The World Bank Loan (WBL) is leveraged by Xinjiang (China) to implement the agricultural project for sustainable development

Pest Management Plan

The Agriculture Comprehensive Development Office of Xinjiang Uygur Autonomous Region

2012-10-12
## Content

1 Project Overview .................................................................................................................. 1
2 Project Background ............................................................................................................. 3
  2.1 Project Objective ........................................................................................................... 3
  2.2 Status Quo of Agriculture in the Counties (Cities) ......................................................... 3
  2.3 Status quo of cultivations for dominant crops in project counties (cities) ...................... 4
2.4 PEST SPECIES AND OCCURRENCE ............................................................................ 4
2.5 Control measures against pest taken by project areas ..................................................... 6
2.6 Crop pest management situation and problems .............................................................. 8
2.7 RISK ASSESSMENT AFTER IMPLEMENTATION OF THE PROJECT ............................ 9
2.8 Current management policy and framework ................................................................... 10
  2.8.1 Current Integrated Pest Management Policy .......................................................... 10
  2.8.2 Pest management and regulatory framework ......................................................... 11
  2.8.3 Description of evaluation on pest management capacity ....................................... 13
  2.8.4 Major problems in the pest management ............................................................... 13
3 Pest management plan ....................................................................................................... 14
  3.1 GENERAL OBJECTIVE .......................................................................................... 14
  3.2 ACTIVITY CONTENT .............................................................................................. 14
    3.2.1 Concept of integrated PMP ............................................................................... 14
    3.2.2 Main implementation content ......................................................................... 15
3.3 EXPECTED OUTPUT OF PROJECT (INTEGRATED CONTROL TECHNOLOGIES FOR PESTS OF STAPLE CROPS) .................................................................................. 18
3.4 SCIENTIFIC APPLICATION OF PESTICIDES ............................................................ 26
3.5 TECHNICAL REQUIREMENTS OF PROJECT AREAS ON THE PESTICIDE APPLYING MACHINERY ............................................................ 27
3.6 PROBLEMS OF PESTICIDE APPLICATION ............................................................... 27
4 Organizational management and implementation................................................................... 29
  4.1 EXECUTIVE AGENCY AND ITS RESPONSIBILITY .................................................. 29
  4.2 CAPACITY CONSTRUCTION .................................................................................... 30
  4.3 MANAGEMENT CAPACITY, ORGANIZATION ARRANGEMENT AND MUTUAL COOPERATION ........................................................................... 31
  4.4 TRAINING AND POPULARIZATION OF INTEGRATED PEST MANAGEMENT (IPM) TECHNOLOGY ........................................................................ 31
  4.5 SUPERVISION MANAGEMENT ................................................................................. 33
  4.6 MONITORING EVALUATION ..................................................................................... 35
5 Work plan and expense arrangement .................................................................................. 37
  5.1 INTEGRATED PEST CONTROL ................................................................................. 37
  5.2 TECHNICAL ASSISTANCE ...................................................................................... 38
  5.3 FARMER TRAINING ................................................................................................. 38
  5.4 MONITORING AND EVALUATION ON PMP IMPLEMENTATION .............................. 38
Appendix 1 PMP Schedule .................................................................................................. 40
Appendix 2 Selection of pesticide operator and personal protection ...................................... 45
Appendix 3 Public advisory table ......................................................................................... 45
1 Project Overview

Xinjiang takes advantage of WBL to carry out agricultural project for sustainable development with the purpose of introducing best practices from all the countries in the world, while improving the basic conditions for agricultural production, strengthening crop adaptation and response to climate changes, thus to realize the sustainable development of agriculture. The implementation of this project covers 14 villages and towns of 4 counties, Yanqi, Bohu, Fukang and Qitai, and is involved in cultivated land area up to 124 million hm². In this project, the primary work is focused on infrastructure constructions, such as farmland canal system, mating irrigation facilities, farm field remediation and soil fertility, in order to improve the conditions for producing wheat, corn, cotton, tomato, chili and vegetables, increasing the production levels, and expanding the capacity for disaster containment and removal.

Subject to the Pest Management Environment Evaluation OP/BP4.09 and Pest Management issued by the World Bank, in combination with Status Quo of pests prevailing in project areas and new issues that are caused by project activities, we set down the Pest Management Plan (PMP) for the project. Through encouraging the farmers to adopt the best agricultural practices in favor of environment and the integrated technologies for controlling pest prevalence, the PMP plan is proposed to provide the farmers with technical assistance, training program and prevention equipment, as well to support the farmers in applying biological prevention technology for improving the quality of agro-products and security level. The primary works include as follows:

(1) To prepare the prevention and control equipment such as Solar Insecticidal Lamp, etc, and to promote application of IMP technology, so that biodiversity could be established step by step, protecting and utilizing resources against natural enemies, as well as improving ecological environment.

(2) To encourage the farmers to take some measures against biological pest by providing them with allowance for prevention and containment of pests, applying biological and botanical pesticides instead of chemical pesticides. In project areas, the dosage of chemical pesticides will be reduced little by little, while, on the contrary, increasing the dosage of the biological pesticide in order to alleviate adverse impacts on environment and human body.

(3) Through training sessions, farmer field schools, to help the farmers learn knowledge on pesticide storage and scientific application technique, as well as integrated pest control technique.

(4) To employ a group of advisory experts to provide technical assistance on PMP technology for project areas.

For effective implementation of this plan, the integrated pest control program supervision and guidance and mobile expert advisory groups will be established at the regional level; all the counties (cities) will set up their own project offices at county (city) level. All counties and villages arrange the staffs responsible for implementation and management works of this project. The area, where the integrated pest control technique will be implemented for crops in this project, covers 124 million hm², budget fund is RMB 17.16635 million.
The contents of this report include: survey on project construction background and significance, detection of issues about crop, horticulture and specialty pests, investigation into pest control and pesticide application policies, clear definition for objective of pest control program, developing pest control program and pesticide application technique, identifying performance evaluation and implementation program, proposed supervision and evaluation solution, for prevention and control capacity against pest and budget funds with sources, the estimation has been done in order to ensure all the actions can be timely put into practice.

After a great deal of data has been acquired, the project of “Pest Control & Extermination Program” is prepared under the Pest Control Management Environment Evaluation. On the basis of plant protection policy, i.e. “Prevention first and Integrated Control”, we carry out and try to apply the concept of “Public Plant Protection” and “Green Plant Protection” in practices, summing up some effective control measures against recurrent pests on the staple crops for project coverage. On the premise of protecting the ecological environment, this plan gives emphasis to nature control function, popularize the use of methods in agriculture, physical and biological controls against pest, while working with chemical control technique to reduce the dependence on agricultural chemicals, so that the pest will be controlled below the permissible level in economic victimization, thus to obtain higher economic, social and ecological efficiencies.
2 Project Background

2.1 Project Objective

Xinjiang takes advantage of WBL to develop pest control management plan for the purpose of achieving sustainable development in agriculture. The focus of this plan is on high-standard farmland improvement in combination with water conservancy and mating establishments, strengthening crop adaptation and response to climate changes, thus to realize sustainable development of agricultural industry, while encouraging the peasants to apply the best practices to agriculture, designing a set of Integrated Pest Management (IPM) techniques in line with the local conditions, where the adverse impact will be eliminated from increasing pesticide dosage during project implementation to improve the agro-product quality. The risk of impact that, the pesticide has brought on the human body and ecological environment, will be at minimum, in order to ensure agricultural yields, peasants’ income and sustainable development.

2.2 Status Quo of Agriculture in the Counties (Cities)

The statistics on agricultural production in 4 counties (Cities) show that the area for grain crops is 137,533 hm2, cash crops 53,734 hm2, specialty crops 12,667 hm2, and the ratio of these three crops is 68:26:6. The grain takes wheat, corn and barley as the dominant crops; cash crops to cotton, oil seeds, vegetables and beetroot mainly, while specialty crops to processing tomato and pigment chilli mainly (Table 1).

<table>
<thead>
<tr>
<th>County</th>
<th>Grain</th>
<th>Cash</th>
<th>Specialty</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wheat</td>
<td>Corn</td>
<td>barley</td>
<td>Cotton</td>
</tr>
<tr>
<td>Qitaí</td>
<td>74000</td>
<td>16667</td>
<td>13333</td>
<td>/</td>
</tr>
<tr>
<td>Fukang</td>
<td>13333</td>
<td>6667</td>
<td>/</td>
<td>667</td>
</tr>
<tr>
<td>Yanji</td>
<td>8667</td>
<td>1333</td>
<td>/</td>
<td>2000</td>
</tr>
<tr>
<td>Bohu</td>
<td>2267</td>
<td>1267</td>
<td>/</td>
<td>5533</td>
</tr>
<tr>
<td>Subtotal</td>
<td>98267</td>
<td>25933</td>
<td>13333</td>
<td>8200</td>
</tr>
</tbody>
</table>

Table 1 Varieties and areas (hm2) of dominant crops in project regions
2.3 Status quo of cultivations for dominant crops in project counties (cities)

In agricultural cultivation, it could be said that each county represents the advanced level of local area. As 90% arable lands in Xinjiang belongs to dry-land agriculture, the agricultural cultivation technique in all areas, i.e. dry-land agricultural cultivation technique, takes the drought-resistance, seeding protection and sprinkler efficiency maximum as the core. The wheat is mainly planted by machine-sowing and drilling methods; the corn adopts the whole Plastic-film Mulching on Double Ridges; the cotton is laminating machine sowing method. In vegetable cultivation, the technique is open field seeding transplantation in summer and autumn seasons, while the solar greenhouse or plastic greenhouse facility can be used in winter.

Currently, the production modes in agriculture focus on the peasant households in Xinjiang. The arable lands are less, and continuous cropping question is also widely spreading. Due to plastic mulching, the soil-borne disease and soil pests are resulted in prevailing day by day. As the farmyard manure is lack and the chemical fertilizer is usually used, this can cause soil hardness, low content of organic substance, and that the soil fertility is declining year after year.

In respect to pest management, as most youths in rural areas flow to work in the cities, the measures for field management are not in place. All kinds of crop straw, diseased plant debris are treated at random; due to lack of IPM knowledge, they heavily depend on chemical pesticides to control pest by bad compounds, this not only reduces anti-pest effect, but also leads to occurrence of pest resistant medicines. If the pesticide is not used as specified, or increased in dosage, this can also result in phytotoxicity.

2.4 Pest species and occurrence

2.4.1 Epidemic pest species

Due to vast territory, complex terrain, multiple ecological types, and unique climates in Xinjiang, the agriculture pest species takes on diversified characteristics. As one of provinces where the crop pests are rather prevailing, Xinjiang is attacked by increasing species of frequent and unexpected plant diseases. Therefore, more foreign biological species will be invaded into Xinjiang, especially in the cases of increased grain yields, rapid development in agricultural facilities and specialty crops. As original pest control technologies present much lower effect, the damage caused by pest gets worsening. Through surveys and studies on project areas, the pest species occurred in staple crops are shown as follows (Table 2).

