO</td>
<td>Cm, Ct</td>
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<tr>
<td>(2) Pest control technology on forest and trees</td>
<td>PPMO</td>
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<td>72</td>
<td>the 1st, 2nd, 3rd Year</td>
<td>2.88</td>
<td>400 Yuan/per/day</td>
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<td>(3) Pesticide procurement, management and safety</td>
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</tr>
<tr>
<td>application</td>
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<td>72</td>
<td></td>
<td>2.88</td>
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<td>2 City, County Level</td>
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<tr>
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<td>management techniques</td>
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<td>70</td>
<td>210</td>
<td>the 1st, 2nd, 3rd Year</td>
<td>8.4</td>
<td>400 Yuan/per/day</td>
</tr>
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<td>(2) Pesticide Safety application techniques</td>
<td>CPMO</td>
<td>Tt, Ft, Fm</td>
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<td></td>
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</tr>
</tbody>
</table>

Note: PPMO: Provincial/Regional PMO; CPMO: city, county PMO; Cm: city, county PMO managers; Ct: city, county technicians; Tt: technicians of towns, Ft: technicians of counties, towns; Fm: project village leaders, cooperative directors or household representatives.
5 Monitoring on Pest Management

5.1 Monitoring Objectives and Key Points

Monitoring is the most effective way in defending the spread of epidemic diseases, which nips it in the bud. By means of setting monitoring points scientifically, building strict monitoring networks, early obtaining the distribution and trend of epidemic pathogens, and scientifically assessing the immunization effect can defend main exotic and new diseases effectively, analyze the epidemic situation regularly, study the control circumstances scientifically, and provide scientific basis on project decision-making.

Plant pest monitoring focuses on: pests and diseases that have occurred and not occurred but with hazard on mango, pitaya, mulberry, kiwifruit, oil tea, tea, walnut, wild grape, oranges, mulberry planting and silkworm raising, and edible fungi.

5.2 Building Monitoring Points

The project involves in 10 counties (cities). Relying on the existing systems of disease and pests monitoring, forecasting and prevention and plant protection stations of each county( or city), the county monitoring sample points should be set according to the project area distribution. Each county should have at least 2 county-level points, which can be set at the new project areas or make full use of original motoring points. The plant protection stations should be included in the daily monitoring work of county-level plant protection stations. The monitoring points help to obtain information on animal diseases and plant pests, and trace and monitor the procurement, distribution and safe application of pesticides.

5.3 Monitoring Plan

The county planting stations are responsible for the observation and survey of all the pests monitoring points in project areas and publish the development degree and trend forecast of plant diseases and pests. County PMOs shall summary all the data in time and report to the belonged city and regional/provincial PMO.

The specific monitoring plan is as following Table 5.3-1.

<table>
<thead>
<tr>
<th>Monitoring Objects</th>
<th>Diseases and Pests</th>
<th>Location</th>
<th>Frequency</th>
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Table 5.3-1 Pest Management Monitoring
<table>
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<th>Fruit</th>
<th>Diseases and Pests</th>
<th>County</th>
<th>Cycle</th>
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<td>pitaya</td>
<td>scab, anthracnose, fusarium wilt, alternaria leaf spot, stem blight, spiny white fly, red spider, Geometridae and scarab etc.</td>
<td>Pingguo County</td>
<td>Twice</td>
</tr>
<tr>
<td>mulberry</td>
<td>sclerotinia blight of mulberry, mulberry small weevi, and apripona germari etc.</td>
<td>Pingguo County</td>
<td>Twice</td>
</tr>
<tr>
<td>mango</td>
<td>anthracnose, powdery mildew, bacterial black spot, Chlumetia guttiventris Wank, Erosomya mangiferae Felt, Lawana Imitata Melichar, and Rhytidodera bowrinii White etc.</td>
<td>Tiandong and Tianlin County</td>
<td>Twice</td>
</tr>
<tr>
<td>oil tea</td>
<td>Camellia anthrax disease, sooty mould, Porthesia similis, Lasiocampidae, Parametriotes theae Kuznetzov, and Geometridae etc.</td>
<td>Fengshan, Donglan and Tianlin County</td>
<td>Twice</td>
</tr>
<tr>
<td>kiwifruit</td>
<td>Fusarium solani, brown blotch disease, Pseudomonassyringaepv.actinidiaeTakikawa et al., powdery mildew, scale insect, and leafhopper etc.</td>
<td>Leye County</td>
<td>Twice</td>
</tr>
<tr>
<td>orange</td>
<td>oranges canker, anthracnose, scab, black rot, red spider, and arrowhead scale insect etc.</td>
<td>Dahua County</td>
<td>Twice</td>
</tr>
<tr>
<td>Crop</td>
<td>Diseases and Pests</td>
<td>Location</td>
<td>Treatment Frequency</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>-------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Walnut</td>
<td>Cytospora juglandicola Ell. Et Barth., alternaria leaf spot, walnut branch blight, Dothiorella gregaria Sacc., Geometridae, Dyscerus juglaus, leaf beetle, longicorn, and red spider etc..</td>
<td>Fenshan County</td>
<td>Twice/growth cycle</td>
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<td>Wild Grape</td>
<td>Scab, anthracnose, Coniothyrium diplodiella, gray mold, brown blotch, downy mildew powdery mildew, clearwing moth, fruit-piercing moth, thrip, Lygocoris, mites, aphid, mealybug, and leafhopper etc..</td>
<td>Dahu County</td>
<td>Twice/growth cycle</td>
</tr>
<tr>
<td>Edible Fungi</td>
<td>Mould, mushroom mosquitoes and flies, mole cricket, and maggot etc..</td>
<td>Yizhou City</td>
<td>Twice/growth cycle</td>
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</table>