

Country Name	The Model Project for Water-saving Irrigation of Environmental Conservation Type in Grassland
People's Republic of China	

I. Project Outline

Background	In the arid/semiarid land of northwest China, the devastation of grassland and its desertification were in progress due to human factors such as over cultivation and overgrazing, and due to natural factors such as climate change. Because of the devastation of grassland, the natural environment was also deteriorating, and the decline of vegetation percentage was causing dust damage, such as yellow sand, soil erosion and heavy sediment influx into nearby rivers. The deterioration of the natural environment was aggravating the living environment of humans and hampering sustainable development of its national economy. Under such situation, 1) the Chinese Government established a grazing management system (grazing prohibition, grazing cessation, circular grazing, etc.) combined with stall-feed to reduce environmental load on grassland, and 2) as part of this system the Government was carrying out activities to realize long-term forage production, including creating artificial grasslands. It was necessary to supply water with irrigation facilities to improve the productivity of forage in artificial grasslands. However, there were few irrigation facilities, capacity of herders to cope with natural disasters such as drought was low, and a water-saving irrigation method in the artificial grasslands that could be used as a model did not exist.				
Objectives of the Project	Through preparing a planning manual of the ‘Water-saving Irrigation Facility Installation Plan in Artificial Grasslands (distribution and selection of facilities, selection of water-saving irrigation methods and the facility operation plan)’ (hereinafter called ‘Installation Plan’), examining the impact of the Installation Plan in the model sites, preparing training contents for spreading the planning method of the Installation Plan, and conducting trainings of engineers in the main target area of ‘Ecosystem and Water Resources Security Plan for Grazing Grasslands in the National Livestock Grazing Areas’ in China (hereinafter called ‘Security Plan’) ¹ , the project aimed at establishing a planning method of the Installation Plan as the model to spread in the main target area of the Security Plan (Project Purpose), thereby contributing to realization of the best farming (stock-farming) practices through water-saving irrigation system based on the Installation Plan and reduction of the grazing pressure on the natural grassland in the main target area of the Security Plan (Overall Goal). The project objectives set forth are as follows:				
	1. Overall Goal: The best farming (stock-farming) practices are carried out through water-saving irrigation system based on the Installation Plan and the grazing pressure ² on the natural grassland is subsequently reduced in the main target area of the Security Plan. 2. Project Purpose: Planning method of the Installation Plan is established as the model to spread in the main target area of the Security Plan.				
Activities of the Project	1. Project site: Beijing and model sites (Hangjinqi ³ , the Inner Mongolia Autonomous Region and Murei County, the Xinjiang Uygur Autonomous Region) 2. Main activities: Preparation of a planning manual of the Installation Plan, formulation of the Plan appropriate for the model sites, improvement of irrigation facilities in the model sites based on the Plan, implementation of trainings for engineers, farmers and herders in the model sites, monitoring on changes of the amount of water-use, forage production areas, production volume and grazing pressure to verify the Plan, preparation of training contents and implementation of trainings for engineers in the main target area of the Security Plan, and implementation of seminars to share project effects etc. 3. Inputs (to carry out above activities) Japanese Side 1. Experts: 10 persons 2. Trainees received: 26 persons 3. Machinery and equipment: vehicle, copying machine, computer, printer, digital camera, survey equipment, and irrigation equipment etc. 4. Overseas activities cost Chinese Side 1. Staff allocated: 83 persons 2. Land and facilities: project office (Beijing) 3. Local cost				
Ex-Ante Evaluation	2006	Project Period	June 2007 to May 2011	Project Cost	337 million yen
Implementing Agency	Ministry of Water Resources of the People’s Republic of China (Department of International Cooperation, Department of Rural Water Resources, China Irrigation and Drainage Development Center, Water Resources Departments/ County Water Authorities in the project-targeted autonomous regions and counties)				
Cooperation Agency in Japan	Ministry of Agriculture, Forestry and Fisheries				

II. Result of the Evaluation

Constraints on Evaluation: The evaluation judgments were made based on information collected and analyzed through questionnaires and interviews with stakeholders by telephone and e-mail. Site surveys were not conducted under this ex-post evaluation.

