

Country Name	<b>Sustainable Agricultural Technology Research and Development Phase 2</b>
People's Republic of China	

**I. Project Outline**

Background	<p>China enjoyed 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. In the agriculture sector, 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 Chinese government took countermeasures to improve legal systems for reducing application of pesticides and chemical fertilizer and for emission standards, but the effect was limited because the research necessary for the countermeasures, including monitoring of contamination and identification of contamination sources, was just started. In the meantime, the eco-friendly agricultural technologies for production and management, which was developed through JICA's technical cooperation project "Sustainable Agricultural Technology Research and Development Project" (2002-2007) (Phase 1 of this project), saw a certain level of success at the research level. In order for the government to utilize the positive outputs of the research and development for countermeasures against environmental contamination, it was required to implement and encourage promotion of eco-friendly cultivation technologies according to the local conditions.</p>												
Objectives of the Project	<p>The project aimed at systematization of eco-friendly agricultural technologies in the Model Areas in China through establishment of implementation system for continuous monitoring and evaluation of water quality and soil, development of eco-friendly agriculture technologies (technologies reducing soil and water contamination) and verification through multidisciplinary research, and identification of measures to promote extension of the proven technologies, thereby having prevention and improvement measures for water and soil contamination promoted as extension projects.</p> <p>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.</p>												
Activities of the Project	<p>1. Project Site: Beijing, Model Areas (Hunan Province, Ningxia Hui Autonomous Region (NHAR), and Shandong Province) 2. Main Activities:</p> <ul style="list-style-type: none"> <li>- Establishment of monitoring techniques and evaluation system of water and soil in the Model Areas, research and establishment of water and soil pollution control index, strengthening research capacity of Academy of Agricultural Science.</li> <li>- Development and demonstration of agricultural environment conservation technology (sustainable agricultural technology and technology for restoration of polluted soil and water) in the Model Areas, compilation of technologies.</li> <li>- Trainings for water and soil monitoring staff in local areas (i.e. the Model Areas), agricultural technology extension workers, and administrative officials in the central and local governments (i.e. the Model Areas) on the developed and demonstrated technologies etc., establishment of a platform to share information related to research and extension.</li> <li>- Establishment of extension system and mechanism for the developed and demonstrated technologies, development of guidelines (countermeasure proposals), training for the model farmers and extension activities for the farmers in the Model Areas.</li> </ul> <p>3. Inputs (to carry out above activities)</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Japanese Side</td> <td style="width: 50%;">Chinese Side</td> </tr> <tr> <td>1) Experts: (long-term) 6 persons, (short-term) 32 persons</td> <td>1) Staff Allocated: 80 persons (Institute of Environment and Sustainable Development in Agriculture (IEDA) /Chinese Academy of Agricultural Sciences (CAAS), Academies of Agricultural Science (AASs) in the Model Areas, Ministry of Agriculture (MOA), and headquarters of CAAS))</td> </tr> <tr> <td>2) Training Received: 70 persons</td> <td>2) Land and Facility: project office, land for construction of facilities for demonstration and warehouse, fields in the model sites etc.</td> </tr> <tr> <td>3) Equipment: vehicles, office equipment, equipment for water quality and soil monitoring, agricultural equipment for fertilization</td> <td>3) Local cost</td> </tr> <tr> <td>4) Local cost</td> <td></td> </tr> </table>			Japanese Side	Chinese Side	1) Experts: (long-term) 6 persons, (short-term) 32 persons	1) Staff Allocated: 80 persons (Institute of Environment and Sustainable Development in Agriculture (IEDA) /Chinese Academy of Agricultural Sciences (CAAS), Academies of Agricultural Science (AASs) in the Model Areas, Ministry of Agriculture (MOA), and headquarters of CAAS))	2) Training Received: 70 persons	2) Land and Facility: project office, land for construction of facilities for demonstration and warehouse, fields in the model sites etc.	3) Equipment: vehicles, office equipment, equipment for water quality and soil monitoring, agricultural equipment for fertilization	3) Local cost	4) Local cost	
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Project Period	April 2009 - March 2014	Project Cost	(ex-ante) 389million yen, (actual) 416 million yen										
Implementing Agency	Responsible Agency: Ministry of Agriculture (MOA) Implementing Agency: Chinese Academy of Agricultural Sciences (CAAS)												
Cooperation Agency in Japan	Ministry of Agriculture, Forestry and Fisheries												

## II. Result of the Evaluation

### 1 Relevance

<Consistency with the Development Policy of China at the Time of Ex-Ante Evaluation and Project Completion>

The project was consistent with China's development policy of prevention of agricultural contamination as set forth in the "11th Five Year Plan for National Economic and Social Development of the Republic of China" (2006-2010) and the "12th Five Year Plan" (2011-2015).

<Consistency with the Development Needs of China at the Time of Ex-Ante Evaluation and Project Completion >

At the time of ex-ante evaluation, Hunan Province, NHAR and Shandong Province (the Model Areas) were representative agricultural production areas of North China Plain, Yangtze River Middle Region, and Northwest Arid Region respectively, facing typical agricultural contamination problems in the areas. At the time of terminal evaluation, farmers regarded the soaring input costs as an issue in agricultural implementation. The project was consistent with the needs of these farmers in that it aimed to develop technologies to reduce fertilizer and labor while maintaining the yield.

