

The Summary of Terminal Evaluation

1. Outline of the Project	
Country: People's Republic of China	Project Name: Research and Development Project for Sustainable Agricultural Technology in People's Republic of China: 2nd Phase Development and Extension of Eco-friendly Agriculture Technology
Sector: Agriculture	Cooperation Scheme: Technical Cooperation Project
Division in Charge: Field Crop Based Farming Area Group, Rural Development Department	Total Cost: 427 million yen
Period of Cooperation: (R/D): April 2009 – March 2014	Executing Agency: Chinese Academy of Agricultural Sciences (CAAS) ¹ , Department of Agriculture, Ministry of Agriculture
	Cooperating Agencies of Japanese Side: Ministry of Agriculture, Forestry, and Fisheries
	Related Projects: Grant Aid Project for 'Japan-China Research and Development Center for Agriculture Technology' (2000) Technical Cooperation Project 'Research and Development Project for Sustainable Agriculture Technology in People's Republic of China' (2002-2007)
1-1 Background of the Project	
<p>People's Republic of China (PRC) enjoys dynamic economic development since the Reform and the Open-Door Policy. On the other hand rapid industrial development resulted in rapid environmental disruption and pollution. Agriculture sector has enjoyed considerable rise in production efficiency by massive increase of agricultural inputs such as chemical fertilizer, pesticides, and agricultural film, that led to contamination of water system e.g. rivers and swamps and soil. The Government of PRC takes countermeasures of improving legal systems for reducing application of pesticides and chemical fertilizer and for emission standards. However, the nature of agricultural contamination, being distributed in extension range with its possible causes untraceable, attracted minimum concern until relatively recently. As a result necessary research efforts in monitoring and identifying the causes of contamination marked its beginning. In fact the countermeasures are yet to have much outcome while utilization of chemical fertilizer and pesticide is on an increasing trend.</p> <p>Meanwhile the eco-friendly agricultural technologies for production and management, which was developed in the Phase 1 of this Project for the purpose of reducing the use of the agricultural</p>	

¹ Institute of Environment and Sustainable Development in Agriculture, formerly Japan-China Research and Development Center for Agriculture Technology, under CAAS is primary counterpart agency.

inputs, saw a certain level of success by the end of Phase 1. In view of applying and expanding the positive outputs of the research and development efforts in the earlier phase, it is required to utilize and promote the developed technologies through applying it to meet the local needs.

Under such background, the Government of PRC requested technical cooperation of strengthening its countermeasures to environmental contamination of agricultural origin to the Government of Japan, which went through similar experiences during the rapid economic development. The Government of Japan started a five year project since April 2009 with long-term JICA Experts (Chief Advisor, Eco-friendly Agricultural Technology, Coordinator/Extension of Agriculture Technology, Extension of Eco-friendly Agricultural Technology, and Short-term Experts) for the implementation of research and development activities for eco-friendly agriculture technologies.

1-2 Project Overview

By means of establishing Continuous monitoring and evaluation system in the Model Areas², development and verification of eco-friendly agricultural technologies through multidisciplinary research³, and identification of measures for extending the technologies in Model Areas, eco-friendly agricultural technologies are systematized⁴ in the Model Areas.

(1) Overall Goal

Water and soil contamination attributed to agriculture is prevented or improved with a focus upon Model Areas

(2) Project Purpose

Eco-friendly agricultural technologies are systematized in the Model Areas

(3) Outputs

Output 1 Continuous monitoring and evaluation system of Model Areas is established

Output 2 Eco-friendly agricultural technologies (technologies reducing soil and water contamination) are developed in the Model Areas

Output 3 Eco-friendly agricultural technologies are verified through multidisciplinary research in the Model Areas

Output 4 For the proved eco-friendly agricultural technologies in Output 3, measures to promote extension are identified in the Model Areas

² Model Areas are located in Hunan province (Yueyang), Ningxia Hui Autonomous Region (Qingtongxia and Lingwu), and Shandong province. Model Sites are the sites and/or the farm plots of cooperative, agricultural enterprises, farmers, and/or experimental plot, where the demonstrations of eco-friendly agricultural technologies are conducted in the Model Areas.