<table>
<thead>
<tr>
<th>Total</th>
<th>137533</th>
<th>53734</th>
<th>12667</th>
</tr>
</thead>
</table>

Table 2 Pest Species of frequent diseases & conventional control medications
<table>
<thead>
<tr>
<th>Crop</th>
<th>Frequent pest</th>
<th>Frequent disease</th>
<th>Conventional control medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>Soil pest, aphid, green wheat mite, Heliothis armigera, Haplothrips tritici, kurdjiumov, Crioceridae</td>
<td>stripe rust, powdery mildew, full rot, snow mold, snow mold, root rot</td>
<td>Phoxim, chlorpyrifos, acetamiprid; triadimefon, tebuconazole, carbendazim, triadimefon, propiconazole azole, etc.</td>
</tr>
<tr>
<td>Corn</td>
<td>Soil pests, Ostrinia nubilalis, Heliothis armigera leathopper, aphid, spider mites</td>
<td>head smut, gall smut, ear rot, rust disease</td>
<td>phoxim, Chlorpyrifos, Acetamiprid, cyhalothrin, Thiacloprid, Propiconazole, Tebuconazole, K-Xi seed coating agent</td>
</tr>
<tr>
<td>Cotton</td>
<td>Heliothis armigera, cotton aphid, Tetranychus urticae, Thrips tabaci</td>
<td>Rhizoctonia, blight, greensickness</td>
<td>Phoxim, profenofos, avermectins, Pyridaben, Chlorpyrifos, cypermethrin, etc.</td>
</tr>
<tr>
<td>Vegetable</td>
<td>Soil pest, aphid, spider mite, Pieris rapae, Plutella xylostella, Liriomyza sativae, Thrips tabaci</td>
<td>downy mildew, gray mold, powdery mildew, Rhizoctonia, Pythium debaryanum, Anthrax, Pestilence, Phytophthora capsici,</td>
<td>Phoxim, Chlorpyrifos, avermectins, Spinosad, deltamethrin, thiophonate-methyl, carbendazim, chlorothalonil, mancozeb, cymoxanilmancozeb, Propamocarb, dimethomorph, Fosetyl-aluminium, polysulfide suspending agent, Olefin.hydroxyl.Moroxydine, streptomycin, Cupric hydroxide, Pyrimethanil, Iprodione, etc.</td>
</tr>
<tr>
<td>Beetroot</td>
<td>Stem weevil, Beet weevil, Phyllotreta striolata</td>
<td>Rhizoctonia, powdery mildew, Brown spot, root rot</td>
<td>Thiacloprid, Acetamiprid, Chlorpyrifos, Carbendazim, Mancozeb, etc.</td>
</tr>
<tr>
<td>Oilseed</td>
<td>Rape stem weevil, aphid, leaf miner</td>
<td>Rape Sclerotinia sclerotiorum, rust disease, white blister, Sclerotinia sclerotiorum, downy mildew</td>
<td>Imidacloprid, Thiacloprid, Acetamiprid, Chlorpyrifos, Triadimefon, polysulfide suspending agent, carbendazim, etc.</td>
</tr>
<tr>
<td>Process tomato</td>
<td>Soil pest, Heliothis armigera, aphid, Whitefly</td>
<td>early blight, Stalk Rot, blossom-end rot, Soft rot, virosis</td>
<td>Phoxim, Chlorpyrifos, Acetamiprid, Imidacloprid, cyhalothrin, Thiacloprid, Chlorothalonil, Mancozeb, Chlorine dioxide,</td>
</tr>
</tbody>
</table>
2.4.2 The perennial biohazards and losses occur in project areas

As shown in figure 3, although in all areas, the great efforts have been made on pest control every year, the losses of all kinds of crops in yields are still serious. The more the area is covered for planting crops, the more the area is invaded by pests, so does the actual losses.

Table 3 Perennial pest control area and reparable losses in project areas

<table>
<thead>
<tr>
<th>County</th>
<th>Occurred Area (10,000hm²)</th>
<th>Controlled area (10,000hm²)</th>
<th>Reparable loss (ton)</th>
<th>Actual loss (ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qitai</td>
<td>15</td>
<td>16.67</td>
<td>84319</td>
<td>29770</td>
</tr>
<tr>
<td>Fukang</td>
<td>5.33</td>
<td>9</td>
<td>33475</td>
<td>17326</td>
</tr>
<tr>
<td>Yanji</td>
<td>3</td>
<td>2.67</td>
<td>1860</td>
<td>2020</td>
</tr>
<tr>
<td>Bohu</td>
<td>2.67</td>
<td>4</td>
<td>2552</td>
<td>2072</td>
</tr>
</tbody>
</table>

2.5 Control measures against pest taken by project areas

In terms of economic development, the areas are all in the middle and lower levels. The area for controlling the pest nearly equals to the sown area of farming crops, and the pest control level is relatively low. The natural conditions vary from area to area, so do the plant crops. However, the control measures taken by each area are identical on the whole. In summary, these mainly include: agricultural measures, physical machinery, biological, ecological and chemical controls. Among them, the chemical control measure is still the most effective way of exterminating pests, and accounts for 80% in utilization, agricultural measure for 10% or so, and physical machinery and biological measures are 5% each (see Table 4).
Table 4 Pest control measures taken by project areas

<table>
<thead>
<tr>
<th>Control measures</th>
<th>Suitable crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select anti-pest variations, seedlings</td>
<td>Suitable for various crops</td>
</tr>
<tr>
<td>Plastic mulching</td>
<td>Corn, cotton, vegetable, processing tomato, pigment chilli</td>
</tr>
<tr>
<td>Rotating crops</td>
<td>Suitable for various crops</td>
</tr>
<tr>
<td>Clean cropland</td>
<td>Fruit trees, vegetables</td>
</tr>
<tr>
<td>Plant trap corn around cotton fields</td>
<td>Cotton</td>
</tr>
<tr>
<td><strong>Agricultural measure</strong></td>
<td></td>
</tr>
<tr>
<td>Set insecticidal lamp, sweet and sour fluid and hanging yellow sticky board to trap insects</td>
<td>Fruit trees, vegetables, processing tomato, pigment chilli</td>
</tr>
<tr>
<td>Soaking seed, sterilization insecticide under high temperature, closing greenhouse at high temperature by natural light in summer</td>
<td>Vegetables</td>
</tr>
<tr>
<td><strong>Physical control</strong></td>
<td></td>
</tr>
<tr>
<td>Regulate greenhouse at room temperature, humidity</td>
<td>Greenhouse vegetable cultivation</td>
</tr>
<tr>
<td>Protect, make use of natural enemies</td>
<td>Suitable for various crops</td>
</tr>
<tr>
<td>Use biological agents control pest</td>
<td>Vegetables, fruit trees</td>
</tr>
<tr>
<td><strong>Ecological control</strong></td>
<td></td>
</tr>
<tr>
<td>Seed dressing or coating</td>
<td>Wheat, corn, cotton, oilseed</td>
</tr>
<tr>
<td>Medication for seeding in a ditch (cave) or spreading pesticide-clay mixture</td>
<td>Corn, vegetables, rape</td>
</tr>
<tr>
<td>Make various poison baits to trap and kill pest</td>
<td>Suitable for various crops</td>
</tr>
<tr>
<td>Smoke agent against pest</td>
<td>Greenhouse vegetable cultivation</td>
</tr>
<tr>
<td>Spray on the ground and underground irrigation root</td>
<td>Suitable for various crops</td>
</tr>
</tbody>
</table>
2.6 Crop pest management situation and problems

During pest control, the peasant households in these areas are fully aware that some agricultural measures, such as disease-resistant variety, rotation of crops, are the fundamental methods to prevent and control the pests. In addition, the peasant households depend on chemical pesticides in pest prevention and controls, while the biological and physical control measures are rarely used. In chemical control and management, in addition to relying on the guidance from agricultural technique sector, most peasants resolve pest problems more only by means of their experiences or taking the advices from the pesticide dealers. Due to massive application of chemical pesticides in the past years, and the lack of knowledge on the pesticide, environmental protection and human health, the peasants face a lot of risks in the misuse of pesticides, however this often leads to low effect and phytotoxicity on the crops, and even gets poisoned due to lack of necessary protective measures.

The majority of peasant households in these areas are not familiar with the knowledge on integrated pest control technology, and fail to apply the pest control techniques such as biological control, ecological control, physical control, and scientific application of agricultural pesticides. Only few of them understand the concept of integrated pest management (IPM), but don’t know the technical system and working procedures of IPM. In this case, it is difficult for them to meet the requirements of agriculture structure adjustment, pollution-free production and also to realize sustainable development. Therefore, they are in urgent need to be trained on these techniques in order to minimize the use of chemical pesticides.

The study shows that the local governments of all areas attach great importance to local and rural economical development, and also give more backings on the pest control works for all kinds of staple crops. The forecasting and preventive techniques are also improved year by year. However, a lot of problems still remain in the use of chemical pesticides.

(1) The dependence on chemical pesticides is much higher, especially for vegetables, melons, fruits which have high values and can bring better economic benefits, cash crops.

(2) The chemical pesticides, especially in the applied dosage of exterminator, tend to increase yearly.

(3) Lack knowledge on correct application and management of chemical pesticides (fungicide, exterminator, herbicide) and other pesticides.

(4) The risks of contamination and poisoning hazards exist due to free disposal of the residuals of chemical pesticides and packaging wastes;

(5) Failure to comply with the policies and regulations, and weak supervision for chemical pesticides;

(6) The agencies, pesticide dealers and farmers are not fully aware of integrated pest management;
The traditional training mechanism cannot resolve the problems on production and some of the emerging difficulties for individual farmers;

Lack of timely and adequate information on chemical pesticides.

2.7 Risk assessment after implementation of the project

The implementation of project has created the favourable conditions for the field irrigation and water conservancy, and good water and fertilizer management technology has greatly controlled the incidence of pests and diseases. With adjustment of planting structure, the area for high-yield crops such as wheat, corn, vegetables, specialties, etc. is expanded, though the total area remains unchanged, leading to increased use of pesticides. It is predicted that the major pests of crops is likely to occur the following changes (see Table 5).

After implementation of the project, with construction of farmland shelter belts, the area of farmland shelter forester is further expanded. The forestry pests will be occurred with some changes, but generally speaking, these pests cannot multiply a new type, and will not be very serious. The reasons are: 1. The varieties newly planted for shelter belt in the project are for the local poplar saplings of Xinjiang, and cultivated by the local forestry technology department. Therefore it is impossible to have the risk of introduction of new pests and diseases; 2. Xinjiang aspen newly planted is drought-resistant, easy to survive, and has a pest-resistant ability; 3. As the climate is arid in Xinjiang, it is not conducive to the occurrence of pests. Xinjiang aspen has seldom pests, and also lighter, only Apocheima cinerarius and aphid occur in a particular year; 4. significantly improved, with the expansion of the area of farmland shelter belts, the farmland ecological environment gets improved evidently, while cultivating a large number of beneficial organisms.

Table 5 Possible changes occurred after implementation of project

<table>
<thead>
<tr>
<th>Crop</th>
<th>Pest that may relieved or controlled</th>
<th>Pest that are persistent and causes the loss</th>
<th>Emerging pest</th>
<th>Appropriate control measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>Soil pest, aphid, full rot, loose kernel smut</td>
<td>spider mites, stripe rust, powdery mildew, snow mold, snow mould</td>
<td>Virosis, eelworm disease</td>
<td>By killing transmission agent aphid to control virosis, and by phytosanitary to intercept pests</td>
</tr>
<tr>
<td>Corn</td>
<td>Ostrinia nubilalis, aphid, head smut, gall smut, virosis</td>
<td>Soil pest, spider mites</td>
<td>corn top rot, late whorl twist of corn</td>
<td>Select new medications for pest control; manual separate disease cluster whorl leaves, and</td>
</tr>
<tr>
<td>Crop</td>
<td>Pests</td>
<td>Diseases</td>
<td>Measures</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------------------------</td>
<td>-----------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Cotton</td>
<td>Aphid, Heliothis armigera</td>
<td>spider mites, Bemisia tabaci, Bemisia solenopsis, Tinsley, greensickness, bligh</td>
<td>Select new control medications</td>
<td></td>
</tr>
<tr>
<td>Vegetable</td>
<td>Aphid, Liriomyza, downy mildew, gray mold, powdery mildew, Anthrax</td>
<td>Greenhouse Whitefly, bligh, Pestilence, eelworm disease</td>
<td>Improve quarantine measures; implement different vegetable rotation; enhance cultivation management; scientific fertilization, formulated fertilization</td>
<td></td>
</tr>
<tr>
<td>Open land</td>
<td>Pieris rapae, Mamestra brassicae, Helicoverpa assulta, Plutella xylostella</td>
<td>Aphid, Soil pest, root disease, Pestilence</td>
<td>Improve quarantine measures; enhance cultivation management; apply biological control</td>
<td></td>
</tr>
<tr>
<td>Processing tomato</td>
<td>Soil pest, aphid, Whitefly</td>
<td>Heliothis armigera, Pestilence</td>
<td>Bemisia tabaci, virosis</td>
<td></td>
</tr>
<tr>
<td>Pigment chilli</td>
<td>Soil pest, aphid</td>
<td>Heliothis armigera, Pestilence</td>
<td>Bemisia tabaci, virosis</td>
<td></td>
</tr>
<tr>
<td>Oilseed</td>
<td>Phaloniaepilinana Linneae ; linseed wilt</td>
<td>root rot</td>
<td>Improved quarantine measures; enhance cultivation management; apply biological control</td>
<td></td>
</tr>
<tr>
<td>Rape</td>
<td>leaf miner, Rape Sclerotinia sclerotiorum, powdery mildew</td>
<td>Soil pest, Flea Beetle</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 2.8 Current management policy and framework

#### 2.8.1 Current Integrated Pest Management Policy

In the early 1950s, the concept of the integrated pest management was proposed in China, and the working principle of “Prevention first, Integrated control” was developed at the national conference on
In conclusion of experiences and lessons over decades, we get to know and evaluate the role of agricultural pesticides once again, stress the importance of maintaining ecological environmental balance. The chemical control is the last choice for integrated pest management. By virtue of implementation integrated with a variety of methods, we try to make the pest control in line with requirements of three benefits in economy, society and ecological environment. The National and local promulgated and implemented a series of regulations, ordinances, standards, approaches, procedures, guidelines, through implementation of them, to further promote the application of integrated pest management (IMP).