<Consistency with Japan's ODA Policy at the Time of Ex-Ante Evaluation>

The project was consistent with one of the main develop agenda of the Economic Cooperation Plan for China (2001), "realizing sustainable development" and one of its priority areas, "cooperation for dealing with global issues such as environmental problems".

<Evaluation Result>

In light of the above, the relevance of the project is high.

### 2 Effectiveness/Impact

<Status of Achievement for the Project Purpose at the time of Project Completion>

The Project Purpose was achieved by the project completion. At each Model Area, at least one proposal (report), which described the contents and dissemination measures of an eco-friendly agricultural technology developed and verified by the project, was submitted to its respective guidance committee<sup>1</sup> (proposals on five technologies submitted in total).

<Continuation Status of Project Effects at the time of Ex-post Evaluation>

The achievement status of the project is continued. After the project completion, the proposals for two technologies were submitted to the local government in a Model Area. Of the seven technologies proposed through this project, six technologies were considered as extension projects. Meanwhile, IESA/CAAS and AASs in the Model Areas have been utilizing the knowledge accumulated in the project to conduct research and development of eco-friendly agricultural technologies.

<Status of Achievement for Overall Goal at the time of Ex-post Evaluation>

The Overall Goal was achieved by the time of ex-post evaluation. Among the eco-friendly agricultural technologies developed and demonstrated by the project, at least two (to be precise, six in total) were already approved as extension projects in the provinces/autonomous region in the Model Areas and several other provinces (Indicator 1). According to the Implementing Agency, monitoring and evaluation of water and soil is implemented based on the manuals developed by the project in the Model Areas: officers in charge were editors of the manuals so that they select the necessary items for the monitoring and evaluation according to the local conditions (Indicator 2).

<Other Impacts at the time of Ex-post Evaluation>

Negative impacts on the natural and social environment by the project have not occurred. Other positive impacts of the project include dissemination of the eco-friendly agricultural technologies approved as extension projects in the Model Areas. For example, 37 farmers in 7 prefectures and cities have already applied the technology of side dressing rice farming in NHAR, and 140 farmers in 3 cities have applied the technology of drip fertilization in Shandong province. In addition, the manuals for eco-friendly agricultural technologies, developed by the project, are utilized in extension projects and training of farmers, rural technicians, staff of agricultural technology extension stations, etc.

<Evaluation Result>

In light of the above, through the project, the Project Purpose was achieved at the time of project completion, the project effect is continued at the time of ex-post evaluation, and the Overall Goal was achieved at the time of ex-post evaluation. Therefore, the effectiveness/impact of the project is high.

Achievement of Project Purpose and Overall Goal

Aim	Indicator	Results
(Project Purpose) Eco-friendly agricultural technology is systematized in the Model Areas.	Reports covering the information necessary for adopting eco-friendly agricultural technologies as extension projects are submitted to the guidance committees (At least one per Model Area).	Status of the Achievement: achieved (continued) (Project Completion) At least one proposal (report) was submitted to the guidance commission in each Model Area. (Ex-post Evaluation) -Out of the seven technologies for which the proposals were submitted, six were considered as extension projects.

<sup>1</sup> The roles of the committee were to provide advice for promoting the project implementation as well as to evaluate the project outputs and to recommend the project to disseminate outputs to higher level. Related departments of MOA participated in the committee.

<Submission of recommendation paper on eco-friendly agricultural technologies>		
Model Area	At the time of project completion	After project completion
Hunan Province	-Side dressing rice farming -Zero-emission pig raising	-
NHAR	-Side dressing rice farming	-Border irrigation -Recycling technology of straw *
山東省 Shandong Province	-Drip fertilization -Utilization technology of slow-release fertilizer in protected cultivation	-

\*Although the proposal was submitted, recycling technology of straw in NHAR was not considered as an extension project because it did not meet the needs of local farmers who earn cash income by selling rice straw.

(Overall Goal)  
Water and soil contamination attributed to agriculture is prevented or improved with a focus upon Model Areas.

(Indicator 1) Eco-friendly agricultural technologies developed and demonstrated in the project are approved as extension projects (at least 2).

(Ex-post Evaluation) achieved  
-Five out of the six eco-friendly agricultural technologies developed and demonstrated in the project were already approved as extension projects.  
<Approval status of extension projects of eco-friendly agricultural technologies developed and demonstrated under this project (as of June 2017)>

Approved technologies	Model Areas	Outside Model Areas
Zero-emission pig farming	*1	Sichuan Province, Hebei Province
Side dressing rice farming	NHAR	Heilongjiang Province, Liaoning Province, Anhui Province, Jiangsu Province
Border irrigation	NHAR	-
Drip fertilization	Shandong Province	-
Utilization technology of slow-release fertilizer in protected cultivation	Shandong Province	-

\* 1 Extension project is being considered in Hunan Province.