³ Multidisciplinary research in this Project is a research method of eco-friendly agricultural technologies conducting farmer participating demonstrations incorporating viewpoints of not only natural science and but also socio-economic aspect e.g. economic ones.

⁴ Systematization in this Project means a situation where monitoring, development, and demonstrations of eco-friendly agricultural technologies are conducted and the technologies become ready for extension.

(4)Inputs

Japanese side:

(Unit: Japanese Yen)

1) Dispatch of Experts

Long-term Experts

6 persons

Short-term Experts

30 person

2) Local Cost (As of June 2013)

Approx. 43.8 million yen

3) Machinery and Equipment

Materials and equipment

Approx. 40 million yen

4) Counterpart (C/P) Training

Training in Japan

80 persons

Chinese side:

(Unit: Japanese Yen)

1) C/P Assigned

80 persons

2) Local Cost (As of July 2013)

262 million yen⁵

3) Land space and facility

- Project office

- Land space and storage for facility for piloting and demo farms in Pilot Sites

4) Other in-kind input

- Utility (electricity and water supply), telephone and internet fee, and maintenance cost for Project Office and equipment and materials provided

(1RMB= 16.7 Japanese Yen as of September 2013)

2. Terminal Evaluation Team

**Members of
Evaluation
Team:**

<Japanese Side>

Mr. Noriaki Nagatomo

Leader

Deputy Director to Director General,
Rural Development Department, JICA

Ms.Naho Aizu

Cooperation
Planning

Field Crop Based Farming Area Division
Rural Development Department, JICA

⁵ Exchange rates are 1 RMB=12.5186 Japanese yen until Japanese fiscal year (FY) 2012, and 1 RMB=16.343 Japanese yen for FY 2013.

	Ms. Noriko Ishibashi	Evaluation Analysis	Consultant, IC Net Limited
	<Chinese Side>		
	Mr. Xiaoping Lu	Leader	Deputy Director General, International Potato Center, Regional Office for East, Southeast Asia and the Pacific (ESEAP)
	Dr. Jinmin Hao	Member	Professor, College of Resources and Environmental Sciences, Department of Land Resource Management, China Agricultural University
	Dr. Lixin Zhao	Member	Director, Institute of Energy and Environment Protection, Chinese Academy of Agricultural Engineering, Ministry of Agriculture
Period of Evaluation:	25 August – 6 September 2013		Type of Evaluation: Terminal Evaluation

3. Results of Evaluation

3-1 Achievement of the Project

(1) Project Purpose:

Among the 12 targeted technologies⁶ for research and development activities, seven are expected to complete the proposal for making ready for extension. At the time of Terminal Evaluation in Sep 2013, the proposals of three technologies (zero-emission pig raising technology, drip fertilization technology, and Utilization technology of slow-release fertilizer in protected cultivation), have already been developed and the rest of four are expected to be ready by the termination of the Project. Since one proposal per Model Area is to be achieved according to the indicator, therefore the Project Purpose is to be achieved during the Project period.

In addition, it is understood that the technologies which obtained international certification and/or provincial⁷ standards have already satisfied the conditions for extension. Thus the level of achieving the Project Purpose is judged to be high.

(2) Outputs

- 1) Output 1: Continuous monitoring and evaluation system of Model Areas is established
Output 1 is expected to be achieved by the Project termination.

⁶ Side dressing rice farming technology, recycling technology of straw, utilization technology of methane fermentation digested liquid, zero-emission pig raising technology, spot dressing technology (partial mixing and applying technology in the ridge), eco-friendly tomato cultivation technology, drip fertilization technology, utilization technology of slow-release fertilizer in protected cultivation, cleanup technology of soil contaminant (adsorbent), border irrigation, and analytical technology at global standard level (analysis of heavy-metal, agricultural chemical, and anti-biotics).

