IV. INTEGRATED PEST MANAGEMENT (IPM) AND GREEN FARMING IN RURAL POVERTY ALLEVIATION IN CHINA*

Introduction

China is a developing country with 60-70 per cent or 1.25 billion people engaged in agriculture. With 7 per cent of the world arable land China has fed up to 22 per cent of world population, which proved to be a great marvel in world history. Food security is of high priority in China and is under tremendous pressure. Speeding up the development of agriculture is the primary task of the national economy.

China is also one of the countries in the world that suffer serious natural disasters. Frequent and serious biological disasters cause great damage to crop production. In the past two decades, effected by continuous application of new agricultural technologies, changes in the tillage system and weather, the problem of crop pests in China had increased significantly. The enlarged emerging area and increased frequency of pest occurrence and outbreak led to even more severe damage and huge losses. The total crop pest emerging area in China enlarged from 1.7 billion acre times to 3.36 billion acre times (about 2 million mu = 130,000 ha). Since 1992, cotton bollworm, rice planthoppers, and Asiatic migratory locust have broken out more and more frequently in much larger areas, and brought along greater damage and become more difficult to control, resulting in more application of pesticides. Inappropriate application of pesticide, polluted the environment, increased pest resistance, decreased the control effect and enhanced the resurgence and damage of pests.

To effectively control pest damage, protect the safety of agricultural production, satisfy the ever-increasing demand for food, quality of people's life, and in particular increase farmer's income, contributing towards alleviating poverty, strong support would be required from policies, as well as science and technology. Apart from arable land conservation, expanding IPM and other capabilities for prevention and alleviation of disasters as well as increasing per unit yield and quality of products are important factors. All of these would contribute to sustainable development of China's agriculture.

IPM methodology in China was first initiated in 1975. Guided with " Prevention and integrated control", China began to execute IPM programmes in the field of plant protection research and extension, traditional single pest management to multi-pest management centered on crops, to fully exert the natural control function of ecological system and establish an IPM system. Up to now, IPM has been combined with the sustainable agriculture. People's perception of IPM has reached a new stage. IPM has achieved great success.

At the same time, China still has a long road to traverse to fully implement IPM, especially combining it with the development of green farming, improving farmer's income and alleviation of rural poverty.

A. Current status of pesticides use and its impact on the environment

1. Current status of pesticide use in agricultural products and crop production

Pesticide is an important input in agriculture. Since 1980, with the development of research on pesticides, production capacity of pesticides in China, except for Taiwan, Province of China increased rapidly. In 1997, pesticide production in China reached 757 thousand tons (estimated by effective component, the same as the following data), which was 3.2 times that in 1986 (see table IV.1).

Manufacturing capacity of various agents totalled 1.3 million tons. Pesticides production of 395 thousand tons in 1997 was 3.8 times that in 1986, with China occupying second place in world production (see table IV.2). Pesticides production in China has been adequate to meet the demands of agriculture as well as other demands such as export, forests, sanitation. However, since the structure of products was not rational, some herbicides and fungicides had to be imported (see table IV.3).

The volume of pesticide application in China totals more than 200 thousand tons per annum (estimated by effective component), of which insecticide accounts for 70 per cent. Pesticides plays an important role in controlling pests and ensuring the high yield of agro-products. In 1996, area planted with crops occupied about 2.9 billion acres, while area under chemical control approximated more than 4.0 billion acres (about 2 million mu = 130,000 ha), and area applied with herbicides reached 620 million acres (about 2 million mu = 130,000 ha). Estimates

* Presented by Wang Yanqing, National Agro-Technical Extension and Service Center (NATESC), Ministry of Agriculture.