¹ The main target area of the Security Plan includes the Xinjiang Uygur Autonomous Region, the Inner Mongolia Autonomous Region, Gansu Province, Chinghai Province, Sichuan Province and Tibet Autonomous Region (six areas in total).

² 'Grazing pressure' means a grazing population per unit area on grassland.

³ 'qi' is an administrative unit in the Inner Mongolia Autonomous Region and equivalent to 'county'.

1 Relevance

<Consistency with the Development Policy of China at the time of ex-ante and project completion>

The project has been consistent with China's development policy on 'ecosystem conservation on grassland' and 'promotion of creating artificial grasslands with water-saving irrigation facilities' as set forth in "the National Ecological Environment Construction Plan (1999)", "the 11th Five-Year Plan (2006-2010) for National and Social Development of People's Republic of China", "the 11th Five-Year Plan for National security pastoral grassland ecological protection of water resources" (under preparation at the time of ex-ante evaluation), and "the National Grassland Development Plan" (under preparation at the time of terminal evaluation).

<Consistency with the Development Needs of China at the time of ex-ante and project completion>

The project met the development needs for 'recovering the vegetation of grassland and improving the ecology' and 'installing water-saving irrigation facilities in artificial grasslands'.

<Consistency with Japan's ODA Policy at the time of ex-ante evaluation>

The project was consistent with the Japan's ODA policy on 'cooperation to cope with global issues including environmental problems', as stated as one of priorities/economic cooperation policies in the "Economic Cooperation Program for China (2001)".

<Evaluation Result> In light of the above, the relevance of the project is high.

2 Effectiveness/Impact

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

The Project Purpose was achieved by the time of project completion. It was verified in the model sites that the amount of lost water was reduced by improvement of irrigation water supply system, irrigable area was expanded by utilization of surplus water, production volume of forage was increased by improvement of irrigation management, and net income per capita from agriculture and stock farming increased etc. Moreover, awareness-raising on water-saving irrigation was conducted through trainings for farmers and herders, which increased awareness among farmers in the model sites. The planning manual of the Installation Plan was finalized after revising based on these verification results etc. and it was confirmed that the manual would be published (Indicator 1, however, it was not published as mentioned below). The degree of dependency on forage produced in artificial grasslands per sheep achieved the target in the model sites (35.8% and 28.9% in Hangjinqi, the Inner Mongolia Autonomous Region and Murei County, the Xinjiang Uygur Autonomous Region, respectively) (Indicator 2). Moreover, it was confirmed that the Ministry of Water resources would use the training contents prepared under the project as standard contents in trainings for water-related engineers (Indicator 3).

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

After project completion, while the planning manual of the Installation Plan has not been officially published, it was confirmed that it has been utilized as a training material at least in the Xinjiang Uygur Autonomous Region. The degree of dependency on forage produced in artificial grasslands per sheep in both model sites has been 42% and 28.9% from 2012 to 2014, achieving the target continuously.

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

The Overall Goal has been partially achieved at the time of ex-post evaluation and is likely to be mostly achieved by the target year (2016)⁴, and the contribution of the project was observed in two areas where the project was implemented among the main target area of the Security Plan. Among the two areas, in the Xinjiang Uygur Autonomous Region, the Ministry of Water Resources and the China Irrigation and Drainage Development Center have continuously provided trainings to disseminate the planning method of the Installation Plan and trainings on construction, operation and maintenance (O&M) of water-saving irrigation facilities for water-related engineers, association of farmers and village leaders etc., utilizing project outputs. The Installation Plan has been prepared in all the main target area of the Security Plan, among which in the Xinjiang Uygur Autonomous Region and the Inner Mongolia Autonomous Region, irrigation projects have been implemented utilizing water-saving irrigation methods whose effects were verified under the project. The actual area of artificial grasslands irrigated based on the Installation Plan is 467,500 mu at the time of ex-post evaluation, which exceeds the target (Indicator 1), however, how project outputs have been utilized in the main target area of the Security Plan apart from the Xinjiang Uygur Autonomous Region and the Inner Mongolia Autonomous Region has not been confirmed. The degree of dependency on forage produced in artificial grasslands per sheep in the Xinjiang Uygur Autonomous Region has been 31.2% from 2012 to 2015, however, data is not available for other main target area (Indicator 2).