(1) Standards for Safety Application of Pesticides of PLC (1982);

(2) Law of the People's Republic of China on Quality and Safety of Agricultural Products (Issued by the Standing Committee of the National People's Congress in April 2006);

(3) Regulations on the Control of Agricultural Chemicals of the People’s Republic of China (promulgated by the State Council in January 2001);

(4) Measures for Implementing the Regulation on Pesticide Administration (issued on December 8, 2007, and amended by Directive No. 9, the Ministry of Agriculture in 2007);

(5) Regulations on Pollution-Free Agricultural Product (issued by General Administration of Quality Supervision, Inspection and Quarantine of the People’s Republic of China and Ministry of Agriculture in April 2002);


(7) Pesticide Application Guideline for Green Food Production, NY/T393-2000 (issued by the Ministry of Agriculture in March 2000);

(8) Maximum Residue Limits for Pesticides in Food GB2763-2005;

(9) Determination of Organophosphorus Pesticide Residues in Foods, GB/T 5009.20-2003;

(10) Guideline for Safety Application of Pesticides (1-8), GB/TB8321.1-8321.8 (Ministry of Agriculture);

(11) Regulation on Plant Quarantine (amended by the State Council on May 13, 1992);

(12) Rules for the Implementation of Plant Quarantine Regulations (agriculture part) (issued by the Ministry of Agriculture in May 1995);

(13) Antitoxic regulations for storage-transportation, marketing and use of pesticides (GB 12475-2006) (Ministry of Agriculture);

(14) Methods of Regulations on Plant Quarantine implemented by Xinjiang Uygur Autonomous Region (autonomous government directive No. 151, issued by November 2007).

2.8.2 Pest management and regulatory framework

The Regulatory Authorities for PMP Pest Management include: the pesticide regulatory authority, the pest control and management authority, and the pesticide residue detection organization. As shown in Table 6, the different departments take different tasks and responsibilities in the pesticide market management, during agricultural production and postproduction process.
<table>
<thead>
<tr>
<th>1. <strong>Pesticide market regulatory</strong></th>
<th>Government</th>
<th>Agricultural technology</th>
<th>Peasant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Several departments, e.g. the industry and commerce and agricultural executive group, cooperate to develop periodic check on the agricultural markets, preventing sales of counterfeit drugs, and prohibiting sales of high toxic pesticides in the vegetable and fruit production areas.</td>
<td>Assist the government departments in carrying out survey on pesticide market, and on the use of pesticide of peasants.</td>
<td>Purchase the pesticides under the guidance of local technicians to minimize the number of high-toxic pesticides purchased.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. <strong>Management in the process of agricultural production</strong></th>
<th>Government</th>
<th>Agricultural technology</th>
<th>Peasant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issue, examine and modify the list of registered high-toxic pesticides in reference to the standards of the World Bank, FAO and European Union; develop more stringent regulations on pesticide application to strictly prohibit the use of high-toxic pesticides on the fruit and vegetable crops; diminish registrations and approvals of high-toxic pesticide production enterprise and varieties; strengthen supervision and inspection of tree and crop seeds distributed across provinces.</td>
<td>Strengthen the training and guidance on conventional pest control works for the peasants, guide the peasants to apply low-toxic pesticides, bio-pesticide and other control methods to control pest.</td>
<td>Participate in technical training, develop pest control activities as guided by agricultural technicians, and absolutely terminate application of high-toxic pesticide on crops.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. <strong>Management after agricultural product's access to the market</strong></th>
<th>Government</th>
<th>Agricultural technology</th>
<th>Peasant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implement agro-product recall system; enhance the supervision and inspection for pesticide residues in agricultural product market; encourage peasants to produce green foods, pollution-free products and IPM foods and create sustainable agriculture market with quality and price advantages to motivate the peasants to adopt IPM technology; inspire the leading enterprises in line with agricultural products to create order system with peasants.</td>
<td>Encourage the peasants to apply IPM technology for producing agro-products, help them apply for registration of green, pollution-free and organic foods</td>
<td>Join in the peasant association, production base of leading enterprises, or register for green foods, pollution-free and organic foods; actively adopt IPM technology to produce high value-added products.</td>
<td></td>
</tr>
</tbody>
</table>
The pesticides used in these areas must be subject to the national standard, industry standard or enterprise standard. The pesticide package, transportation and storage are essential parts in the process from production to application of pesticides. The pesticide package should comply with the relevant provisions of the three national standards issued by the State Bureau of Technical Supervision, i.e. GB3796-85 “General Clauses for Pesticide Package”, GB4838-84 EC Pesticide Package”, GB5736-85 “Calcium plastics Corrugated Boxes for Pesticide”. The pesticide transport shall be implemented in accordance to the Anti-virus Procedures of Pesticide Transportation, Sale and Application. The storage shall comply with clause 3, Provisions of Safe Use of Pesticides.

There is a gap between the laws and regulations of our country and international markets in pesticide production, package, storage, transportation, marketing and application. Like other provinces of country wide, the pesticide management of Xinjiang Uygur Autonomous Region is also poor in regulatory. For some farmers, the use of highly toxic pesticides and excessive use of pesticides still exist, and even they can not comply with the spraying interval provisions specified by the government.

In order to alleviate the risk of pest incident after implementation of project, the government, technicians, and together with the farmers, will make great efforts to help farmers not only effectively control pest hazards, and also reduce the environmental and agricultural product pollution caused by pesticides in these areas.

2.8.3 Description of evaluation on pest management capacity

Xinjiang is one of the major agricultural provinces in the country. In order to push forward the process of the development on pollution-free agricultural products and green foods, the application of integrated pest management techniques has been vigorously promoted in recent years, and by gradually reducing the amount of agricultural chemicals. However, due to limited technical force at all levels responsible for agricultural extension services and slow popularization of non-chemical control techniques such as physical control and biological control, it is urgent to further increase training activity, intensify promotion and application.

2.8.4 Major problems in the pest management

(1) Backward prevention concept: The ideological of the crop Fitness cultivation cannot go through the practices of preventing pest on crops, lack of effective measures against pests and for strengthening crop resilience in the light of the views of the ecosystem.

(2) Poor regulatory of pesticide market: there are a lot of business entities in pesticide market, which are all operating with small-scale and have informal sourcing channels. The pesticide market order is a bit confusing, and professional quality of pesticide dealers is generally low. In addition, the misuse and residues of pesticides often cause the risk of quality safety in agricultural products.

(3) Unhealthy Capacity-building system: the training work on integrated pest control techniques is lag. In current time, the farmers mainly rely on the guidance of pesticide dealers to prevent and control pests, and are not fully aware of the dangers from agricultural pests. These factors show that the conditions are still premature for introduction, demonstration and promotion of advanced surveillance and control techniques or organized training. Therefore, it is impossible for them to achieve real-time monitor and early warning and effective prevention and control of agricultural pests within local area.
3 Pest management plan

3.1 General objective

The PMP of this project is only implemented in 14 towns of 4 counties (cities) (including Yanqi, Bohu, Fukang and Qitai) of the Xinjiang Uygur Autonomous Region. This project plans to use the integrated pest management method to control the crop pests in 12,400hm², realize the nuisance-free agricultural products in 5,934hm², and thus to improve the normalization and standardization level of integrated agricultural pest control, effectively control the hazards of plant pests, reduce the loss and reduce the use of high-toxic chemical pesticides. In order to realize the target that no serious pest could result in disaster, no epidemics could spread malignantly and no migratory locust could fly to damage anywhere, the consumption of chemical pesticides in 3-5 years will be reduced in order to eliminate the poisoning accidents caused by unsafe storage or the wastes that are disposed improperly.

In this project, the peasants' understanding and cognition on integrated pest management will be enhanced through the following measures:

(1) Engage the foreign, domestic and Xinjiang experts to compose a moveable expert consultancy group in order to offer the project areas the technical assistance about PMP technical problem, and to improve the promotion and application of integrated pest management technologies in the project areas.

(2) Install the solar insecticidal lamps and other control devices in and introduce the non-chemical control technologies into the project areas, in order to gradually reduce the dependence on the agricultural chemicals and improve the ecological environment of farmland.

(3) Through such measures as biological control subsidies, support and urge the farmers to take the biological measures to control the pests and apply biological and plant-source pesticides instead of chemical pesticides in order to decrease the consumption of chemical pesticides, increase the use of biological pesticides and reduce the adverse impact of chemical pesticides on the environment and personal health in the project areas.

(4) Enhance the instruction and training for the farmers in the project areas on the integrated pest management methods.

3.2 Activity content

Xinjiang will leverage WBL(World Bank Loan) to implement the integrated PMP of the agricultural project for sustainable development, and based on the specific crops in different towns, try to take such integrated measures such as agricultural, physical, biological and chemical control to manage the pests, enhance the technical training, technical demonstration and effect experiment, and reduce the dependence of agricultural production on the chemical pesticides.

3.2.1 Concept of integrated PMP

The PMP (namely integrated pest management plan) aims to implement the integrated pest management, reduce the dependence on chemical synthetic pesticides and keep the pest hazard activities on the economic level with the targets to control the pests, ensure the safety of agricultural products, protect the environment and improve the farmer's qualification. This PMP focuses on the following four points: (1) control but not extinguish the pests; (2) try to remain the quantity of pests at a low level by non-chemical measures; (3) minimize the impact of selected and applied pesticides on the human beings and environment if the application of pesticides cannot be avoided; (4) establish a
standard IPM technical system in conformity with the regional characteristics, and integrate the agricultural control, biological control, ecological control, physical prevention and trapping technique to substitute and diminish the use of chemical pesticides to the maximum extent, try to protect the environment and natural enemies of pests and control the pests at the endurable level.

3.2.2 Main implementation content

In the integrated pest management, it is necessary to fulfill the plant protection guideline of “Prevention First and Integrated Control” in order to implement the pest control in the whole process of agricultural production. First, enhance plant quarantine, and do well in the circulation of seeds, young plant and agricultural products in order to avoid spreading of any dangerous pest; based on the agricultural measures, cultivate the healthy plant, enhance the abilities of crops to resist the pests; strengthen the pest monitoring and warning system to offer a reference for the decision; in the pest control, give priority to the agricultural control, physical and mechanical control and biological control, take the chemical control method only when other control methods are invalid and the monitored results of pests show that the dangerous degree of pests has exceeded the economic threshold, and also be careful of selecting the high-efficiency, low-toxic, environment-friendly and pollution-free pesticides and applying methods, reduce the pests’ resistance to pesticides and avoid environmental pollution.

(1) Enhance plant quarantine: Strictly execute the origin quarantine, transport quarantine and re-inspection system to ensure the effective pest removal. Never allocate and transfer the seeds, young plants and agricultural products from the place with quarantine object and serious epidemic situation. Enhance the legal inspection on seeds, and standardize the production and sale of seeds and young plant. Strengthen the quarantine of outsourced seeds, young plant and agricultural product, and eliminate the product with any quarantine object on site in order to protect the project area from the quarantine object.

(2) Strengthen the pest monitoring and warning system: The pest monitoring station of each county (city) in the project area shall strengthen the pest inspection and monitoring, issue the warning information timely, provide the framers with the technical guides about pest control, including the controlled object, suitable control period, control technologies and control pesticides, etc., and also perform the pertinent pest control, so as to improve the control effect and reduce the consumption of pesticides.

(3) Agricultural control: Based on specific measures adopted in the course of agricultural production, create the farmland environment suitable for the crops but not for the pest on purpose, so as to directly eliminate or prohibit the pests. According to the specific situations of four project counties (cities), the following agricultural measures shall be performed pertinently based on local conditions:

① Reasonable crop arrangement: The reasonable arrangement of crops is good for both the growth of crop production and containment of pests.

② Crop rotation: The reasonable rotation of different crops can change the living conditions of pests, inhibite or reduce the pests; moreover, this is one of important measures to use, fertilize and recover the land capability.

③ Reasonable intercropping and multiple cropping: this method can inhibite the incident of the pests. For example, the intercropping of wheat with rape or cotton can cultivate the natural enemies and obviously reduce the damage caused by cotton pests; the intercropping of cotton with corn or sorghum can induce the heliothis armigera to lay eggs on the cotton and sorghum, and thus scatter the density of
cotton pests; the intercropping of Chinese cabbage with lettuce can drive away the cabbage butterfly endangering the vegetable by the smell of lettuce.

④ Deep tillage and soil reforming or tillage in Autumn and watering in Winter: the deep tillage and soil reforming or the deep tillage and smashed stubble immediately after the crops are harvested and watering in winter can change the economical conditions of soil, inhibit the living and breeding of pests, destroy the hiding environment of pests, kill the pests by sunshine or freezing and bury the pests on the soil surface deeply; in such ways, the base number of pests can be reduced greatly and the damage can be relieved.

⑤ Selection of resistant variety: According to the development of pests in the project area, select the good resistant variety suitable for local conditions, and be careful of reasonable matching and renewal to realize the matching the good varieties and methods and exert the genetic resistant potential of crops and varieties. This is one of important measures to effectively prevent and reduce the pests, establish biological diversity and reduce the use of chemical pesticides.