Table IV.1. Production capacity of pesticides in China

(100% effective component, thousand tons)

Year	Total capacity	Insecticide		Fungicide		Herbicide		Plant growth regulator	
		total	%	total	%	total	%	Total	%
1986	231	183	79.2	21	9.1	14	6.1	1.6	0.7
1994	555	400	72.8	69	12.4	75	13.5	7.7	1.4
1995	651	474	72.8	88	12.7	87	12.6	10.0	1.4
1996	693	513	72.8	79	11.4	89	12.8	11.0	1.6
1997	757	547	72.3	824	10.9	114	15.1	18.0	2.4

Table IV.2. Pesticide production in China

(100% effective component, thousand tons)

Year	Total production	Insecticide		Fungicide		Herbicide growth		Plant growth	
		Production	%	Production	%	Production	%	Production	%
1986	1 102	74	72.5	8	7.8	7.7	7.5	0.477	0.5
1994	264	201	76.1	25	9.5	34	112.9	2.9	1.1
1995	349	246	70.5	37	10.6	53	15.2	9.0	2.6
1996	381	272	71.4	37	9.7	60	15.8	12.0	3.4
1997	395	275	69.6	41	10.4	67	17.0	10.8	2.7

Table IV.3. Import and export for pesticide in China

(Thousand tons, million US dollars)

Year	Import quantity	Import value	Export quantity	Export
1993	26.2	130	47.7	96
1994	32.0	137	609	152
1995	34.7	160	708	234
1996	32.3	138	737	276
1997	48.6	166	877	309
1998	46.0	180	1 070	320
1999.1-8	32.0	1 620	1 005	298

showed a retrieval in food losses of more than 54 million Yuan (RMB) and an economic return of more than 60 billion Yuan (RMB) owing to application of pesticides in 1995. The output/input ratio in pesticide application scored 8-16:1.

Pesticides application was used extensively on the major crops – cotton, rice, wheat, vegetables, and fruits, because of the large areas under cultivation, and infecting pest varieties. Expenditure on pesticide application for cotton totalled Y 1.58 billion, followed by rice and vegetables which occupied second and third place respectively, at Y 1.42 and Y 0.87 billion. Figure IV.1 shows the expenditure of insecticide on main crops. It should be mentioned that the imported insecticides occupied 15.6 per cent of the total insecticide expenditure.

Figure IV.2 shows costs of fungicide use on main crops. The highest costs was on vegetables

Figure IV.1. Insecticide expenditure on main crops in China

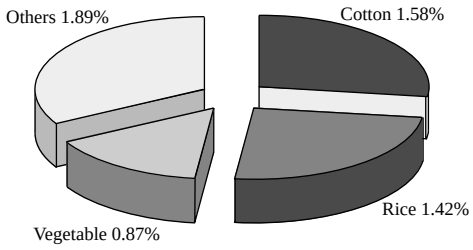
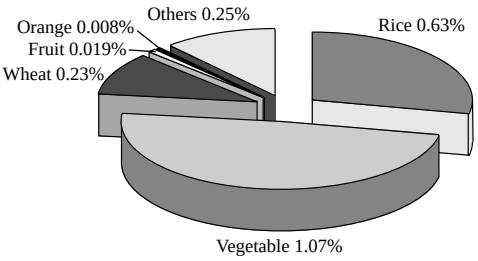


Figure IV.2. Fungicide expenditure on main crops in China



followed by rice, wheat, fruit, and orange at Y 1.07, Y 0.63, Y 0.23, Y 0.19 and Y 0.08 billion, respectively. The five crops shared 89.9 per cent of total fungicide market, vegetables accounting for 43.6 per cent.

Rice, soybean, wheat and maize are the main crops using herbicides, and account for Y 2.12, Y 0.84, Y 0.78, Y 0.52 billion (see figure IV.3). Imported herbicides accounted for about 40 per cent of the total herbicide usage. Detailed information on pesticides could be seen in table IV.4.