<Other Impact Observed at the time of Ex-post Evaluation>

No negative impact on natural or social environment has been occurred under the project. As a positive impact, the implementing agency mentioned that the volume of production and stock of forage has increased due to the project, which resulted in a reduction of the expenditure of farmers and herders for purchasing forage. In addition, work hours of farmers and herders outside of stock-farming has increased, which resulted in an increase of their income.

<Evaluation Result>

While the Project Purpose was achieved by the time of project completion and project effects have been mostly maintained at the time of ex-post evaluation, the achievement level of a part of the Overall Goal and contribution of the project to the achievement were not verified in areas which were not covered by the project. Therefore, effectiveness and impact of the project are fair.

Achievement of Project Purpose and Overall Goal

Aim	Indicators	Results
(Project Purpose) Planning method of the Installation Plan is established as the model to spread in the main target area of	1. The planning manual of the Installation Plan is officially approved and published by the Ministry of Water Resources.	Status of achievement: <u>Achieved/Partially continued</u> (Project Completion) The contents of the manual was reviewed and its publication (under the names of the Ministry of Water Resources Department of Rural Water Resources and the China Irrigation and Drainage Development Center) were confirmed in the committee designated to complete the manual's composition (February 2011).

⁴ PDM states that the target year of the Overall Goal is "within approximately five years after project completion", which means that target year is 2016.