⑥ Stock grafting: Promote the cucumber and eggplant grafting technologies in the solar greenhouse. The stock grafting can avoid more than 90% of blight, pestilence and greensickness.

⑦ Scientific sowing and adjustment of sowing time: The sowing time, density and depth can affect the pests. If the sowing time is advanced or delayed, the crops can miss the period at when the crop is easy to be infected or damaged by pests or miss the high-incidence period of pests so that the pests can be avoided or relieved. The reasonable sowing density and depth can promote the strong seeding and improve the resistance.

⑧ Cultivation of disease-free seeding: Do well in the disinfection of seeds and soil, remove the sick and bad seeding and cultivate the strong seeding.

⑨ Enhancement of farmland management: The balanced fertilization measures such as enriching the base fertilizer, controlling the nitrogenous fertilizer and adding the phosphorus-potassium fertilizer as well as the plastic mulching, reasonable watering and intensive farming can enhance the growing of crops and improve their pest resistance. In the greenhouse, it is necessary to enhance the management, keep timely ventilation and take the water-saving irrigation technologies such as drip irrigation under plastic so as to decrease the humidity and reduce the probability of pest incident.

⑩ Farmland cleaning: Eliminate the affected leaves, deadwood or disabled body in the growing period of crops or after the crops are harvested in order to reduce the pest source and decrease the infection probability.

(4) Physical and mechanical control

① Direct killing: Based on the farmland management, remove the eggs and kill the pests or remove the leaves and fruits with pests and eggs manually.

② Isolation by pest-proof screen: This method is applicable to the green house for the purpose of pest and disease prevention, and have shading and moistening effect.

③ Trapping: Trap the whitefly, aphid and leaf miner imagoes by yellow adhesive board, the thrips tabaci by blue adhesive board, the imagoes of moth, beetle, orthoptera and other pests by black light lamp and frequency oscillation pest-killing lamp, the cutworm and scarab, etc. by sweet and sour solution.
(5) Biological control

① Natural enemies: Improve the ecological environment of farmland and increase the number of natural enemies by agricultural measures, for example, grow the protection forest near the orchard or farmland, grow the bee plant such as alfalfa in the orchard, and improve the harvesting method of crops; reasonably use the pesticides in order to relieve the damages to the natural enemies; cultivate and free the natural enemies, for example the trichogramma are able to control the heliothis armigera and ostrinia nubilalis, the encarsia formosa to control the whitefly, and the amblvaeius fallacis to control the spider mites on the cotton and vegetable, etc.

② Biological agent: For example, Bt emulsion, nuclear polyhedrosis viruses (NPV), beauveria bassiana, metarhizium, kasugamycin, D-chiro-Inositol and Liuyangmycin, etc.

③ Applied attractant: For example, for the control of heliothis armigera, plutella xylostella and ostrinia nubilalis, the sex attractant can be used for direct trapping and mating interference.

(6) Chemical control

If the above measures cannot control the pests effectively and the pests have reached the control index, the chemical control technologies can be adopted. It is required to use the high-quality and high efficiency, toxic-free or low-toxic, safe and less-residual pesticides, please note to rationalize and control the use of pesticides, improve the formulation and application technologies of pesticides, prevent and prolong the occurrence of pests’ resistance to pesticide . The main chemical control measures include:

① Select the pesticide pertinently: According to the different crops and control objects, select the correct type, formulation of pesticide and the suitable plant protection machinery for control, and give priority to the high-efficiency, low-toxic and less-residual pesticide.

② Apply the pesticide duly: According to the rules and forecast of pest incident, select the optimal control time.

③ Apply the appropriate amount of pesticide: Know well the correct applied concentration and times, improve the applying technologies and quality, enhance the effective utilization of pesticide, and reduce the consumption of pesticide and the pollution to the agricultural environment.

④ Improve the applying method of pesticide: For example, use the fumigating method, pesticide-clay mixture spreading method, applying the systemics onto the stem and the parathion methyl onto the root, pesticide onto new leaf and other methods to replace the conventional mist and powder spraying method because they can reduce the effect on the natural enemies.

⑤ Mix the pesticides reasonably in order to improve the control effect.

⑥ Note to change the pesticides alternatively in order to prolong the occurrence of pesticide resistance.

⑦ Know well the safe interval period of pesticide and prohibit the application of pesticide within a period right before the crops are harvested, in order to ensure the safety of agricultural products.

⑧ Strictly comply with the laws and regulations of the state, select the high-efficiency, low-toxic and less-residual pesticides for the crops in pest control, and not use the agricultural pesticides prohibited and limited by the state.
During applying pesticide, do well in personal protection in order to avoid the pesticide poisoning accident.

### 3.3 Expected output of project (Integrated control technologies for pests of staple crops)

The pests and diseases of staple crops within project areas are controlled with the plant protection policy of "Prevention first, Integrated control and Green control". Appropriate, effective control techniques and pesticides with little negative effects should be adopted aiming at different crops and different pests/diseases; we advocate employing agricultural, biological and physical measures and trying best to reduce the chemical control application proportion and frequency; meanwhile we advocate applying biological pesticide control method and adopting low-toxic pesticides with low residue in accordance with the varieties of crops and different pests, do not use those chemical pesticides with high toxicity and more residues.

#### 3.3.1 Wheat

Main pests and diseases: these include wheat stripe rust, powdery mildew, snow mold, loose kernel smut, root rot, full rot, and bacterial leaf streak, etc.; pests include aphid, haplothrips tritici kurdjiumov, heliothis armigera and gree wheat mite, etc.

**Pest control target**
- Promote IPM technology, improve integrated control effects, prevent major pests causing great loss;
- Reduce consumption of chemical pesticide;
- Strictly follow the safety interval for applying pesticides and the provisions about using high-toxic pesticides on wheats; completely eradicate the productive pesticide poisoning accidents.

**Pest control strategies and methods**
- Control strategies. On basis of healthy cultivation and condition prediction, grasp two key stages of wheat: jointing and booting & heading through adopting early prevention, ecological regulation and emergency control measures, in order to reduce the base number of bacteria sources and pest sources, maintain overall damages and losses within 5%.
- Agricultural control. Regulate and optimize the crops structure, improve the ecological environment of cornfields, reasonably arrange the disease-resistant variety within large area, promote the cultivation of disease-resistant variety according to local conditions and cut off the year-round circulation of bacteria; implement crop rotation and water saving irrigation measures and apply more organic fertilizer, observe fertilizer with N, P, K formula; seed at suitable time, e.g. the winter wheat should be seeded late to control the morbidity of autumn wheat seedlings, the spring wheat should be seeded earlier; overall ploughing and stubble plowing should be done timely after the harvest of wheat, in order to remove volunteer seedlings and reduce the over-summering bacteria source.
- Seed dressing with pesticides. Utilize 2.5% fluioxonil flowable seed-coating agent, 25% triadimefon, 3% difenoconazole flowable seed-coating agent and 0.03% tebuconazole to dress seeds; by this way several kinds of diseases such as rust disease, powdery mildew, smut and snow mold could be prevented and controlled.

18
Biological control. Select low--toxic pesticide which has little negative effect on the natural enemies of cornfield, avoid the period when the natural enemies such as ladybug, hoverfly and chrysopa perla (etc.) are sensitive to pesticides, fully play the control effect of natural enemies on aphid and cotton bollworm and other pests; promote the application of biological pesticide to prevent the pests of wheat, e.g. adopting ningnanmycin, polyoxin (3%) and validamycin to control the powdery mildew and rust disease of wheat; adopting sophocarpidine emulsifiable solution and avermectin to control the aphid, gree wheat mite and heliothis armigera.

Chemical control. The monitoring of winter wheat shall be enhanced after reviving; the disease which is found in early period should be annihilated and controlled intensively to control the spreading. When the percentage of diseased leaf of stripe rust ups to 0.5%~1% or the percentage of diseased leaf of powdery mildew ups to 10%, it is required to implement mass treatment immediately. 15% triadimefon wettable powder, 25% triadimefon emulsifiable solution, 5% diniconazole wettable powder and 25% tebuconazole leaf spray may be used to control rust disease and powdery mildew, the spraying work shall be done once in medium disease-occurring years, and 2~3 times in serious disease-occurring years. Utilize biological pesticide or acetamiprid, and imidacloprid pesticide to control the aphid.

3.3.2 Corn

Major pests and diseases: corn gall smut, head smut, ostrinia nubilalis, corn spider mites, zygina salina, aphid, cutworm, heliothis armigera and protaetia brevitarsis lewis, etc.

Pest control target:

- Promote IPM technology, improve integrated control effects, prevent major pests causing great loss;
- Reduce the consumption of chemical pesticide;
- Strictly follow and abide by the safety interval for applying pesticides and the provisions about forbidding using high-toxic pesticides on corns, completely eradicate the productive pesticide poisoning accidents.

Pest control strategies and methods

- Control strategies. Carry out the policy of relying mainly on disease-resistant variety, and in combination with integrated control policies of agricultural technologies and seed treatment measures, to decrease the base number of bacteria sources and pest sources, and reduce the damages in later period.

- Agricultural control. Adopt disease-resistant variety, generally the drought-enduring variety with long and tight bracteal leaf has stronger disease-resistant ability, while the hybrid variety has stronger disease-resistant ability than the inbred line; the early maturing variety has stronger disease-resistant ability than the late maturing variety; implement reasonable crop rotation and autumn ploughing & winter irrigation measures; through ensiling, grinding and micro-storage, timely dispose cornstalk and eradicate over-wintering larva such as ostrinia nubilalis; it is required to seed in proper time and improve the seeding quality, and boost growth in early seeding and sound seeding; adopt plastic mulching and corrugation irrigation technologies; enhance the water and fertilizer management, control the content of nitrogen and increase the content of potassium, prevent the plant from growing excessively; clear up and destroy diseased plant remains timely, decrease the bacteria source and pest
source, and timely remove the gall smut of corn before tasseling stage, combine with farm operation to remove the mite blade; the spider mite also could be eliminated during seedling stage through controlling the over-wintering pests on the weeds among fields and field ridges.

- Seed dressing with pesticides. Utilize 50% thiram wettable powder, 40% seedvax wettable powder or 40% Vitavax FS that occupy 0.3~0.5% of the grain weight to dress seed, with the purpose of preventing the gall smut and head smut and other diseases of corn. Corn spider mite, zygina salina and cutworm (etc.) could also be controlled by seed dressing with seed coating agent in early stage.

- Physical trapping. Making use of the phototaxis and chemotaxis of pests, the ostrinia nubilalis, cutworm and protaetia brevitarsis lewis could be killed by adopting frequency oscillation pest-killing lamb or sweet and sour fluid.

- Artificial capture. Utilize the feigning death and grouping features of protaetia brevitarsis lewis adult, to make artificial capture when they are resting at early morning.

- Biological control. Protect and utilize the natural enemies, fully play the control role of chrysopaperla, trichogramma and ladybug on ostrinia nubilalis and aphid (etc.); utilize the artificially-propagated trichogramma to control ostrinia nubilalis: in accordance with observed information of pests, to release trichogramma to fields artificially in early stage of second-generation ostrinia nubilalis spawn, the release amount of per Mu shall be 40,000~60,000, and the release interval shall be 3~5 days; the second-generation ostrinia nubilalis will be controlled effectively after released for 3~4 times; release pheromone contiguously to trap and kill the male adults of heliothis armigera and ostrinia nubilalis, and harass their mating; promote the application of biological pesticide such as Bt emulsion and matrine to control heliothis armigera and ostrinia nubilalis; it is required to control zygina salina and spider mites and other pests by biological pesticide such as azadirachtin and abamectin; promote the application of sealing beauveria bassiana buttress to prevent the parasitism of the over-wintering larva of ostrinia nubilalis, etc.

- Chemical control. The pests such as ostrinia nubilalis and zygina salina could be effectively controlled through adopting 20% imidacloprid spray (5000 times); adopt a kind of dedicated acaricide which consists of 73% propargite emulsifiable solution (1000~1500 times), 25% clofentezine (2000 times), 5% hexythiazox wettable powder or emulsifiable concentrate (1500 times), and 15% pyridaben spray (2000 times) to control the corn spider mites.

### 3.3.3 Cotton

Main pests: the diseases include root diseases of seeding stage (rhizoctonia, anthrax and pythium debaryanum), cotton blight and greensickness, etc.; the pests includes cotton aphid, heliothis armigera, tetranychus urticae, thrips tabaci and bemisia tabaci, etc.