Figure IV.3. Herbicide expenditure on main crops in China

Table IV.4. Pesticide expenditure on main crops

(Y Billion)

Crop	Insecticide	Fungicide	Herbicide
Cotton	1.58		0.10
Rice	1.42	0.63	2.12
Vegetable	0.87	1.07	0.096
Wheat	0.57	0.23	0.78
Fruit	0.46	0.19	0.02
Orange	0.33	0.08	
Soybean	0.05		0.84
Maize			0.52

2. Emerging issues and problems as a result of pesticide use

Since high toxic pesticides share of the market in China was 70-80 per cent and the utilization ratio of pesticide was only 40 per cent, pesticide application had led to pesticide migration, deposit in soil and water area resulting in severe damage to the agricultural ecosystem by decreasing the index of biological diversification and lessening the function of natural enemies. The problems of pest resurgence, resistance, and residue had become even more serious. Consequently, pest control confronted bigger pressure of severe pests, further increasing dosages leading to increased costs.

3. Strategies adopted to cope with the problems

The Government of China has adopted the following strategies to resolve the problem of aggravating crop pests and the negative consequences caused by misuse of pesticides.

(a) Stick to a strategy of developing agriculture based on science and technology and updated plant protection techniques

Strengthening the research and extension components of plant protection technology would be important for effective implementation of IPM programme. Beginning with the Sixth Five-Year Plan, 20 years ago, the IPM programme had always been listed among the national key scientific and technological projects. Over one thousand scientists from over 50 research institutes were engaged in the research (Guo, 1997). Meanwhile, China began implementing the Sparkle Programme and Bumper Harvest Programme in mid-1980s, aimed at extending science and technology and assisting the poor with technical guidance.

(b) Accurate and strict implementation of policies, regulations and rules on environment protection

In order to enhance the management of the pesticide market as well as protect farmers, the State Council issued Regulations of People's Republic of China on Pesticide Administration in 1997. The Ministry of Agriculture issued Implementation Rules on Regulations of People's Republic of China on Pesticide Administration in 1999. The two legal texts standardized the behavior of pesticide production, operation and application in China. Since then over 300 national rules on pesticide safety application were issued, which strictly limited the application of pesticides harmful to the environment, natural enemies and easy to leave residues. High toxic and high residue pesticides were forbidden for use on vegetables and tea gardens. At the same time, a team qualified in pesticide residue testing was established, to facilitate quality control.

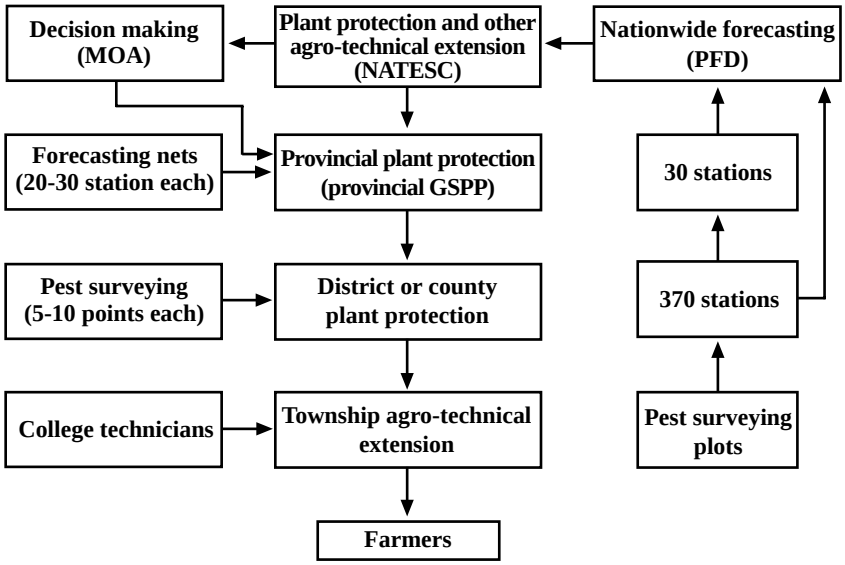
(c) Establish non-pesticide vegetables, non-pesticide fruit production bases and ecological demonstration bases and develop green farming

At large vegetable and fruit farms and export bases in the suburbs of large cities, safe application of pesticide has been listed as an important index of base construction. The concept of "Non-Pesticide Residue vegetables" and/or "non-pesticide residue fruit" is beginning to effect farmers' production activities. Both farmers and consumers are aware of the importance of food safety. On one side, farmers try to improve the quality of products, on the other side, consumers pay the price of high quality products.