the Security Plan.		(Ex-post Evaluation) The title of the manual, “the Guideline on Water-saving Irrigation for Pastoral Grassland Ecological Protection” and the publisher (as mentioned above) were determined and final review was conducted. However, official publication was not materialized due to a long and complicated publishing procedure in China. Despite this, the manual has been continuously utilized as training material.																																														
	2. In the model sites the degree of dependency on forage produced in artificial grasslands per sheep reaches 35% in Hangjinqi in the Inner Mongolia Autonomous Region and 25% in Murei County in the Xinjiang Uygur Autonomous Region.	<u>Status of achievement: Achieved/Continued</u> (Project Completion) The model site in Hangjinqi in the Inner Mongolia Autonomous Region: 35.8%. The model site in Murei County in the Xinjiang Uygur Autonomous Region: 28.9%. Both figures are the average among the model households, and the figure was 0% before the project implementation (there was no artificial grassland). (Ex-post Evaluation) The figures in the above model sites are 42% and 28.9% respectively (both figures are the average of 2012 to 2014). However, the figures of the model households only and those in each year are not available.																																														
	3. Training contents are officially approved and published by the Ministry of Water Resources.	<u>Status of achievement: Achieved/Continued</u> (Project Completion) It was confirmed in the committee designated to complete the manual’s composition (February 2011) that the training contents would be used as standard contents in trainings for water-related engineers in the Ministry of Water Resources etc. in livestock grazing areas and that the contents would be revised and case examples would be collected and added in accordance with the progress of water resource projects. (Ex-post Evaluation) The training contents prepared under the project, such as “the Guideline on Water-saving Irrigation for Pastoral Grassland Ecological Protection”, “Knowledge Dissemination Book for Water-saving Irrigation for Pastoral Grassland Ecological Protection”, “Bits of Knowledge on Grassland Ecological Protection” and “Knowledge on Cultivation Management of Alfalfa” etc., have not been officially published, however, they have been utilized as training materials in the trainings for water-related engineers, farmers and herders.																																														
(Overall Goal) The best farming (stock-farming) practices are carried out through water-saving irrigation system based on the Installation Plan and the grazing pressure on the natural grassland is subsequently reduced in the main target area of the Security Plan.	(Supplemental information) Trainings to disseminate the planning method of the Installation Plan are continuously conducted by the China Irrigation and Drainage Development Center etc. in the main target area of the Security Plan.	<u>Status of achievement: Partially achieved</u> (Ex-post Evaluation) Trainings to introduce “the Guideline on Water-saving Irrigation for Pastoral Grassland Ecological Protection” prepared under the project and trainings on highly efficient water-saving irrigation technique and construction and O&M of such irrigation facilities etc. have continuously been conducted by the Ministry of Water Resources and the China Irrigation and Drainage Development Center for water-related engineers, association of farmers and village leaders etc. in the Xinjiang Uygur Autonomous Region. In other areas, trainings on the planning method of the Installation Plan are conducted according to necessities, however, it was not confirmed to what extent the materials prepared under the project are utilized and to what extent the planning method of the Installation Plan established under the project is covered in trainings.																																														
	(Supplemental information) The Installation Plan is prepared and water-saving irrigation in artificial grasslands is conducted based on the Plan in the main target area of the Security Plan.	<u>Status of achievement: Partially achieved</u> (Ex-post Evaluation) The Installation Plan has been prepared in all the main target area of the Security Plan. It was prepared in the Xinjiang Uygur Autonomous Region in 2010 and in the Inner Mongolia Autonomous Region in 2012, and in both regions irrigation projects have been implemented utilizing water-saving irrigation methods whose effects were verified under the project. For the remaining four main target area of the Security Plan, information on utilization of project outputs etc. is not available.																																														
	1. (In the main target area of the Security Plan and within approximately five years after project completion) The area of artificial grasslands irrigated based on the Installation Plan managed by the Ministry of Water Resources (including re-developed area) reaches 30,000 ha (450,000 mu).	<u>Status of achievement: Achieved</u> (Ex-post Evaluation) The area of artificial grasslands irrigated based on the Installation Plan in the main target area of the Security Plan from the project completion to the time of ex-post evaluation is 467,500 mu in total (identified area only), and its breakdown is shown below. <table><tr><th rowspan="2">Name of the main target area</th><th colspan="5">The area of artificial grasslands irrigated based on the Installation Plan (including re-developed area) (Area per year) (mu)</th></tr><tr><th>2012</th><th>2013</th><th>2014</th><th>2015</th><th>Total</th></tr><tr><td>The Xinjiang Uygur Autonomous Region</td><td>N/A</td><td>48,000</td><td>69,000</td><td>47,000</td><td>164,000</td></tr><tr><td>The Inner Mongolia Autonomous Region</td><td>35,800</td><td>40,000</td><td>42,000</td><td>19,000</td><td>136,800</td></tr><tr><td>Gansu Province</td><td>8,000</td><td>18,900</td><td>21,000</td><td>11,000</td><td>58,900</td></tr><tr><td>Chinghai Province</td><td>2,000</td><td>20,000</td><td>23,000</td><td>26,000</td><td>71,000</td></tr><tr><td>Sichuan Province</td><td>5,000</td><td>12,000</td><td>13,000</td><td>6,800</td><td>36,800</td></tr><tr><td>Tibet Autonomous Region</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td></tr></table>	Name of the main target area	The area of artificial grasslands irrigated based on the Installation Plan (including re-developed area) (Area per year) (mu)					2012	2013	2014	2015	Total	The Xinjiang Uygur Autonomous Region	N/A	48,000	69,000	47,000	164,000	The Inner Mongolia Autonomous Region	35,800	40,000	42,000	19,000	136,800	Gansu Province	8,000	18,900	21,000	11,000	58,900	Chinghai Province	2,000	20,000	23,000	26,000	71,000	Sichuan Province	5,000	12,000	13,000	6,800	36,800	Tibet Autonomous Region	N/A	N/A	N/A	N/A
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Tibet Autonomous Region	N/A	N/A	N/A	N/A	N/A																																											

		Total	50,800	138,900	168,000	109,800	467,500	
	2. (In the main target area of the Security Plan and within approximately five years after project completion) In the area of artificial grasslands irrigated based on the Installation Plan, the degree of dependency on forage produced in artificial grasslands per sheep reaches 30%.	<u>Status of achievement: Partially achieved</u> (Ex-post Evaluation) In the area of artificial grasslands irrigated based on the Installation Plan, the degree of dependency on forage produced in artificial grasslands per sheep has been 31.2% (the average of 2012 to 2015) in the Xinjiang Uygur Autonomous Region, however, data is unavailable in other main target area.						

Source : Internal documents, Terminal evaluation report, Questionnaire survey to the Ministry of Water Resources and the China Irrigation and Drainage Development Center

Note: Supplemental information was used to assess whether the Overall Goal has been achieved by utilizing the project outputs.