⁷ PRC administrative structure in the Province is Province/Region, prefecture, county, township, and village

- Water quality is monitored and analyzed by automated monitoring system in the monitoring points allocated in Model Areas and it is analyzed by automated data analysis program. C/Ps summarized contamination distribution and causes of contamination and so on. Analytical capabilities of water quality test reached to international standard, obtained the certification from Environmental Protection Agency of United State of America⁸. For soil analysis, the Project conducts analysis of nitrogen, phosphate and heavy-metal content and concentration.
- The data collection of phosphate concentration faced some difficulty (See Output 2 for details) however, the sampling and analysis methods of water and soil and system of conducting regular monitoring and analysis are systematized.
- These monitoring and analysis methods for water and soil are to be compiled in two manuals respectively so that the systematization of monitoring and analysis is to be in place. Therefore Output 1 is expected to be achieved.

2) Output 2: Eco-friendly agricultural technologies (technologies reducing soil and water contamination) are developed in the Model Areas

Output 2 is almost achieved.

- The four indicators of Output 2 has target figure for reducing chemical fertilizer utilization, agriculture waste recycling rate, amount of irrigation water saving, nitrogen and phosphate reduction in irrigation drain water and soil solution. The indicators are mostly achieved except for the one for phosphate reduction in soil solution. Phosphate measurement in soil solution in the fourth indicator requires real time analysis in time of raining and so on so that it was not gathered in Ningxia Hui Autonomous Region and Shandong Province. However, the data of the other chemical elements of ammonia nitrogen, nitrate nitrogen, and total nitrogen have almost achieved the targeted reduction rate in the indicator in all three Model Areas.
- The eco-friendly agricultural technologies which achieved the above indicators have proved its effectiveness in reducing water and soils contamination, therefore it is judged that these technologies are successfully developed through the demonstration.

3) Output 3: Eco-friendly agricultural technologies are verified through multidisciplinary research in the Model Areas

Output 3 is expected to be achieved since four out of five indicators are achieved while the last one is to be achieved.

- Five indicators are the followings: identification of more than five Model Sites, more than 10 farmers participating in demonstrations for each technology, economic evaluation (cost calculation) for each of targeted technologies, and training of in-country and abroad. All the indicators are mostly achieved or expected to be achieved

⁸ Certified by a certification agency named RTC.

but one, which is number of participating farmers in demonstration conducted in Shandong Province.

- This Project developed 12 eco-friendly technologies, the nine out of which conducted farmer-participating demonstrations. Those technologies are studies through multidisciplinary demonstrations in all of the three Model Areas therefore it is judged that Output 3 is expected to be achieved.

4) Output 4: For the proved eco-friendly agricultural technologies in Output 3, measures to promote extension are identified in the Model Areas

Output 4 is expected to be achieved since one of two indicators is already achieved and the last one is to be achieved by the end of Project term.

- The first one out of two indicators is to publicize information on Japanese eco-friendly agricultural technologies via website. Meanwhile the second one is to make a proposal indicating effect and cost of introducing the technology, and suggesting possible target groups and areas, and possible measures of extension e.g. provision of subsidy. The first indicator is already achieved as related information regarding Japanese eco-friendly technologies is publicized via CAAS website. In addition, the proposals are ready for three out of seven technologies, and the ones for rest of four are to be completed by the termination of the Project. Therefore it is judged that Output 4 is mostly achieved.

3-2 Summary of Evaluation

(1) Relevance

For the following reasons, relevance of this Project is judged to be high.

upgrading

- The 12th Socio-Economic Development Plan (2011-2015) highlighted improvement of planning and management capacity of local level government, strengthening of rural basic infrastructure construction, improvement of rural public service, and total development of rural environment in its seventh chapter on 'Production and livelihood improvement in rural areas'. The last plan, total development of rural environment indicated the importance of countermeasures against non-point pollution, and prevention of soil pollution. Therefore the Project is highly relevant to the Government of the People's Republic of China (PRC). In addition, CCAC the counterpart (C/P) organization was established to serve policy makers through provision of necessary evidences on agriculture technologies, thereby meeting the needs of C/P agency.
- Japan's policy of Official Development Assistance (ODA) toward PRC has four priority sectors of cooperation: global environmental issue including taking measures to environment problems of regional scale, support for open-door policy, promotion of mutual understanding, and disaster reconstruction of Shichuan Great Earthquake. This Project is one of technical assistance related to the efforts against environmental pollution affecting domestic and abroad under umbrella of 'countermeasures to environmental issue'. Therefore this Project is also along with Japan's ODA policy.