(d) Further enhance the extension of IPM approaches

Since 1988, FAO inter-country rice IPM project, Asian Development Bank, cotton IPM project, FAO rice IPM project, FAO/EU cotton IPM project have been successively executed in China. The programmes have progressed significantly in collaboration with the National Agro-Technical Extension and Service Centre (NATESC), Plant Protection Departments and farmers in project bases.

Figure IV.4. Overall pest forecasting system involved in the collection, distribution and use of information in China



(e) Enhance the construction of pest monitoring and forecasting system to provide timely information

Pest monitoring and forecasting is the basis for implementing the IPM programme. The central government has invested more than one hundred million Yuan RMB over the past ten years into 400 regional forecasting stations under the National Crop Pest Forecasting Net (NCPFN). It, together with provincial stations, constitutes a huge national crop pest-forecasting network. The main responsibility of NCPFN is to provide data to governmental decision-making agencies and, at the same time to provide forecasting information to farmers via various media. Accurate and timely forecasting can avoid blind management so as to reduce crop losses and pesticide use. Figure IV.4 shows the overall pest forecasting system involved in the collection, distribution and use of information in China.

(f) Attach great importance to non-toxic pesticide research, improved methods and instruments for pesticide application so as to decrease pesticides dosage, environmental pollution and health hazard

Some kinds of non-toxic agents have been explored such as Bt agent, insect virus agent, Avermectin, to name a few. Limited by the slow speed and specification of most bioagents, their application scope appears to be narrower than chemical agents. In recent years, China has attempted to plant genetically modified crops (only transgenic cotton) that are pest resistant, an important characteristic of GMOs. However, owing to the debate on risks, the planting area has been limited to only Hubei, and Shandong province.

4. Degree of use of IPM methodologies (perception of IPM by farmers)

The following IPM tactics based on ecological regulations have been fundamentally accepted for many years in most regions, even though IPM methodologies regarded as a simple combination of different control measures still exist in China.

To improve farmer's IPM knowledge, China, with assistance from UNDP, FAO and other funding countries has established many farmer field schools (FFS). During 1994 to 1995, the programme of farmer training was carried out in 70 counties of 10 provinces, and more than 4,000 farmers, mostly from rice growing areas, were trained. These trainees include village demonstration farmers, farmer group leaders and heads of demonstration households who in turn, trained 29,700 other farmers in implementing IPM with significant profits.

Investigations show that trained farmers were aware of the concept of ecology and of the importance of environment protection. Chemical control was seen as a last resort of pest management. The IPM programme had helped farmers improve their IPM knowledge, and field scouting tactics. Frequency and volume of pesticide application was greatly reduced. An investigation conducted in 1999 by Plant Protection Department of Sichuan province showed recognition by trained farmers, increased by 54.5 per cent and 64.3 per cent of 10 species of pests and 12 species of natural enemies *vis-à-vis* before training. Another investigation conducted among 1,181 trained farmers and 395 untrained farmers in Sichuan, Guangdong, Hubei, Anhui, Zhejiang, Hunan provinces showed pesticide application frequency by trained farmer was lower, compared to the untrained farmer. Pesticide dosage per acre (mu) used by

trained farmers was 162 gram, which was 141 grams lower than that by the untrained farmers. The decreasing rate reached 46.5 per cent.

However, the scope of IPM has not expanded to the whole country. Farmers have not attended the whole process of decision-making. They still cannot cope with serious pest situations when confronted with multi-pest outbreak, abnormal weather, unusual crop growth and other unfavourable ecological conditions. Investigation of farmers' behaviour showed 33.8 per cent of rice IPM farmers sprayed pesticide relying on their own experience, 21.4 per cent in accordance with the neighbours' practices and only 44.8 per cent followed suggestions put forward by the Plant Protection Departments.