**Pest control targets:**

- Promote IPM technology, improve integrated control effects, prevent major pests causing great loss;

- Reduce the consumption of chemical pesticide;

- Strictly follow and abide by the safety interval for applying pesticides and the provisions about forbidding using high-toxic pesticides on cottons, completely eradicate the productive pesticide poisoning incidents.
Pest control strategies and methods

- Control strategies. Adopt the control strategies of “Relying on ecological control mainly, while physical trapping subsidiary, combining with the technologies of biological control and chemical control”.

- Agricultural control. Cultivating disease-resistant variety is the most economical and effective measure for controlling blight and greensickness; implement reasonable rotation mode and reduce the amount of pathogenic bacteria accumulated in soil to reduce the morbidity; strengthen the force of autumn ploughing & winter irrigation to remove the field ridge and larva, clear up field straws, debris and dead leaves, remove field weeds and lower the base number of over-wintering pests; seed in proper time and boost the pre-mature of sound seeding; strengthen the cultivation management and combine with farm operation, to pull out the plants with aphids and diseases, and carry out of the field for centralized destruction. Promote the application of ground film planting and under-film dripping irrigation, it is required to test the soil formula before applying fertilizer, and make topping and chemical control timely, remove useless flower bud and heart to reduce damages.

- Ecological regulation. Optimize the crop allocation and adopt wheat-cotton intercropping mode, or plant some safflower, rape and alfalfa (etc.) around the cotton field, to change the ecological structure of field and cultivate natural enemies, by which the pests could be effectively controlled. Through planting corns in cotton field, the heliothis armigera could be trapped and killed and thus to reduce disease caused by such pests.

- Physical control. Making use of phototaxis to trap and kill the adults of heliothis armigera, cutworm and cotton plant bug by frequency oscillation pest-killing lamp; making use of chemotaxis, and adopting sweet and sour fluid to trap and kill the adults of heliothis armigera and cutworm; making use of pheromone and polar branch to trap and kill heliothis armigera; making use of yellow trend to trap and kill cotton aphid and bemisia tabaci adults.

- Biological control. Protect and utilize the natural enemies, fully play the control role of ladybug and spider on cotton aphid and eliothis armigera, and improve the ratio of benefit insects to pests in the field. Release trichogramma to fields artificially to control heliothis armigera, and the release amount of per Mu shall be 12,000~14,000; release predatory mite to control tetranychus urticae, and encarsia formosa to control bemisia tabaci. It is required to promote the application of biological pesticides such as Bt emulsion, heliothis armigera NPV, matrine, avermectins, C4H75NO13.C7H6O2 microemulsion and azadirachtin to control the pests such as heliothis armigera, cotton aphid, bemisia tabaci, cotton spider mite, and so on.

- Chemical control. Seed dressing with pesticides: dress seed with 50% carbendazim wettable powder, 70% thiophanate-methyl wettable powder, or 2% tebuconazole dispersible granule, by this way the diseases of seeding stage and the blight and greensickness could be prevented and controlled; dress seeds with 70% Gaucho (imidacloprid) seed-dressing agent could control the pests with piercing-sucking mouthparts such as cotton aphids. Observe over-wintering pest sources and have early prevention: control the cotton aphid and bemisia tabaci in green-house and indoor flowers in early Spring and Autumn uniformly; spray acaricide to the surrounding and ridge of cotton field before the beginning of June, to perish the mite on the weeds, prevent the mites in the field ridge from spreading to cotton field; in case of the leaf with cotton aphid, it is required to eliminate with stalk-applying method, heart-dropping method and urine-mixture spraying method. 50% carbendazim wettable powder, 65% zineb wettable powder or 70% thiophanate-methyl wettable powder (800~1000 times) spray could be used to control the pests at the early diseased period of seeding stage. From the hatching stage of
helicthis armigera to young larva stage, it is required to control with 25% phoxim-fenvalerate emulsifiable solution (1000 times). Make use of dedicated acaricide which include 60% hexythiazox emulsifiable concentrate, 15% pyridaben emulsifiable concentrate (1000~1500 times), 9.5% fenazaquin emulsifiable concentrate (3000 fold), and 73% propargite emulsifiable concentrate (2000 times) to prevent and control the tetranychus urtica. Adopt 10% imidaclorpid wettable powder (1500 times), 3% acetamiprid wettable powder (2000 times), 25% thiamethoxam water dispersible granules (5000 times), and 10.8% pyriproxyfen emulsifiable concentrate (600~800 times) to control the cotton aphid, cotton plant bug, thrips tabaci and bemisia tabaci, etc.

3.3.4 Outdoor vegetable (including potato, processing tomato and pigment chilli)

Main pests of outdoor vegetables: these diseases mainly include downy mildew, powdery mildew, virosis, bligh, soft rot and early blight of potato, black shank, and ring rot, etc.; the pests include cabbage aphid, leaf miner, bemisia (white) tabaci, plutella xylostella, spider mite, heliothis armigera, potato beetle, and cutworm, etc.

Pest control target:
- Promote IPM technology, improve integrated control effects, prevent major pests causing great loss;
- Reduce the consumption of chemical pesticide;
- Strictly follow and abide by the safety interval for applying pesticides and the provisions about forbidding using high-toxic pesticides on outdoor vegetables, completely eradicate the productive pesticide poisoning accidents.

Pest control strategies and methods
- Control strategies. Starting from the whole ecological system of vegetable pests, comprehensively apply various control measures of “Relying on ecological control mainly, while physical trapping subsiadiary, combining with the technologies of biological control and chemical control”, to create a environment that is harmful to the generation of pests but beneficial to the propagation of natural enemies, maintain the balance of the ecological system of agriculture and the biological diversity, reduce the losses that result from various pests, and decrease the pesticide residues on the vegetable, with the purpose of ensuring the quality safety of agricultural products and that the ecological environment is well protected.
- Agricultural control. Select disease-resistant variety or high-quality virus-free potatoes; seed in proper time and cultivate pest-free and sound seedlings for later transplantation, reasonably arrange the planting density and optimize the group structure of vegetables; promote the measures such as deepening tillage soil, drying field, ridging cultivation, cleaning field ground, watering pests and so on; implement rotation planting mode between field crops and vegetables, to reduce the amount of pests accumulated in soil. Remove the diseased vegetables that lay in the center of field, pick off the diseased leaves and fruits and burn them up in bunches during the growth stage. The parting tool must be dis-infected, with the purpose of reducing the bacteria quantity carried on potato seed, and preventing the occurrence of plant disease.
- Catching adults and killing egg masses artificially. Utilize the condition that the potato beetles are always moving on the plants in the morning and evening, and they possess the feigning death feature and weak moving ability, thus it will be very easy to catch them; the egg mass takes on
orange-yellow and is always easy to be found, therefore in the active stage of adults, combine catching adults with killing egg masses, to achieve a multiplier effect.

- Physical control. The seed could be sterilized by warm-water dipping seed method or putting in a 70°C dry-heat incubator; we can adopt silver gray film to insulate from aphid; also adopt yellow sticky trap to kill the adults of aphid, leaf miner and bemisia (white) tabaci; adopt blue sticky trap to kill thrips; set up frequency oscillation pest-killing lamb and black light lamp in the vegetable field to trap and kill heliothis armigera, cutworm and other noctuidae pests and several kinds of pest adults such as plutella xylostella and potato beetle, to finally decrease the population quantity of phototaxis pests. Through adopting physical measures to control pests, the incidence of virosis could also be reduced.

- Biological control. Vigorously promote the application of biological pesticide, botanical pesticide, microbial source or agricultural antibiotic to control the pests of vegetable; release natural enemies and corresponding natural promoting technologies, protect and utilize natural enemies to improve natural pest-controlling abilities. For example: using agricultural streptomycin to control several bacterial diseases; using agricultural antibiotic 120 to control the powdery mildew and blight of melons and several vegetable root rots; using polyoxins to control the gray mold of vegetable, downy mildew of cucumber and melon blight; using urea hydrogen peroxide, moroxydine and chlorine dioxide to control the viruses on tomatoes, chillis, melons and brassicaceous vegetables; using Bt, matrine, Toosendanin, cnidium lactone, abamectin and pyrethrin to control heliothis armigera, bemisia (white) tabaci, plutella xylostella, aphid and leaf miner, etc.; and releasing predatory mites to control vegetable leaf mites.

- Chemical control. In accordance with the vegetable variety, cultivation method and different varieties of pests, guarantee the prevention and control effect of various birthing stages. During seeding stage, it is required to adopt 75% chlorothalonil wettable powder (600 times) and 70% topstn-methyl wettable powder (500 times) to spray or irrigate roots, so as to control the rhizoctonia, anthrax and pythium debaryanum. During growing stage, it is required to adopt 70% mancozeb, 58% fubol wettable powder, 50% iprodione wettable powder (500 times), 72.2% propamocarb hydrochloride (800 times), 72% cymoxanil mancozeb wettable powder (500 times) and 10% difenoconazole water dispersible granule (1500 times) to control the fungal diseases such as gray mold, downy mildew, early blight, powdery mildew, leaf mold and the diseases on potatoes, etc.; the bacterial disease could be controlled with 77% copper hydroxide wettable powder; the viral disease could be controlled with the moroxydine hydrochloride copper wettable powder (20%) (500 times), 1.5% hydrogen peroxide emulsion (800~1000 times), 5% moroxydine wettable powder (500 times) and 5% chlorine dioxide wettable powder (500 times). The pests on vegetables could be controlled by 10% imidacloprid wettable powder (2000~3000 times), 25% thiamethoxam water dispersible granule (3000~5000 times), 25% buprofezin wettable powder (2000 times), and 3% acetamiprid emulsifiable solution (2000 times). The growth stage of vegetable is relatively short, but the existing pests and diseases are quite serious and frequent controls as needed, thus it is required to harvest in the safety interval after spraying pesticides.

3.3.5 Greenhouse vegetable

Main pests and diseases of greenhouse vegetables: the diseases include seeding-stage diseases (pythium debaryanum, rhizoctonia and retting root), gray mold, downy mildew, powdery mildew, leaf mold, blight, pestilence and bacterial angular leaf spot, etc.; the pests include bemisia (white) tabaci, leaf miner, aphid, spider mite and thrips, etc.

Pest control targets:
Promote IPM technology, improve integrated control effects, prevent major pests causing great loss;

Reduce the consumption of chemical pesticide;

Strictly follow and abide by the safety interval for applying pesticides and the provisions about forbidding using high-toxic pesticides on greenhouse vegetables, completely eradicate the productive pesticide poisoning accidents.

**Pest control strategies and methods**

- **Control strategies.** During the course of pest-control for greenhouse vegetables, it is required to insist on the protection policy of “Prevention first, Integrated control”, and promote the control strategies of “Based on the pest and disease forecast, focus on optimizing the agricultural ecological environment, with the purpose of effectively controlling pests and reducing the pesticide residues, and combining agricultural, biological and physical control measures with scientific chemical control technologies”, to enhance the applying pesticide technology and reduce the pesticide residue and plant-protection risk, in order to guarantee the quality safety of agricultural products and make sure the ecological environment is well protected.

- **Agricultural control.** Plant disease-resistant variety; and implement soil disinfection; cultivate “pest-free and disease-free” seeds; reasonably implement crop rotation, graft & root exchange and high-ridge cultivation work, effectively control the soil-borne disease such as blight, greensickness, bacterial wilt and nematode; rationalize planting density and enhance irrigation and fertilization management, apply the water-saving measures such as double-ridge film mulching and under-film dripping irrigation, lower the relative air humidity in the greenhouse, slow down the reproduction of high-humidity diseases such as gray mold and downy mildew; clean up fields and timely pull out or remove diseased plants, or leaf, the leaves with pests or dried flower petal to reduce the base number of disease sources and pest sources.

- **Ecological regulation.** Enhance the temperature and humidity regulation technology for greenhouse; regulate the ecological environmental conditions in the greenhouse, to restrain the occurrence of pests. Before the culture of seedling (from January in Winter), it is needed to freeze the the air in the house with low temperature naturally to perish the over-wintering pest source – keep the greenhouse open and exposed to low temperature for 7~10 days; at the time of rotating crops in high temperature of Summer, it is needed to employ high-temperature suffocation technology to kill pest source and prevent the occurrence of pests and diseases; during growth stage, high-temperature suffocation technology can also be used to prevent high-humidity diseases such as gray mold and downy mildew. Bemisia tabaci likes to forage and breed on melon and piemarker, so we can plant melons among solanaceous vegetables in the greenhouse, and plant potted piemarker to trap bemisia tabaci for centralized control, consequently the damages of vegetables can be relieved.