(2) Effectiveness

Effectiveness of the Project is judged to be high. The targeted technologies have reached to the stage of extension as a few of targeted ones are at the stage of extension.

- Two Provinces amongst the three Areas, two technologies in Shangong Province and one in Huna Province, already submitted the proposals along with the indicator of the Project Purpose. The one for Ningxia Hui Autonomous Region is to be completed by the end of the Project term.
- Furthermore, the introduction and further application of side dressing rice farming technology and zero-emission pig farming technology are on the way after the successful demonstrations.
- High level of achieving four Outputs contributed to achievement of Project Purpose.

(3) Efficiency

The efficiency of this Project is judged to be high.

- An overall level of achieving four Outputs is high from the viewpoint of satisfying the indicators: 9 amongst 11 indicators are mostly achieved or to be achieved by the end of the Project.
- The amount of resources from both Japanese and Chinese sides, assignment of human resources for Chinese C/Ps and Japanese Experts, provision of equipment and machinery and allocation of local operational costs from both sides were provided mostly according to the plan. For the timing of providing inputs, the timing of providing a side dressing rice planter for Hunan Province was delayed due to delayed procurement (The original plan is two rice planters in 2010), which in turn resulted in shorter demonstration period in Hunan Province than the plan. Also the C/P training in Japan faced one year delay after the accident at Nuclear Power Stations in Fukushima in 2011. However, neither of these delays caused serious disturbance in achieving the Outputs.

(4) Impact

Although the prospect of achieving Overall Goal is yet to be concluded at this stage, some of technologies began to show the sign of achieving the Overall Goal while foreseeing positive economic impact during its demonstrations.

- The indicators for Overall Goal are not yet achieved. For the horizontal expansion of the eco-friendly technologies in the first indicator, a local government under Ningxia Hui Autonomous Region has a plan of extending side dressing rice farming technology (2000 mu⁹ for 2014 according to its plan), therefore it is understood synonymous with approval as an extension project. Furthermore, a group of C/P in CAAS with an agricultural enterprise are conducting demonstration of spot dressing technology (partial mixing and applying technology in the ridge) in Inner Mongolia Autonomous Region for further expansion. For the second indicator on environmental load caused by agriculture-oriented non-point source pollution, the data itself is technically difficult to grasp so that it is not available for calculation.

⁹ Mu is an area unit and 1 mu = 0.067 ha.

- The economic calculations of demonstrations for spot dressing technology (partial mixing and applying technology in the ridge), side dressing rice farming technology, drip fertilization technology, Utilization technology of slow-release fertilizer in protected cultivation, recycling technology of straw showed the increase of the sales profit of participating farmer-stakeholders (farmers, cooperatives, and agricultural enterprises¹⁰), therefore there is a prospect of producing positive economic impact in addition to showing a ripple effect of the technologies.

(5) Sustainability

Sustainability of the Project is judged to be high on the whole. The eco-friendly agricultural technologies which reached to extension stage have high level of sustainability. Meanwhile the other ones need organizational and budgetary support for further study.

- Policy Aspect: No significant modification to the related policy in the sector is expected for neither of PRC nor Japanese side. The importance of promoting eco-friendly agricultural technologies is to be highlighted in the policy of the Government of PRC.
- Institutional and financial Aspect: the C/Ps are researchers in eco-friendly agricultural technology development so that their continuous engagement in this sector is highly likely. If C/Ps can allocate necessary budget for running demonstrations via various national projects, the studies in eco-friendly agricultural technology would be maintained. However the continuation of on-going demonstrations for the technologies yet to be proved its effectiveness is indeterminable.
- Technical aspect: The technology of monitoring and analysis of water and soil is to be maintained. The accumulated various data and papers, and the introduced eco-friendly technologies may even provide a seed for further research and development activities. The transfer of the C/Ps influences sustainability of technical knowledge.