B. Socio-economic and income effects of IPM and green farming on poverty alleviation

1. An assessment of the income impacts

Since China adopted the open-door policy, farmers incomes have improved significantly with the development of agricultural production and rural economy (see figure IV.5 and table IV.5). Farmer's per capita income increased from Y 133.6 to Y 2,162 in 1998. During the period of 1978-1998, farmer's per capita income increased by 7.9 per cent, 1.4 per cent higher than rural development in the same period.

Figure IV.5. Farmers per capita net income 1978-1998

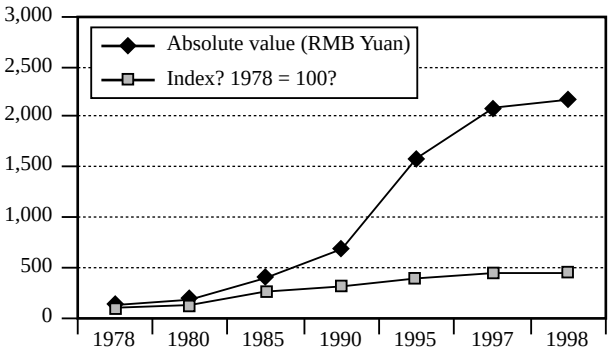


Table IV.5. Farmers per capita net income during 1978-1998

Year	Absolute value (Y)	Index (1978 = 100)
1978	133.6	100.00
1980	191.3	138.99
1985	397.6	268.94
1990	686.3	311.20
1995	1 577.7	386.67
1997	2 090.1	437.44
1998	2 162.0	456.78

China, with 220 million households is the largest developing country in the world. Per household owns only 0.45 hectares of arable land, which is termed mini-economy by agricultural economists. Consequently, the farmers literally rely on land to speed income growth rate. Table IV.5 shows that farmers' income was very low compared with those in developed countries. Up to 1999, population below the poverty line in China numbered 34 million, most of whom were centralized in remote mountainous areas, desert, and other poor water resource regions. In the west, where there is large land and rich resource, farmers mostly depend on agriculture especially crop production and animal breeding. Approximately 70-80 per cent of total income comes from agriculture. But in the East, agricultural income accounts only for 30-40 per cent. However, whether it is the West or the East, China is heavily dependent on crop yields for its income.

2. IPM and green farming as a tool in poverty alleviation

Agriculture is the basis of China's national economy and the pillar of rural economy. The government is fully aware that China should follow the road to sustainable development for the purpose of shaking off agricultural and rural poverty. The following strategies have been adopted:

(i) Refining of regulations and policies on guiding rural development;

(ii) utilization of market mechanism and sound macro-regulations;

(iii) ensuring food safety;

(iv) adjusting rural industry structure;

(v) improving agricultural investment and integrated production levels;

(vi) developing sustainable science and technologies in agriculture for the purpose of promoting protection of agricultural ecological environment and sound utilization of natural resources.

One of the alternatives adopted by China following the 1992 Conference of United Nations Environment Programme are the implementation of IPM and green farming as priority areas in executing sustainable management in China's 21st Century Agenda.

3. Effect of IPM and green farming on farmer's income

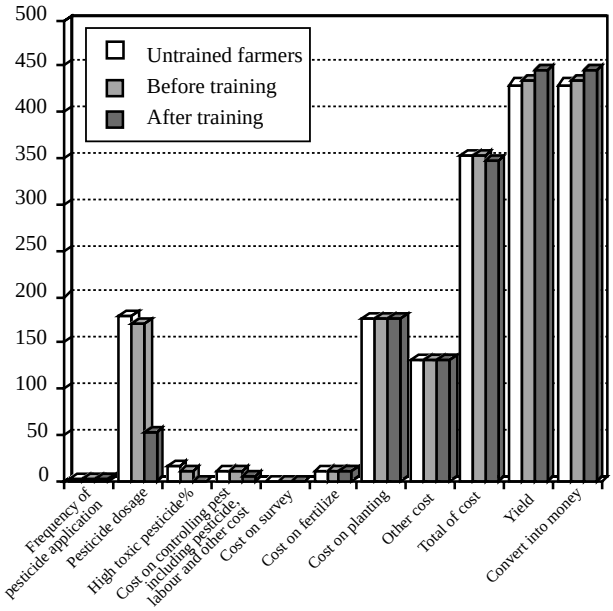
The national IPM programme in China including rice, cotton, maize, vegetables and fruits is organized by the National Agro-Technical Extension and Service Center, Ministry of Agriculture