- **Physical control.** The seed can be sterilized by warm-water dipping method or putting in a 70℃ dry-heat incubator; we can install pest-proof screen at the air vent or places near door/window to keep pests from entering; also adopt yellow sticky trap to kill the adults of liriomyza sativae, bemisia (white) tabaci and aphid; adopt blue sticky trap to kill thrips; hang silver-gray film strips at the air vents of greenhouse or lay silver-gray film strips in the field by interval to repellent aphid and bemisia tabaci, etc., in order to reduce the damage degree of pests and the incidence of vegetable viruses.
 Biological control. Vigorously promote the application of biological pesticide, botanical pesticide, microbial source or agricultural antibiotic for use to control the pests of vegetables; release natural enemies and corresponding natural promoting technologies, and improve natural pest-controlling abilities. For example: using agricultural streptomycin to control several bacterial diseases; using agricultural antibiotic 120 and astromicin to control powdery mildew and blight of melons and several vegetable root rots; using polyoxins to control the gray mold of vegetable, downy mildew of cucumber and melon blight; using urea hydrogen peroxide, moroxydine and chlorine dioxide to control the viruses of vegetables; using Bt, matrine, nicotine, toosendanin, cnidium lactone, abamectin and pyrethrin to control several kinds of pests; through releasing predatory mites to control vegetable leaf mite, and through releasing encarsia formosa to control bemesia (white) tabaci.

 Chemical control: Know well the rules of vegetable pest incidence in the greenhouse and select the pesticide correctly; grasp the key links and valid opportunities, take the correct control methods, give priority to prevention and control, apply the pesticides immediately if the center disease (pest) plant is found, and try to use the aerosol generation and spraying methods to apply the pesticides under the condition of tightness in the house; select the high-efficiency and low-toxic pesticides, and use the pesticides alternatively and reasonably in order to avoid the pesticide resistance of pests; reasonably use the fumigating, mist spraying, daubing, pesticide-clay mixsture spreading and other methods to overcome the uneven application pesticide and guarantee the healthy growing of vegetable. For example, to control the gray mold of pumpkin and cucumber, not spray the pesticide entirely but just mainly spray the pesticide onto the fruit top; to control the phytopthora capsici leonian, mainly spray the pesticide onto the stem base or the root; to control the aphid, blight and gummy stem blight, daub the pesticide onto the stem.

For example, 45% chlorothalonil smoke, 15% triadimefon smoke, 20% procymidone smoke and 50% vinclozolin can control various diseases; 10% Isopropcarb smoke, aphid smoke, aphid control smoke, 10% high chlorine thia-smoke, and 1% deltamethrin smoke can control various pests. 50% carbendazol wettable powder, 40% formalin, streptomycin sulphate, trisodium phosphate solution or potassium permanganate is usually used to immerse the seeds for disinfection. 75% chlorothalonil wettable powder (600 times), 80% mancozeb wettable powder (600 times), 10% difenoconazole water dispersible granule (2500-3000 times), 70% ethyl-phosphate manganese zinc wettable powder (500 times), 72.2% propamocarb hydrochloride (800 times), 58% ridomil-manganese zinc wettable powder (500 times) can control various fungal diseases: 77% copper hydroxide wettable powder (500 times) and 38% oxadixyl azoxystrobin (1000 times) can control various bacterioses; 20% moroxydine hydrochloride- copper wettable powder (500 times), 1.5% plant disease control emulsion (800-1000 times), and 5% chlorine dioxide wettable powder (500 times) can control the vegetable virus disease. 10% imidacloprid wettable powder (2000-3000 times), 25% thiamethoxam water dispersible granule (3000-5000 times), 25% buprofezin wettable powder (2000 times), 3% acetamiprid cream (1500 times), 15% pyridaben cream (2000-3000 times) and 5% hexythiazox cream (2000 times) can control various pests of vegetable.

3.3.6 Farmland and road protection forest

Suitable varieties of trees and varieties of pests: The local aspen of Xinjiang is staple variety of farmland protection forest. This variety which has adapted to the local climates and biological conditions is resistant to barren and dryness, easy to cultivate and has stronger resistance to pest. Because of the dry weather, the pests of farmland protection forest in Xinjiang are less. The longicorn, buprestid beetle, apocheima cinerarius and aphid, etc. are the prevailing pests, which are not serious and almost need no control. But in some years, the apocheima cinerarius and aphid are serious.
Pest control strategies and methods

- Control strategies: Follow the guideline of “Prevention First and Integrated Control”; based on the agricultural control and physical control, enhance the resistances of trees, and select the safe, high-efficiency and low-toxic pesticides in a reasonable way to keep the pests under the economic damage level.

- Control methods: attach importance to the source of young trees and remove the diseased branches by strict quarantine; actively cultivate and select the local optimal variety and avoid the outsourcing of young trees from other areas; according to the local conditions, combine the trees with the grain crops, fruit trees, vegetable or grass, to breed the natural enemies and reduce the pests; when the pesticides are necessary, select the high-efficiency and low-toxic pesticides for control according to the forecast of forest department.

3.4 Scientific application of pesticides

3.4.1 Principle of biological pesticide application

For the agricultural project of Xinjiang financed by the World Bank Loan to sustain development, the pesticides will be selected and used according to the following standards: (1) the pesticides shall have an obvious effect on the objective species; (2) the pesticides shall have a minor impact on the non-objective species and environment; (3) the pesticides shall not be dangerous for the personal health; (4) the pesticides must be highly efficient, lowly toxic, less or no residue; (5) every type of pesticide can be used for 2 times at most during each growing season.

The planned and recommended pesticides for this project shall be subject to the latest WHO’s standard-Pesticide Classification Recommendation based on Hazard and Classification Guide (in Geneva, WHO) referred by WB.

The pesticides that are prohibited and not registered or belong to class I pesticides of WHO will not be procured for this project.

3.4.2 Allowable varieties of pesticides

The project will give priority to the agricultural, physical (such as trapping) and biological control measures or biological pesticides (such as Bt) equivalent to the synthetic pesticides. This project mainly supports the biological control measures and the seed coating agent because those measures have the minimum impact on the environment, people and livestock. Moreover, the same pesticide will not be used for the same crop continuously or repeatedly in order to avoid the occurrence of pesticide resistance.

3.4.3 Selection of other pesticides

The new pesticide has to be proposed by the expert from the plant protection organization at province level or above, as approved by the provincial project office , and submitted to WB for filing before it is determined as the allowable pesticide for the project. All the adopted pesticides must meet the requirements of WB (for the pesticide classification standard, please refer to the latest World Health Organization’s Recommended Classification of Pesticides by Hazard and Guidelines to Classification) and comply with the policies and regulations of China.

3.4.4 Types of pesticides prohibited and limited in the project area
In order to enhance the use of pesticides in the project areas, solve the problem about excessive pesticide residual in agricultural products from the source and ensure the safe quality of agricultural products, The project areas shall enhance the supervision of high-toxic pesticides, and subject to the Regulations on the Control of Agricultural Chemicals of the People’s Republic of China, strictly punish the behaviors for illegal production of pesticides that are prohibited definitely and the use of prohibited and limited pesticides on the vegetable, fruit trees and other agricultural products. Meanwhile, the project area shall do well the works in publicity, education and training in order to guide the pesticide producers, operators and users to produce, promote and use the safe, high-efficiency and economic pesticides and guarantee the safety of agricultural products and the health of the people.

3.5 Technical requirements of project areas on the pesticide applying machinery

The pesticides are indispensible means for agricultural production. To ensure the scientific, reasonable and safe use of pesticides, a good pesticide applying machinery must be equipped. The selection or technical requirements of applying machinery shall focus on the following cases:

3.5.1 Consider the control object and site, the variety and growing of crop, and the pesticide formulation, application method and control scale of pesticides comprehensively, in order to determine the type of applying machinery.

- Select the manual sprayer to spray the pesticide on a small area;
- Select the mechanical knapsack sprayer to spray the pesticide on a large area;
- Select the boom sprayer or on-vehicle sprayer to spray the pesticide on a massive area.

3.5.2 Select the suitable nozzle and regularly replace the worn nozzle according to the control requirements of diseases, worms, grass and other pests and the type of applying machinery.

- Select the sector nozzle for the herbicide and plant growth regulator because its sprayed mist is sector shaped plane with big drip and less drift.
- Select the tapered hollow nozzle for the exterminator and fungicide because its sprayed mist is thin and easy to drift, and can contact the leaves from different directions.
- Never use different types of nozzles on the spray beam.

3.5.3 Select the applying machinery produced by normal manufacturer and with quality certificate.

Upon purchase, it is necessary to check if the package is good according to the packing list, and the fittings are complete according to the technical documents and accessories provided with machinery. Every time the pesticide needs to be sprayed, check the sprayer to avoid overflowing, dripping and leaking before pesticide spraying.

3.5.4 Never use different applying machinery for pesticides.

Normally, the sprayer for exterminator and fungicide can be used for other similar pesticides after it is washed, but the sprayer for herbicide shall not be used for other type of pesticide.

3.6 Problems of pesticide application

The evaluation result on the existing measures used in the project areas shows that the abilities of pesticide sellers to dispose the pesticides within the acceptability of risk (namely safe storage, use of
safe machinery and safe disposal of pesticide packages and wastes) are different. The training plan is proposed for these problems.
4 Organizational management and implementation

4.1 Executive agency and its responsibility

4.1.1 Agency constitution

Xinjiang Uyghur Autonomous Region will establish integrated pest control program supervision and guidance group and movable expert advisory groups. The supervision and guidance group consists of the project office and relevant departments of the autonomous region while the movable expert advisory group consists of experts from plant protection station, promotion station and soil fertilizer station and relevant city- and county-level popularization units of the autonomous region.

4.1.2 Relevant responsibilities

**Supervision and guidance group:**
- Check the planting demonstration base in project areas;
- Supervise the implementation of pest control plan project;
- Coordinate the activities among county- or city-level project office and project construction units.

**Movable expert advisory group:**
- Establish the pest management plan for project areas;
- Provide the technical support for pest management work;
- Assist the project office of autonomous region in supervising and evaluating the project implementation;
- Assist the county (city) plant protection station in checking the project technology and determining whether the financial support is provided;
- Provide technical assistance against PMP technical problem;
- Provide technical training for the project participators;
- Help to organize the visiting and learning activities, establish a relation with international PMP project;
- Compile relevant technical training materials and field operation manual as well as PMP-related works;

**County (city) level agricultural technology popularizing center and plant protection station:**
- Establish the PMP scheme for project areas in counties (cities) and designate relevant personnel to discuss with countryside (town) and farmer associations for implementation;
- Take effective method and measure to ensure the implementation of local PMP work;
- Monitor, forecast and predict the pest of project areas and provide the relevant control technology;
- Organize and carry out the pest control plan of this project area under the direction of mobile expert advisory group;
- Provide technical training for countryside (town) technical personnel;
- Provide technical instruction and training for participating farmers;
- Guide the farmer association to investigate the pest and report to county (city) level plant protecting stations.

4.2 Capacity construction

4.2.1 Improve the awareness of complying with policy

Through the implementation of this project, improve the awareness of complying with the policy of project areas and strengthen the capacity of integrated pest management. The performance shows as follows:

- Strictly follow Regulations on Pesticide Administration, Regulations on Plant Quarantine and relevant laws and regulations;
- Forbid to use the unregistered pesticide in the activity of the project;
- Never use the class I pesticides specified in WHO in the activity of the project;
- Strictly follow the following regulations:
- FAO acts on pesticide management, selling and use (or equivalent Chinese legal documents);
- FAO rules on pesticide package and storage (or equivalent Chinese legal documents);
- FAO rules on pesticide package label specification (or equivalent Chinese legal documents);
- FAO specification on disposal of pesticide wastes and packing container (or equivalent Chinese legal documents);
- Implement the environment standard of agricultural chemicals (including pesticide) prescribed by State Environmental Protection Administration (SEPA);
- Discuss and provide the successful PMP cases and their benefits, particularly the long-term benefits, to encourage the counties and countryside governments to popularize and support PMP method;
- The loan issuing department shall strictly specify that the loan can be only used for purchasing the project-recommended and registered pesticides of high efficiency, low toxicity and less-residual and follow the use specification;
- Underlying financial supports for PMP study and popularization of this project.

4.2.2 Strengthen capacity construction of base plant project.

Through the implementation of this project, obviously strengthen the plant protecting capacity of project area. The details are as follows:
- Cultivate a group of county(city) level plant protection experts, countryside- and town-level agricultural technology popularizing personnel and baseline agricultural technicians and technological demonstration farmers;

- Through the implementation of the project, enable baseline plant projection personnel to know well IMP method and the farmer to understand IMP method;

- Through the implementation of the project, strengthen the communication and liaison of plant protection work among counties (cities), countrysides, towns and villages and promote the implementation of PMP.