3-3 Facilitating Factors

(1) Plan of the Project

Not particularly

(2) Implementation Process

- One of facilitating factors was, although the condition differs from one technology to the other, providing a well-substantiated proof of the effectiveness (in terms of yield and profit, applicability of technologies to the existing farming practices and so on) during the demonstrations. Then it led to the support from local government and so on, concrete examples of which are demonstrations in Ningxia Hui Autonomous Region which was the target areas of the first Phase. Successful demonstrations facilitated the understanding of local government officers toward the new eco-friendly technologies, which then resulted in establishing closer

¹⁰ Cooperative is a commercial organization and alliances of famers/residents, and laborers. Agricultural enterprise is an enterprise coordinating and managing farmers and generating revenue through market. (Japan External Trade Organization 2010 ‘Advanced examples of agriculture in PRC (original in Japanese) ’)

relationship with the local government at the levels of Region, prefecture, county, township, and village.

- The training in Japan provided opportunities for the participating officers from C/P agencies from central to local levels to eyed the advanced eco-friendly technologies in Japan, which were already applied and proved its effectiveness in the local level (city, town, and village level). Their experiences in Japan attracted their attentions to introducing the technology.

3-4 Obstructing Factors

(1) Plan of the Project

Not particularly

(2) Implementation Process

Not particularly

3-5 Conclusion

This Project has mostly completed research and development activities of the targeted eco-friendly agricultural technologies and is expected to achieve the planned Outputs and the Project Purpose. Therefore the effectiveness of the Project is high. In addition, the Project has expanded the areas of demonstrations for some technologies in Ningxia Hui Autonomous Region under collaboration not only with C/P agencies but also with provincial level government offices concerned. It also has a sign of ripple effect for the extension to the other areas of PRC. Having said this the Project has achieved more than expected Outputs. Therefore the Project is terminated in March 2014 according to the plan.

3-6 Recommendations

(1) Activities to be completed by the end of the Project

Amongst the 12 targeted technologies, it is necessary to prioritize the rest of activities and efforts to be done in the Project term for the technologies that are yet to reaching the extension stage. Priority setting may depend upon the level of completion and promisingness of the technologies. Also it is necessary to complete proposals for the following technologies, which has high priority, and to prepare a case study of extension: side dressing rice farming for both of Hunan Province and Ningxia Hui Autonomous Region, recycling technology of straw, and border irrigation.

(2) Recording and organizing extension process

Aiming to utilize the lessons to the other areas, it is recommended to record the structure of conducting demonstration and the working process with agricultural enterprises and cooperatives for the technologies at demonstration stage but in wider area and/or at extension stage. It is particularly so for side dressing rice farming technology in Ningxia Hui Autonomous Region. For the production of side dressing rice planter, it is necessary to

continue further effort for reducing cost and expansion to wider area.

(3) Sharing the Overall Goal and its indicators among the stakeholders

It is recommended that the Overall Goal and one of its indicators to be amended. The amendments are required to be shared among the primary stakeholders of the Project.

(4) Further efforts on public information sharing on eco-friendly technology

In view of promoting eco-friendly agricultural technologies after the Project termination, it is desirable to support further expansion of the existing support system such as government subsidy and to conduct further information sharing with farmers about eco-friendly technology.

3-7 Lessons Learnt

(1) Coordination and collaboration aiming for extension of technology at earlier stage

Emphasizing the coordination and collaboration amongst research institutions and government organizations at earlier stage of the demonstration facilitates the development of more practical technology and also shortens the process of its diffusion and extension.

(2) Collaboration between the research institutions and local government organization

In an effort where research institutions working on extension, an approach of accumulating the results of farmer-participating demonstrations is an effective option with the local government collaboration.

(3) Effectiveness of demonstration

Further improvement in effectiveness of demonstration might be possible when the targeted farmers' receptiveness to the technology and adoptability to incurred cost of inputs and machinery are well considered in the design of demonstrations.

(4) Demonstration and public relations of technologies aiming for extension

In view of extending the technology which is compatible with profitability (maintaining and improving) and environmental conservation, it is important to set various opportunities aiming to diffuse its technical advantages to government offices, and private sectors of agricultural enterprises and manufacturers of farm machinery during the cultivation period.