3 Efficiency

Both project cost and project period were within the plan (the ratio against the plan is 89% and 100% respectively). Therefore efficiency of the project is high.

4 Sustainability

<Policy Aspect>

Installation of water-saving irrigation facilities in artificial grasslands is still stated as an important policy in “the 12th Five-Year Plan (2011-2015) for National and Social Development of People’s Republic of China”. According to the implementing agency, “the 13th Five-Year Plan (2016-2020) for National and Social Development of People’s Republic of China” is planned to inherit the same policy, and rational water resource management through water-saving irrigation is continuously emphasized as a national policy. Therefore, the project is still positioned as important.

<Institutional Aspect>

Department of International Cooperation in the Ministry of Water Resources (18 persons assigned) is responsible for foreign affairs management, tasks related to water-related science and technology, establishment of technical standards for the water-related industries and supervision of its application etc. “Department of Rural Water Resources” in the Ministry of Water Resources (15 persons assigned) is responsible for water resource management in rural areas, guidance on water-related projects in livestock grazing areas, and coordination of relevant project implementation etc. The China Irrigation and Drainage Development Center (54 persons assigned) is responsible for management and support for water-related technologies in rural areas in the country etc. Thus, the organizational structure of the implementing agency is established. Tasks overlapped among different organizations are planned and implemented by each organization in cooperation with related organizations, and the organizational structure and the number of officials are sufficient. In the main target area of the Security Plan, water resource offices/ water authorities in each region, including Agriculture and Animal Husbandry Department in the Water Resources Department of the Inner Mongolia Autonomous Region (11 persons assigned), Water Authority of Hangjinqi (40 persons assigned), Agriculture and Animal Husbandry Department in the Water Resources Department of the Xinjiang Uygur Autonomous Region (8 persons assigned), and the Water Authority of Murei County (11 persons assigned) etc., are responsible for water resource management in rural areas, water-related projects in livestock grazing areas and planning and implementation of related projects. The organizational structure and the number of officials are sufficient, as planned activities are properly implemented. Regarding the installed water-saving irrigation facilities, in case of a facility used by one household, water management and O&M of the facility are conducted by each household, and in case of a facility used by a village, water management and O&M of the facility are conducted by a village group and/or water management group (water association) etc. O&M structure is sufficient since, according to the China Irrigation and Drainage Development Center, the water-saving irrigation facilities installed under the project are properly operated and maintained by farmers and herders.

<Technical Aspect>

It is considered that there is no problem in the technical aspect: the project counterparts in the Ministry of Water Resources, the China Irrigation and Drainage Development Center, the Water Resources Department of the Inner Mongolia Autonomous Region, the Water Authority of Hangjinqi, the Water Resources Department of the Xinjiang Uygur Autonomous Region, and the Water Authority of Murei County are still in charge of tasks related to installation of water-saving irrigation facilities at the time of ex-post evaluation. In other main target area of the Security Plan, the implementing agency explained that the technical level of officials is sufficient to conduct tasks related to installation of water-saving irrigation facilities in artificial grasslands. For example, the number of officials who are certified as Senior Water Engineer is 33, which is 60% of the entire officials in the China Irrigation and Drainage Development Center. Trainings (irrigation water management and water-saving irrigation technology etc.) are conducted utilizing the manuals and training contents prepared under the project for once or twice a year for officials in the Ministry of Water Resources, the China Irrigation and Drainage Development Center, and the Water Resources Departments in the main target area of the Security Plan. Moreover, according to the China Irrigation and Drainage Development Center, O&M of the water-saving irrigation facilities installed under the project is well conducted, and technical level of farmers and herders is sufficient. Trainings for farmers and herders are also conducted once or twice a year.