4.3 Management capacity, organization arrangement and mutual cooperation

In order to strengthen the management capacity of plant protection and control the selling and application of pesticide, it is necessary, the project to make close cooperation with the pest control and quarantine department. For this purpose, the following methods will be adopted in this project:

- The project management office will designate a special person to supervise the implementation of PMP;

- Work out the pest monitoring plan and evaluation method for monitoring and evaluating the pest management technology adopted during the implementation of the project;

- The project office will cooperate with the government and the plant protection stations of autonomous region to renew and enrich the pest control knowledge and improve the integrated pest management capacity;

- The plant protecting experts at the level of autonomous region, municipality and county (city) will strengthen the technical training for farmers of project areas;

- Strengthen the exchange on pest control technology and share experiences among counties (cities) and countrysides (towns);

- Encourage and support the relevant regions, counties (cities), towns and villages to use the safety control method against pest and integrated pest management technology.

4.4 Training and popularization of integrated pest management (IPM) technology

For the implementation of the project, it is very important to strengthen the IPM technical training and widely develop the training of knowledge on integrated pest control technology and reasonable and safe pesticide application. Based on the division of different departments or the level of all participants which are involved in this work, during the implementation of the project, the technical training can be provided for county (city), countryside (town) technicians and farmers by holding training schools for course, centralized lesson, farmer field schools for field direction and other means to gradually improve the pest control level of farmers in project areas, improve status quo of backward technology of the integrated pest control, and strengthen the knowledge about reasonable, scientific and safe use of pesticide.

The units responsible for providing training includes:

- Plant protecting station of autonomous region, Xinjiang Academy of Agricultural Science, Xinjiang Agricultural University and the scientific research institutions;

- Large-sized agricultural demonstration base;
● Well-trained stations for popularizing agricultural technology in municipality, county (city) and countryside and town;

● Pesticide seller;

● Other institutions at the national- or autonomous region-level;

● Food and Agriculture Organization (FAO);

4.4.1 Construction of professional pest control team

Cultivation of baseline professionals:

With the construction and training of integrated pest control demonstration zones in the project areas, select the large farmer houses in line with plantation and the technological demonstration farmer houses with sound integrated control technology and abundant experience as professional pest control professionals and provide them with emphatic cultivation. The town government shall financially appropriate certain funds for deep study of such professional control personnel to improve their learning ability, self-development ability and radiation ability, and to enable the technological demonstration farmer to be the important member of agricultural technology popularization system, agricultural condition investigator, technical popularizing personnel, policy propagandist as well as the “local expert” which can be seen and consulted by farmers at any moment. Additionally, the pest control personnel shall monitor and timely report the local epidemic situation and communicate with the superior leaders and experts in order to take preventive measure in time.

Construction of professional pest control team:

In order to ensure the integrated crop pest control and reasonable use of pesticide in project areas, the professional pest control team which consists of town government and various agricultural associations, cooperative societies and large planting farmer houses will participate in the implementation of integrated pest control work with the above professional pest control personnel as technical backbone.

In order to avoid the blind and excessive use of pesticide, the agricultural authority in project areas shall organize the responsible personnels from all villages and towns to perform the unified procurement of equipment and pesticide necessary for pest control and realize the comprehensive management on pest control in project areas. Within 3~5 years, reduce the use of chemical pesticide, increase the use of biological pesticide, and eliminate the intoxication accident due to improper storage of pesticide and unreasonable disposal of wastes.

The training content mainly includes:

● State and local laws and regulations on agriculture and plant protection;

● IPM plan and implementation;

● Identification, rules, prevention and integrated management technology of main pests in project areas;

● Pesticide purchase and safe application technology;

● Safe storage and disposal of agricultural chemicals and packing wastes;

● Application method and safety protection requirement of chemical pesticide;

● Maintenance and management of applying pesticide machinery.
4.4.2 Training for farmer house

With such training modes as training school, course centralized teaching workshop, farmer field school, field meeting, field guidance, field demonstration, provide the farmers with control technique so that they can identify the common pests and know well integrated control technology, effectively and economically improve the pest control ability and safety awareness of farmer, while guiding farmer to make scientific treatment decision, taking appropriate integrated control measure and use the pesticide in a safe and reasonable form.

The training content mainly includes:

- Identification, rules and main natural enemy of main crop pest;
- Control strategy and integrated control technology of main crop pest;
- Selection and safe application technology of pesticide;
- Safe storage and disposal of agricultural chemicals and packing wastes;
- Use method and safety protection requirement of chemical pesticide;
- Maintenance and management of applying pesticide machinery.

4.5 Supervision management

4.5.1 Supervision management content

When the project supervision group from the World Bank checks and supervises the project, the field monitoring shall be implemented for the following works. The main monitoring contents include:

- Visit famers and hear them about the work report regarding pest control of the county (city), investigate the implementation of integrated pest policy;
- Go to the field to check the pest occurrence and control;
- Investigate the selling records of pesticide seller to check whether the class I pesticide (high toxic pesticide) is used;
- Check the pest monitoring table, protection record and relevant data to investigate the implementation of pest management plan and its corrective measure;

The project supervision group from the World Bank shall inspect the project twice a year, generally at the annual high-incidence period of pest, in order to check the implementation of local pest control.

The project supervision group from the World Bank consists of experienced pest control experts, all the expenses of which are included in the project.

The monitoring activity shall be developed under the mutual cooperation among professional plant protection pest control technicians from the agricultural technology popularizing departments of the counties (cities) and towns in project areas.

The personnel who are dispatched by the World Bank shall assist in establishing appropriate monitoring system and sampling procedure in early time and provide training on the implementation and analysis of the monitoring system.

4.5.2 Supervision implementation
The crop pest control work shall be done jointly by the project-related county (city) and town pest control agency, project office and farmer. Once any pest occurs, the immediate report and disposal must be given.

The agricultural product selling process shall be subject to the agricultural product access quality inspection and agricultural product exit quality inspection of agricultural product production base by county (city) agricultural product quality inspection center.

The environmental, occupational and healthy risk shall be managed subject to the supervision of relevant environmental protection agency and agricultural administration agency. See Fig.2 for the monitoring schematic diagram of pest management.

4.5.3 Supervision plan
The project office of autonomous region shall work out monitoring plan to ensure the normal operation of periodical supervision activity. In order to evaluate the pest management and the application of project PMP technology, a responsible person designated for project office shall check the agricultural pest management work and implementation of PMP method. Additionally, the project office shall cooperate with relevant agencies at home and in autonomous region to strengthen the project capacity in terms of PMP technology and the communication among counties (cities), towns and villages of autonomous region for immediate elimination of possible problems and smooth implementation of PMP. During the high-incidence period of pest, the pest control agencies at various levels shall supervise and control the pest, provide the guidance, supervision, monitoring and training service in terms of integrated pest control technology, popularize the measure and method to reduce the use of high toxic pesticide, and encourage the private operator, especially the agricultural chemical operator, to effectively use PMP method.

The project offices and loan issuing units at various levels are responsible for observing and reporting the pest control situation in time and implement the integrated pest control plan as required.

4.6 Monitoring evaluation

4.6.1 Monitoring content

During the implementation of the project, it is necessary to provide field monitoring on the implementation of integrated pest management plan, installation and use of solar insecticidal lamp, biological control subsidy condition, and main pest control effects.

4.6.2 Monitoring index and inspecting content

**Monitoring index**

- Area of integrated pest control (hectare)
- Quantity of farmers participating in integrated pest control training (person/month)
- Purchase, installation and use of physical control equipment of insecticidal lamp
- Area of biological control subsidy (hectare)
- Change of pesticide consumption
- Change of pesticide residue

**Inspecting content**

**Policy problem:**

- Implementation of governmental subsidy of biological control;
- Compliance with policies and regulations on pesticide application and promoting the integrated pest control;

**Pesticide application:**

- Application of class I pesticide
- Check the pesticide selling point and farmer’s pesticide cabinet to determine whether the class I pesticide is sold and used in the project areas.
Implementation process:

- Evaluation on local monitoring plan by the inspection team of the World Bank
- Problems occurred during the implementation of PMP
- Inspection of various levels

4.6.3 Monitoring and inspecting plan

Various levels of project offices shall ensure the normal operation of periodical supervision activity. They shall supervise and inspect the implementation of pest management plan at any moment during the high-incidence period of pest and assist the supervision group of the World Bank in inspecting the project. The supervision group from the World Bank shall consist of experienced pest control experts to make supervision and inspection 1~2 once a year, generally during high-incidence period of pest annually.

- Monitoring on pest management: various levels of project offices shall organize the departments concerned for the purpose of implementing monitoring work;
  - Inspection plan: various levels of project offices shall be responsible for taking the inspection;
  - Responsibility: various levels of plant protecting inspection station shall provide PMP guidance, monitoring and training services and observe and report the pest situation in time together with the project executor and perform PMP obligation and responsibility as required;
  - Required professional skills: the various levels of plant protecting inspection station shall provide service of plant protecting experts and PMP methods;
  - Budget: listed into daily management of various levels of project offices; the expenses required shall be listed into the budget for project office expenses.

4.6.4 PMP progress report arrangement

- The unit responsible for implementing the project shall submit the project progress report annually, the midterm implementation report and post-implementation report.
  - The annual report and midterm report of the project shall include the project implementation terms, project fund utilization, project progress, project implementation effect, difference between expected effect and actual effect, existing problem and solution during the project implementation;
  - The report submitted at the end of project shall include the project implementation term, project fund utilization, project progress, project effect and evaluation, difference between expected effect and actual effect, and existing problem and solution during the project implementation. The evaluation on project effect refers to the application of standardized popularized technology in the project, increment of farmers’ income and improvement of living standard due to the use of new technology, agricultural product quality safety level, impact on ecological environment, project sustainability, project organization and management. The effect evaluation on the completed project can be used to analyze the whole results of the project.
5 Work plan and expense arrangement

Xinjiang Uyghur Autonomous Region takes advantage of WBL to carry out agricultural project for sustainable development, the important part of which is PMP. In order to complete the planned objective, activity content and expected output, the project is planned to develop work at four aspects, integrated pest control, technical assistance, farmer training and PMP implementation monitoring.

PMP shall be taken as an independent part of total project for consideration and budget. The project expense is mainly arranged according to the demand of main activities and in consideration of the four aspects of the above work arrangement. Additionally, it is noted that the area covered by the planned popularized integrated pest control technology is 12429.9hm² and the total budgeted expense of RMB17.16635 million derives from the World Bank project. The detailed expense budge is shown below (Table 7).

<table>
<thead>
<tr>
<th>Physical control equipment</th>
<th>Biological control subsidy</th>
<th>Farmer training</th>
<th>Demonstration of disease-resistant variety</th>
<th>Technical assistance from expert</th>
<th>Monitoring and evaluation</th>
<th>Total expense</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>368</td>
</tr>
<tr>
<td>Solar insecticidal lamp (set)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>621.495</td>
</tr>
<tr>
<td>Unit price (Yuan)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>107.7</td>
</tr>
<tr>
<td>Total (10,000 Yuan)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>550.84</td>
</tr>
<tr>
<td>Control area (hm²)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>48.6</td>
</tr>
<tr>
<td>Subsidy (Yuan/hm²)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Total (10,000 Yuan)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17.16635</td>
</tr>
</tbody>
</table>

5.1 Integrated pest control

The integrated pest control is the main implementation content of the project. The effective implementation methods of integrated pest control measure are to purchase the solar insecticidal lamp control equipment, direct farmer to adopt the biological control measure for pest control and to grant a certain subsidy. The control expense is calculated as per the quantity of solar insecticidal lamps and area of biological control subsidy of each county (city). During the implementation of the project, the expense budget for integrated pest control is RMB 9.89495 (Table 8).

<table>
<thead>
<tr>
<th>Project area</th>
<th>Control equipment</th>
<th>Biological control subsidy</th>
<th>Total (10,000 Yuan)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Solar insecticidal lamp (set)</td>
<td>Control area (hm²)</td>
<td>Subsidy (Yuan/hm²)</td>
</tr>
<tr>
<td>Qitan County</td>
<td>320</td>
<td>3450</td>
<td>500</td>
</tr>
<tr>
<td>Fukang City</td>
<td>320</td>
<td>3206</td>
<td>500</td>
</tr>
<tr>
<td>Yanqi County</td>
<td>150</td>
<td>3264</td>
<td>500</td>
</tr>
<tr>
<td>Bohu County</td>
<td>130</td>
<td>2509.9</td>
<td>500</td>
</tr>
</tbody>
</table>
5.2 Technical assistance

During the project implementation, the project office of autonomous region will invite the experts at home and abroad as well as in Xinjiang to form movable expert advisory groups for providing project areas with technical assistance in terms of PMP technical problems. The expense budget is RMB 486,000.

5.3 Farmer training

IPM technical training is an important part of IPM plan for the purpose of helping the farmers in four project counties (cities) to build up the principle and method of sustainable application of IPM technology and measures, improving the IPM knowledge and plant protecting skill of the farmer, strengthen their awareness as a master in protecting environment and involving in IPM activity, achieve the pest control target with safe, economical and effective use of pesticide, relieve the pesticide residue on agricultural product, and realize the sustainable development, ecological system diversification and living standard improvement.