(NATESC, MOA) in Beijing which also coordinates the international IPM activities within the country. China has been a member of the FAO Inter-Country IPM Programme since 1988. Phase three of that programme included 11 provinces, and ended in 1997. At the start of 1998, China embarked upon Phase Four: The Programme for Community IPM in Asia. The Community IPM phase will be focusing its efforts on five provinces. In 2000, a new IPM Programme focusing on cotton farmers was funded by EU and managed by FAO. At the provincial and county levels, a number of departments were involved in IPM, particularly Farmer Field Schools.

IPM practice proved that strict implementation of the programme in China would protect the environment as well as provide economic benefits for the farmers. FAO/China Rice IPM programme conducted in Yingcheng city, Hubei province in 1999 was a good example in demonstrating the effects of IPM on farmers incomes.

Figure IV.6 shows input/output ratio analysis of participating and non-participating farmers in Yingcheng city in rice season-long training of Farmer Field Schools guided by NATESC. Although the trained farmer added more cost on field scouting than the untrained farmer, the trained farmer still gained more profits owing to decreased frequency and dosage of pesticide application.

Figure IV.6. Effect of IPM on farmers (Yingcheng city, 1999)



From the point of green farming, Chinese farmers mostly benefitted from green food production. As organic food became popular in most developed countries, green food began to share more market in China. By the end of 1998, green food varieties had reached 1,018. More than 2.26 million hectares of land was cultivated to produce 8.4 million tons of green food. More than 619 enterprises were involved in Green Food production with total output of Y 40.4 billion, sales value of Y 8.5 billion, net profit after duty of Y 17 billion. Eighty per cent of the enterprises made a good profit from operating green farming. But in general, effected by a limited domestic and international market, consumer capability and food quality, the potential of green farming could not be fully reflected in farmers' income.

C. Identification of priority areas and suggestions on future projects to be undertaken at national and/or regional levels

Pesticide hazards to human health and the environment are controlled through increasingly stringent pesticide-use reduction policies and residue standards in China. Farmers are encouraged to reduce usage of purchased inputs through decreased application frequency, transition to integrated pest management or conversion to green farming. However, China, suffering yearly from serious biological disasters, is a large agricultural country with more than 80 per cent of rural population. Its primary task is to ensure food security while attempting to alleviate rural poverty. The situation is the same as in most Asia countries. Therefore, future priority areas should be based on characteristics of the national or regional situations.

1. Renew and enlarge the scope of IPM

IPM, as a plant protection policy and a technique has been widely accepted by various levels of plant protection departments and people involved. Seen from table IV.6 and figure IV.7, although pest control ratio fluctuated around figure 1, it shows pests have been carefully controlled during 1990-1998. Yield losses however, still varied between 0.23-0.35, except in 1998, where pest infestation was very high, in addition to other disasters. It suggested that the scope of IPM should be renewed and enlarged.

2. Enhance regional cooperation on severe and migrating pest monitoring and decision-making soft exploration

Monitoring, decision-making, and treatment are all critical components of the IPM system. China's National Pest Monitoring and Forecasting System, with a perfect net connected with farmers, enterprises, extension and administrative departments at various level of governments has played an important role in IPM practice. Through internet, TV, radio and other modern communication methods,

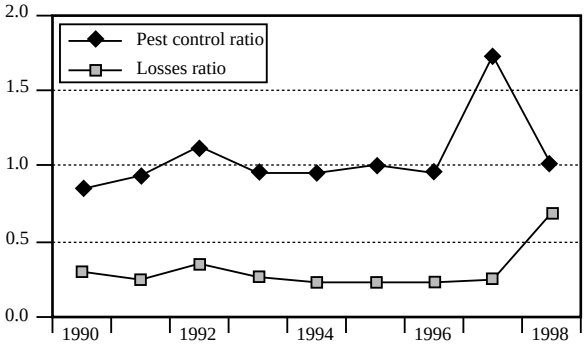
Table IV.6. Analysis on effect of IPM on trained farmers