<Financial Aspect>

According to the implementing agency, sufficient amount of budget has been secured in the Ministry of Water Resources, the China Irrigation and Drainage Development Center, and the Water Resources Departments in the main target area of the Security Plan for promoting, implementing and managing installation of water-saving irrigation facilities in artificial grasslands. The central government has disbursed more than 10 billion yuan every year as a grant for ecosystem conservation on grassland in eight target livestock grazing provinces including six main target provinces (autonomous region) since 2011. Moreover, for example, the amount of construction budget for water-saving irrigation projects in the Xinjiang Uygur Autonomous Region in 2015 is 56,250 thousand yuan (approximately 1.06 billion yen). Data on breakdown of the budget amount and on other main target area was not provided, as the number of projects and departments is extremely numerous and it is difficult to aggregate data. It is nevertheless considered based on the available information that the necessary amount of budget is secured⁵. In the model sites of the project, 500 to 1,000 yuan per year is required as O&M cost in the

⁵ (1) It was calculated from the data collected this time that in the Xinjiang Uygur Autonomous Region, 18,000 yuan/ha of budget was allocated for

Inner Mongolia Autonomous Region (pipeline irrigation) and 30,000 yuan per year is required as O&M cost in the Xinjiang Uygur Autonomous Region (spray irrigation), and these necessary amount has been covered by government budget, self-finance by farmers and herders, and collection of water charge from each household etc.⁶

<Evaluation Result> No major problems have been observed in policy, institutional, technical and financial aspects of the implementing agency. Therefore, sustainability of effects of the project is high.

5 Summary of the Evaluation

The project achieved its Project Purpose, “establishing planning method of the Installation Plan as the model to spread in the main target area of the Security Plan”, as planned through creation of artificial grasslands by water-saving irrigation, verification activities to increase production volume of forage and trainings. Regarding the Overall Goal, while it was confirmed that irrigation projects have been implemented using the planning method and the area of artificial grasslands have increased in the Xinjiang Uygur Autonomous Region and the Inner Mongolia Autonomous Region including the model sites, achievement of part of the Overall Goal and contribution of the project to the achievement were not verified in other main target area of the Security Plan. In terms of sustainability, no major problems have been observed in terms of consistency between the project and development policy in China, and institutional, technical and financial aspects of central and local governments and farmers and herders in the model sites.

In light of the above, this project is evaluated to be highly satisfactory.

III. Recommendations & Lessons Learned

<Recommendations for Implementing Agency>

Effectiveness of the planning method of the Installation Plan established under this project has been proven. It is desirable that the Ministry of Water Resources be more proactive in incorporating this method in its training for other target livestock grazing areas than in the Xinjiang Uygur Autonomous Region as well. In order to do so, it is one idea to reconsider publication of the training contents prepared under the project, such as “the Guideline on Water-saving Irrigation for Pastoral Grassland Ecological Protection”, “Knowledge Dissemination Book for Water-saving Irrigation for Pastoral Grassland Ecological Protection”, “Bits of Knowledge on Grassland Ecological Protection” and “Knowledge on Cultivation Management of Alfalfa” etc., which had not been officially published.

<Lessons Learned for JICA>

This project is a model project for water-saving irrigation of environmental conservation type, and understandings and cooperation from residents as well as rational water resource management is necessary. Thus, activities for dissemination and raising awareness on environmental conservation among residents should be incorporated in the planning stage of a project. The fact that effective trainings on the planning method of the Installation Plan and related topics were conducted for residents etc. to raise awareness on water-saving irrigation during the project implementation is considered to have contributed to the irrigation facilities being well maintained and forage being cultivated successfully after project completion.



Semi-fixed sprinkler in the model site of Dashixiang in Murei County, the Xinjiang Uygur Autonomous Region



Water supply pipe (water outlet) managed by a model household in Hangjinqi, the Inner Mongolia Autonomous Region

water-saving irrigation development projects in 2015. This amount is more or less same as, for example, the unit cost spent for construction of water-saving irrigation facilities under a Japanese ODA loan project “Xinjiang Water-saving Irrigation Project” (2001-2010) (calculated based on the data from the ex-post evaluation report). (2) Construction of water-saving irrigation facilities is progressing in other main target areas as well, though there is yearly fluctuation. (3) More than 10 billion yuan is ensured every year as a grant for ecosystem conservation on grassland in the entire target livestock grazing areas. The money is used for various subsidies and financial incentives to farmers who practice ecological stock farming.

⁶ Repair cost of facilities etc. is covered by government budget, and labor cost etc. of farmers and herders is covered by self-finance. Figures were not provided, as a county water authority disburses such repair cost together with water-related construction cost every year, and it is difficult to calculate detailed amount etc.