The farmer training content covers integrated pest control technology and pesticide application technology. Based on the actual pest occurrence condition at different growth stage of crop and farmers’ questions, such training modes as farmer field school, field meeting and so on are used to direct and teach farmer how to identify and control pest and how to safely use pesticide in order to strengthen the farmer trainee's technical knowledge, organization, intercourse and management skills. It is planned for four project counties and cities within five years that the integrated pest control technology training is 156 person/month and pesticide application technology training is 203 person/month and as per 3000.00 Yuan per person per month, and the expense budget for farmer training is calculated as RMB1.077 million (Table 9).

<table>
<thead>
<tr>
<th>Training category</th>
<th>Trained object</th>
<th>training person-time (person/month)</th>
<th>Unit price (10,000 Yuan/person/month)</th>
<th>Training type</th>
<th>Five-year Total budget (10,000 Yuan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated pest control technology</td>
<td>Farmer</td>
<td>156</td>
<td>0.3</td>
<td>Mobile training</td>
<td>46.8</td>
</tr>
<tr>
<td>Pesticide application technology</td>
<td>Farmer</td>
<td>203</td>
<td>0.3</td>
<td></td>
<td>60.9</td>
</tr>
<tr>
<td>Five-year total</td>
<td>359</td>
<td></td>
<td></td>
<td></td>
<td>107.7</td>
</tr>
</tbody>
</table>

5.4 Monitoring and evaluation on PMP implementation

The monitoring and evaluation on PMP implementation is very important link for making project implementation effect evaluation, providing decision and improving project management. The monitoring and evaluation on PMP implementation quality shall consistent with the evaluation on entire project, so the expense budget shall be considered to be combined together. Due to particularity of IPM, however, some evaluating indexes (Table 10) are recommended against the monitoring and evaluating
requirement of IPM for uniform consideration in order to create the monitoring and evaluating scheme for overall project implementation.

Table 10 Monitoring index

<table>
<thead>
<tr>
<th>Index</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Area covered by integrated pest control</td>
<td>Compare the area changes of farmland which is subject to integrated pest control measure before and after project implementation</td>
</tr>
<tr>
<td>2. Number of the farmers participating integrated pest control training</td>
<td>Number of the farmers who participate in integrated pest control training before and after project implementation</td>
</tr>
<tr>
<td>3. Installation and use of physical control equipment of insecticidal lamp</td>
<td>Compare the changes of installation and use of insecticidal lamps before and after project implementation</td>
</tr>
<tr>
<td>4. Area covered by biological control subsidy</td>
<td>Investigate the implementation of biological control subsidy and the amount of the biological subsidy the farmers obtain, compare the changes of areas covered by the biological control before and after project implementation</td>
</tr>
<tr>
<td>5. Change of pesticide consumption</td>
<td>Compare the changes of pesticide consumption before and after project implementation</td>
</tr>
<tr>
<td>6. Change of pesticide residue</td>
<td>Through environment quality monitoring, compare the changes of pesticide residue before and after project implementation</td>
</tr>
</tbody>
</table>

The monitoring work will be done for three times, of which the first time is done to obtain the starting point data before project implementation. It is allowed to take the mean value of investigation indexes within three years before project implementation as base point data. The second time and third time are done respectively at the third year and the fifth year during project implementation to investigate the index change before and after project implementation and compare with the base point data in order to obtain the overall evaluation on project implementation.

Monitoring method: each project county (city) shall select one typical town as trial investigation point. The monitoring index 1~4 gives priority to the annual statistical data or training records and relevant data and records of the town while combining with the interview data of farmer in project areas; the monitoring index 5, the change of pesticide consumption, may take the questionnaire investigation as primary monitoring method and the farmer interview as secondary monitoring method; the index 6, the change of pesticide residue, can take the report data of environmental quality monitoring department as evaluation standard.
## Appendix 1 PMP Schedule

### A Mitigation Measures

<table>
<thead>
<tr>
<th>Project activity</th>
<th>Potential impact on environment and health</th>
<th>Recommended mitigation measure</th>
<th>Responsible agency/person</th>
<th>Estimated expense (10,000 Yuan)</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Popularize IMP technology.</td>
<td>1. The farmer may lack IPM awareness.</td>
<td>1. Popularize PMP technology.</td>
<td>1. Project offices at various levels</td>
<td>941.495</td>
<td></td>
</tr>
<tr>
<td>2. Implement integrated pest control technology on grain, cotton, vegetable and other crops.</td>
<td>2. The farmer may use, store and apply pesticide incorrectly.</td>
<td>2. Purchase insecticidal lamp for physically skilling pest.</td>
<td>2. County (city) level department of popularizing agricultural technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Implement PMP integrated pest management training plan.</td>
<td>3. The farmer may use highly toxic pesticide.</td>
<td>3. Grant subsidy for the biological control.</td>
<td>3. Technician of plant protecting station of County (city)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. The farmer may use chemical pesticide excessively.</td>
<td>4. Forbid the use of WHO class-I pesticides (1A, 1B).</td>
<td>4. Cooperative society and demonstration farmer houses</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. The farmer may fail to control the residual pesticide strictly.</td>
<td>5. Strengthen training for farmer, provide farmer with the training knowledge on pesticide storage and application, improve their knowledge on pesticide management and application.</td>
<td>5. Farmer of project county (city)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. PPMP awareness is lack.</td>
<td></td>
<td>6. Project office of county (city)</td>
<td>107.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7. Provincial project office training agency</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8. Movable training expert team</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental measure</td>
<td>Monitoring index</td>
<td>Monitoring place</td>
<td>Monitoring method</td>
<td>Monitoring frequency</td>
<td>Responsible party</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>----------------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1. Popularization of IPM technology</td>
<td>1. Area of farmland which is subject to integrated pest control, and compared with that of reference year</td>
<td>Four project counties</td>
<td>Give priority to the annual statistical data or training records and relevant data and records of trial towns while combine with the farmer interview.</td>
<td>Make monitoring before project implementation and at third year and fifth year during project implementation</td>
<td>Provincial project office Project office of County (city) Agricultural department of County (city)</td>
</tr>
<tr>
<td></td>
<td>2. Number of the farmers who participating integrated pest control training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Implementation of physical control technology and biological control subsidy</td>
<td>3. Installation and application of insecticidal lamp, and compared with that of reference year</td>
<td>Four project counties</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Investigate the grant of subsidy and area for biological control, and compare with the changes of biological control area before</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Pesticide use condition

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5. The change of pesticide application, and compared with that of reference year</td>
<td>Four project counties</td>
<td>Take the questionnaire investigation as primary monitoring method and the farmer interview as secondary monitoring method.</td>
</tr>
<tr>
<td>6. The change of pesticide residue, and compared with that of reference year</td>
<td></td>
<td>Take the report data of environmental quality monitoring department as evaluation standard.</td>
</tr>
</tbody>
</table>

**Monitoring method:** for each project county (city), select one typical town as trial investigating point, take the mean value of various monitoring indexes within the first three years as base point data, investigate the changes of various indexes at the third and fifth year during project implementation and compare with the base point data, and finally obtain the overall evaluation on the project implementation.

### C Project organization construction and training activity

<table>
<thead>
<tr>
<th>I Organization construction</th>
<th>Participator</th>
<th>Arrangement</th>
<th>Responsible party</th>
<th>Estimated expense</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Establish PMP implementation supervision group.</td>
<td>The supervision group consists of the personnel of provincial project office and provincial agriculture department.</td>
<td>The supervision and guidance group is established before project implementation or at project commencement to supervise the implementation of the project during project implementation.</td>
<td>Provincial project office</td>
<td>To be determined</td>
</tr>
<tr>
<td>2. Establish PMP mobile advisory expert group.</td>
<td>PMP advisory expert group consists of the personnel of provincial research institution,</td>
<td>The expert group is established before project implementation or at project commencement to supervise</td>
<td>Provincial project office</td>
<td>To be determined</td>
</tr>
</tbody>
</table>
II Training activity

<table>
<thead>
<tr>
<th>Training participator</th>
<th>Training mode</th>
<th>Training content</th>
<th>schedule</th>
<th>Estimated expense</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project office of County (city) Farmer of project county (city)</td>
<td>Mobile training Participating training School teaching training</td>
<td>PMP technology Pest management plan (PMP) Pesticide use and management</td>
<td>1st-5th year during project implementation</td>
<td>46.8</td>
</tr>
<tr>
<td>Project office of County (city) Farmer of Project county (city)</td>
<td></td>
<td></td>
<td></td>
<td>60.9</td>
</tr>
</tbody>
</table>

D Schedule

<table>
<thead>
<tr>
<th>Activity content</th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
<th>Etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q1 Q2 Q3 Q4</td>
<td>Q1 Q2 Q3 Q4</td>
<td>Q1 Q2 Q3 Q4</td>
<td>Q1 Q2 Q3 Q4</td>
</tr>
<tr>
<td>A Mitigation measure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Popularize PMP technology.</td>
<td>X X X X</td>
<td>X X X X</td>
<td>X X X X</td>
<td>X X X X</td>
</tr>
<tr>
<td>2. Implement integrated crop pest control technology.</td>
<td>X X X X</td>
<td>X X X X</td>
<td>X X X X</td>
<td>X X X X</td>
</tr>
<tr>
<td>3. Strengthen training service on farmer and provide the farmer in project areas and the project office of county (city) with PMP training and capacity construction.</td>
<td>X X X X</td>
<td>X X X X</td>
<td>X X X X</td>
<td>X X X X</td>
</tr>
<tr>
<td>B Monitoring</td>
<td>Monitoring on reference data</td>
<td>Monitoring at 3rd year</td>
<td>Monitoring at 5th year</td>
<td></td>
</tr>
<tr>
<td><strong>1. Popularization of IPM technology</strong></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>2. Implementation of physical control technology and biological control subsidy</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>3. Pesticide use condition</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Organization enforcement</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Establish the project PMP supervision group and expert advisory group.</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Establish the county (city) project office.</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 2 Selection of pesticide operator and personal protection

1. The pesticide operator must be healthy, young and strong and must have received a certain technical training.

2. Any person who is weak and sickly, suffers from skin disease, is poisoned by pesticide or doesn’t recover from disease, the woman in lactation period, gestation period and menstrual period and the person who doesn’t recover from skin injury is forbidden to apply pesticide or shall suspend the pesticide application work.

3. Do not bring children to working place during pesticide operation.

4. The pesticide operator must wear anti-poison respirator and long sleeve blouse, trousers, shoes and socks during operation.

5. It is forbidden to smoke, drink and take water and food and wipe mouth, face and eye with hand during operation. Never frolicly inject mutually.

6. Before taking water and food and smoke after daily work, be sure to thoroughly clean hands and face with soap and gargle water and when appropriate, be sure to swab down.

7. Be sure to replace and clean the work clothes which are polluted by pesticide.

8. The pesticide operator shall apply pesticide daily for six hours at most. If the back pack machine is used, it is necessary to set two persons for alternative operation. Be sure to rest a day after continuous operation for 3~5 days.

9. The operator must immediately leave the pesticide site, put off the polluted clothes, gargle and wipe up hands, face and exposed skin and be sent to hospital for treatment, if any headache, dizziness, nausea, emesis and other symptoms appears.

Appendix 3 Public advisory table

In order to really know the operating effects of Pest Management Plan established in this project in each project county (city), we organized and held a public project advisory meeting to ask for the opinions from various levels of agricultural development, administration, technical popularization departments and cooperation organizations as well as some technological demonstration farmers in project areas on July 13. The feedback opinions are shown in the table below.

<table>
<thead>
<tr>
<th>Time</th>
<th>Participator</th>
<th>Feedback opinion</th>
<th>Handling opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 13, 2012</td>
<td>Agricultural development office of project county (city)</td>
<td>If the pest control plan can be implemented as scheduled, the preferred financial support can be provided for PMP research and popularization, and the policy implementation awareness can be improved</td>
<td>Yes</td>
</tr>
<tr>
<td>Department/Role</td>
<td>Description</td>
<td>Yes?</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>Agricultural administration department of project county (city)</td>
<td>If the baseline plant protecting capacity construction can be strengthened and the integrated pest control ability can be improved</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Agricultural technology popularizing department of project county (city)</td>
<td>If the professional technical training can be provided for knowing IPM method, and the technical innovation and the popularizing strength of technological demonstration can be strengthened</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Professional cooperation organization in project areas</td>
<td>If the support strength for professional cooperation organization construction is increased and the training on agricultural pest identification, control method and reasonable and safe use of pesticide is strengthened</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Technological demonstration farmer in project areas</td>
<td>If the technological demonstration and technical training are strengthened for how to identify main pest species, how to select pesticide type, how to determine pesticide applying quantity and time, what problems are noted during use of pesticide and how to store pesticide</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>