-Regarding side dressing rice farming technology in Hunan Province, the proposal was considered but not approved because it was judged that further technical improvement was necessary for dissemination in large area

(Indicator 2) Monitoring and evaluation on water and soil are carried out.

(Ex-post Evaluation) mostly achieved-  
-Through activities of the project, monitoring manuals for groundwater and irrigation water were prepared. Monitoring manual for soil was not finalized before the project completion due to lack of necessary data. The manual was finalized after the project completion, but it was decided to utilize the electronic version without printing and bookbinding since high cost of printing and book binding exceeded the budget of the Chinese side,  
-In the Model Areas, systematic monitoring and evaluation of water and soil, using the manuals, is carried out by selecting the necessary items based on the local conditions. The officers in charge of the above monitoring in each Model Area was the editors of the relevant manuals and implements monitoring according to the manuals. For example, in NHAR, Ningxia Agriculture and Forestry Science Academy conducts monitoring of relatively large ditches for drainage at least six times a year based on the monitoring manual on irrigation water. Also, CAAS conducts monitoring and evaluation of groundwater (every quarter) and nitrate in soil (on periodical basis) in Shunyi, Beijing. (It should be noted that some of the Model Areas only answered that monitoring is conducted according to the manuals, and specific information could not be obtained.)  
-Equipment for water and soil monitoring provided by the project is also used for monitoring in the Model Areas as described later.

Source: Project Completion Report, questionnaire survey to IEDA/CAAS

### 3 Efficiency

While the project cost slightly exceeded the plan (ratio against the plan: 107%), the project period was within the plan. Therefore, the efficiency of the project is fair.

### 4 Sustainability

<Policy Aspect>

Ecosystem conservation continues to be an important issue in the "13th Five Year Plan National Economy and Social Development of the National People's Republic of China" (2016-2020). In addition, the institutional support for eco-friendly agriculture is being developed, such as enactment of "Green Eco Oriented Agricultural Subsidy System Reform Plan" (2016-2020) in 2016.

<Institutional Aspect>

IEDA/CAAS was established with the aim of presenting the grounds for the government to develop important policies on agricultural technologies, and its role and structure have not been changed since the project completion. The quota and actual number of staff at CAAS and ASSs in the Model Areas is not available. The staff necessary for research and development of eco-friendly agricultural technology, however, is presumed to be secured both in the headquarters and the Model Areas, considering that the research is carried out continuously and, according to the Implementing Agency, temporary staff is employed when the number of regular staff is insufficient.

<Technical Aspects>

Almost all the counterpart personnel of IEDA/CAAS and ASSs in the Model Areas continue to work in their respective organizations and utilize the knowledge accumulated through the project to conduct research and development of eco-friendly agricultural technologies. As for the provided equipment, including the one for water and soil monitoring, equipment managers are assigned. Maintenance is properly carried out, and the equipment is utilized for research and development of eco-friendly agricultural technologies according to the Implementing Agency.

<Financial Aspects>

Research and development budget for eco-friendly agricultural technologies at CASS and ASSs in the Model Areas is not available. However, it is presumed that at least the basic budget is secured since the research is carried out continuously by these organizations and the provided equipment is managed properly.

<Evaluation Result>

In light of the above, information that is sufficient for judgment in terms of financial aspects was not available. Therefore, the sustainability of the effectiveness through the project is fair.

5 Summary of the Evaluation

The project achieved the Project Purpose (i.e. systematization of eco-friendly agricultural technologies in the Model Areas). The effect of the project is continued and the Overall Goal (i.e. improvement of water and soil contamination attributed to agriculture with a focus on the Model Areas) has been achieved. Regarding the sustainability, slight problem has been observed in terms of financial aspect (i.e. difficulty with obtaining the budget data), but no problem has been observed in terms of the policy/institutional/technical aspects to maintain the project effects. As for the efficiency, the project cost slightly exceeded the plan. Considering all of the above points, this project is evaluated to be satisfactory.

III. Recommendations & Lessons Learned

Recommendations for Implementing Agency:

-It is recommended that IEDA/CASS as well as ASS in Hunan Province improve and verify the techniques for side dressing rice farming technology, including adjustment of implant density and development of slow-release fertilizer according to the local conditions, as early as possible. If the effect is proven, it should be introduced to local farmers to promote dissemination of the side dressing rice farming

Lessons Learned for JICA:

-Regarding the recycling technology of straw at farmland in NHAR, which was demonstrated in the project, the recommendation paper was submitted after the project completion. However, the technology was not considered as an extension project on the ground that it did not meet the needs of local farmers, who were earning cash income from sales of rice straw. There has been a situation that, as also observed at the time of ex-post evaluation, the rice straw was taken out from the farmland immediately after harvest by buyers because of high demand mainly as curtain for greenhouse (for warming), stimulated by rapid development of facility agriculture in the areas. When demonstrating a new technology, testing the technical adaptability on the farm is not enough, but it is necessary to examine, from perspectives of farm management, possible conflicts in the use of materials between for the concerned technology and for other purposes.



A model site for rice cultivation with side line fertilization technology in NHAR visited by the ex-post evaluator for a field survey