(Yingcheng City, Hubei Province in 1999)

	Untrained farmer	Farmer Before training	Farmer After training
Frequency of pesticide application (time/acre)	2.5	2.3	1.2
Pesticide dosage (gram/acre)	178.0	171.0	54.0
High toxic pesticide per cent	15.0	10.0	0.0
Cost on controlling pest including pesticide, labour and other cost (RMB Yuan/acre)	10.76	10.36	4.09
Cost on survey (RMB Yuan/acre)	0.0	0.0	0.14
Cost on fertilize (RMB Yuan/acre)	11.05	11.05	11.05
Cost on planting (RMB Yuan/acre)	176.4	176.4	176.4
Other cost (RMB Yuan/acre)	130.3	130.3	130.3
Total of cost (RMB Yuan/acre)	353.49	353.09	346.96
Yield (kilo-gram/acre)	430.0	434.0	446.0
Convert into money (RMB Yuan/acre)	430.0	434.0	446.0

Note: * Type of rice cropping: early-rice persons: 30 trained, 30 untrained.

Figure IV.7. Effect of pest control



information is transmitted from the monitoring department to users and vice versa.

Since some migratory pests such as brown and white-backed planthoppers and rice leaf folders can seasonally move from some South-East Asian countries to China and then to East Asia, countries should make concerted efforts in monitoring, controlling and information exchange.

With the development of IPM, green farming and information technology, it is urgent to exploit the decision-making system. This initiative is of regional even worldwide significance because it aims at solving the problems of food safety and livelihood of 800 million of the world's poor.

3. Explore the model of organic integration of traditional and modern agriculture, and develop efficient green farming

Development of green farming will always have multiple objectives: income generation, natural resources conservation, food security and rural development. Conventional agriculture plays a dominant role in China while the methodologies of green farming such as reducing pesticide dosage, avoiding environmental pollution, have been practised in many areas, especially resource-poor and low level productivity regions. Farmer incomes may lag behind other modernized farm sectors except where there is a market niche for organically grown products for which consumers are willing to pay a premium. One of the main challenges confronting the agriculture sector is how to combine conventional agriculture with modern agriculture to reach sustainable agriculture. Exploring a model of organic integration of traditional and modern agriculture would be of some significance.

One example is the combination of IPM and Integrated Plant Nutrition System (IPNS), which is being tested in cotton production in Yongnian county, Hubei province, China. IPM and IPNS are two important technologies in green farming. IPNS addresses the concerns for maintaining soil fertility, sustaining agricultural productivity and improving farmer's profitability by making use of all sources of plant nutrient organic matter, green manuring, biological nitrogen fixation and other inoculants to complement and supplement mineral fertilizers. Modern technologies such as biotechnology and GIS have been used in the experiment. But the success of this experiment could be proved only over a comparatively long time.

There are a number of organic agricultural techniques that could be applied to enhance traditional and other agricultural practices to promote sustainable agriculture and rural development. The international community should assist developing countries to use and take advantage of these techniques.

4. Secure a market niche for IPM and green farming agricultural products to enhance farmer incomes

IPM and green farming could generate farmer incomes through international and domestic markets, or by savings from production costs. In order to secure a niche on national/international markets, agricultural policies should integrate organic agriculture policies as a means to meet the challenge brought by trade liberalization. A legislative

Table IV.7. IPM practice level in whole country (1990-1998)

(Area: billion acre
Losses: million ton)

Year	Pest emergence areas	Pest control area	Retrieved losses	Practical losses
1990	4.28	3.59	41.99	18.10
1991	3.69	3.45	38.81	12.17
1992	1.04	1.18	16.80	9.69
1993	4.72	4.46	43.46	16.10
1994	4.64	4.45	44.42	13.83
1995	5.00	4.99	53.29	16.30
1996	5.22	5.00	54.78	15.91
1997	5.19	5.34	52.77	16.99
1998	6.05	6.14	17.15	38.68

framework that provides definitions, standards and accreditation to certifiers is needed to protect responsible producers. Active government support from inspection to certification and market-oriented services are necessary to provide equal opportunities.

D. Conclusions

Agriculture is the base of China's national economy and the pillar of rural economy. The government is fully aware that China should follow the road of sustainable development to ensure food security and alleviate rural poverty. With the ever-increasing problems of environmental pollution and health hazards, one alternative taken by China is the implementation of IPM and green farming. IPM and green farming practices in China proved to significantly impact on rural poverty alleviation, and should be further implemented and enlarged.

A crucial factor in implementing IPM and green farming is improvement in farmer perception and degree of farmer participation. Consequently training in FFS, especially training for agro-technicians (who usually serve as trainers) and for demonstrators should be increased, to cope with the huge number of households in China. The National Monitoring and Forecasting system of NATESC has attempted to release information on pest trends and IPM approaches through internet, TV, radio and other communication methods. It will help to enlarge the channel of farmer training and improve the speed of information exchange. But more investments in the way of funding and technology needs to be provided or donated.

Conventional agriculture plays a dominant role in China's agriculture. Even though its planting methods are similar to green farming in some aspects, farmers incomes lag behind other modernized sectors. Therefore, while taking advantage of conventional agriculture, more and more advanced agricultural technologies should be injected and incorporated.

To fulfill the targets of enhancing farmers income and alleviating rural poverty via IPM and green farming, more and more agricultural products should be transformed to commodities, that would fetch higher profits from marketing. Priority should be given to policies permitted by international trade rules, standards and market-oriented services to secure a niche, in particular on the international market.

Close cooperation should be enhanced between member countries with the support of international organizations and/or other special agencies, to facilitate the above process.

References

BCPC, 1999, *"Biotechnology in Crop Protection: A BCPC Appraisal of Progress and Prospects"*.

Dai Xiaofeng, GuoYuyuan, *"Cotton Ballworm Resistance and Management"*, China Agriculture Press, Beijing, pp. 28-31.

Ge, F., 1996, *"The ecological risk analysis of effects of chemicals on environment and its reduction strategies"*, Proceedings of Integrated Pest Management Theory. Agri. Sci. Tech. Press, Beijing, pp. 149.

Food and Agriculture Organization of the United Nations, *A comparison of two IPM training strategies in China,* Rome.

Fang Yan, 1998, *"Structural Impact on Agro-technical Extension – A Case Study on Cotton IPM"*.

Li Dianmo and Ge Feng, *"Current Situation, Problem and Trend of IPM"*, in Proceeding of IPM Theory and Practice, pp. 34-37.

Ministry of Agriculture, *"Development of China's Rural Economy for 50 Years"*, China Agricultural Press.

Nadia Scialabba, 2000, *"Factors Influencing Organic Agriculture Policies with Focus on Developing Countries"*, IFOAM 2000 Scientific Conference, Basel, Switzerland, 28-31 August 2000.

NATESC, 1999, *"A Series of Summary on IPM Programme"* (1998-1999).

Tang Jinyi, 1998, *"Integrated Pest Management (IPM) in Rural Poverty Alleviation – A Case Study of China"*, November 1998.

Wang Lvxian, 1999, *"General Situation and Trend of China Pesticide Industry"*, in Symposium on Development Strategy of China Pesticide Industry in 21st Century, 7-9 December 1999, Beijing.

Xu, X., 1996, *"A brief discussion on the position of chemical control in IPM"*, Proceedings of Integrated Pest Management Theory. Agri. Sci. Tech. Press, Beijing, pp. 148.

Yang Yongzhen, 1999, *"Challenge and Opportunity of China's Pesticide in International Trade*", Symposium on Development Stratage of China Pesticide Industry in 21st Century, 7-9 December 1999, Beijing.