

Country Name	The Project for Sustainable Systems for Food and Bio-energy Production with Water-saving irrigation in the Egyptian Nile Basin
Arab Republic of Egypt	

I. Project Outline

Background	Due to the rapid population growth, expansions of food production and employment were key development issues for Egypt. On the other hand, the country faced shortage of water resources and farmland. The agricultural production in the Nile Delta as major agricultural area has already been reaching at the maximum level and had no more room for expansion of farmland. In addition, it was difficult to develop new water resources in Egypt due to the limited annual use of water from the Nile River of 55.5 billion tons under the bilateral agreement between Sudan and Egypt (the Nile River Agreement in 1954) and the limited annual rainfall of 25 mm in Cairo. Therefore, comprehensive and concrete measures for effective water use were needed.												
Objectives of the Project	<p>Through development of models and systems for appropriate crop production and irrigation management based on analysis and observation of evapotranspiration and water/salt balance and soil, the project aimed at proposing methods for efficient and sustainable agricultural production with efficient water management to the rapid population growth, thereby contributing to expansion of agricultural production and employment opportunities.</p> <ol style="list-style-type: none"> Expected Overall Goal: To contribute to increasing agricultural production and to expanding employment opportunities, as stated in the Socio-Economic Development Five-Year Plan, the National Water Resource Plan and Agricultural Production Plan for Egypt 2017. Project Purpose: To propose the methods which realize efficient and sustainable agricultural production with efficient water management to respond the rapid population growth. 												
Activities of the Project	<ol style="list-style-type: none"> Project site: Nile Delta Main activities: i) Development of water/salt balance model for canal/drain command area, ii) Development of improved plan of irrigation management at the different canal levels in the Nile Delta, iii) Development of a simulation model of water, salt, heavy metals and other contamination movement in soils at the experimental field, iv) Development of appropriate crop production and irrigation management system at the farm level Inputs (to carry out above activities) <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Japanese Side</td> <td style="width: 50%;">Egyptian Side</td> </tr> <tr> <td>1. Experts: 21 persons</td> <td>1. Staff allocated: 73 persons</td> </tr> <tr> <td>2. Trainees received: 21 persons</td> <td>2. Land and Facilities: Office space, laboratory, and experimental farm</td> </tr> <tr> <td>3. Equipment: Flux measurement system, Acoustic doppler current profiler, Water level sensor and EC sensor, Leaf chamber flow meter, etc.</td> <td>3. Operational Cost: Cost for transportation and utility</td> </tr> <tr> <td>4. Operational Cost</td> <td></td> </tr> </table> 			Japanese Side	Egyptian Side	1. Experts: 21 persons	1. Staff allocated: 73 persons	2. Trainees received: 21 persons	2. Land and Facilities: Office space, laboratory, and experimental farm	3. Equipment: Flux measurement system, Acoustic doppler current profiler, Water level sensor and EC sensor, Leaf chamber flow meter, etc.	3. Operational Cost: Cost for transportation and utility	4. Operational Cost	
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Project Period	June, 2009 – March, 2015 (Extension: June, 2014 – March, 2015)	Project Cost	(ex-ante)350 million yen, (actual)395 million yen										
Implementing Agency	Cairo University (CU), Water Management Research Center (WMRC), Agriculture Research Center (ARC)												
Cooperation Agency in Japan	University of Tsukuba, Tottori University												

II. Result of the Evaluation

< Special Perspectives Considered in the Ex-Post Evaluation >

The Master Plan of this project sets forth the Overall Goal of “To contribute to increasing agricultural production and to expanding employment opportunities, as stated in the Socio-Economic Development Five-Year Plan, the National Water Resource Plan and Agricultural Production Plan for Egypt 2017”, but no verifiable indicator is set. In order to verify the achievement level of the Overall Goal, the following two indicators were used.

- Indicator 1: The policy recommendations elaborated by the project are reflected in the Socio-Economic Development Five-Year Plan, the National Water Resource Plan and the Agricultural Production Plan, and other relevant policies and programs which are elaborated after the project completion.
- Indicator 2: The appropriate irrigation management system and crop production proposed by the project are disseminated in Nile Delta.

1 Relevance

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

The project was consistent with the Egypt’s policies focusing efficient use of water resources from the Nile River and increase in agricultural production, including “The 6th Socio-Economic Development Plan” (2007/08-2011/12) and the “Long-term Agricultural Development Strategy” (2007) as well as the “Sustainable Agricultural Development Strategy toward 2030”.

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

The project was consistent with the Egypt’s development needs for sustainable and efficient use of limited water resource for agriculture under the difficult conditions to develop additional water sources.

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

¹ SATREPS: Science and Technology Research Partnership for Sustainable Development

The project consistent with the “Country Assistance Program for the Arab Republic of Egypt” (2008) prioritizing support for poverty reduction and improvement of living standard emphasizing on development of agriculture and rural communities.

<Evaluation Result>

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

2 Effectiveness/Impact

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

The Project Purpose was achieved by the time of project completion. Difference in the proposed applicable irrigation methods for water saving in cultivation of the major crops was identified (Indicator 1). Also, optimal water saving irrigation treatments were identified for paddy areas and non-paddy areas (Indicator 2) and an optimal reuse method of drainage water was identified (Indicator 3). Although the project identified optimal irrigation methods in the aspect of water saving, the field survey and research on the cropping pattern in the target water management area confirmed that the proposed water reuse method did not largely affect the cropping pattern and cultivation. Therefore, it was concluded that the Project did not have to consider changes of the cropping pattern and to propose the optimal ones in the target area (Indicator 4).

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

The project effects have been partially continued since the project completion. The investigation on the water saving techniques such as strip irrigation for rice crop and on the reuse of irrigation water from the start point of the main canal have been continued. In addition, the planning for a second stage of the SATREPS project has been undergoing but not yet started.

WMRC continued research on some water saving techniques (strip irrigation for rice crop) and in water reuse. There was also a plan to conduct another project with the University of Tokyo in the same topics, but unfortunately it was not realized. In addition, in WMRC, a researcher with Ph.D., ex-counterpart of the SATREPS project has supervised a research for the master degree on mixing drainage water from upstream areas in the main canal of the Nile Delta.

WMRC has continuously utilized observation and research equipment installed by the SATREPS project, such as Flux measurement system (El-Zankalon Station), the StreamPro Acoustic doppler current profiler, for different researches. The water level sensors had been used until they stopped working due to the batteries went out.

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

The Expected Overall Goal was partially achieved at the time of ex-post evaluation. “The National Water Resources Plan (NWRP)” (2017-2037) of the Ministry of Water Resource and Irrigation (MWRI) describes the necessity of water reuse and the importance of revising the code of reuse of wastewater to enable different uses for different treatment levels (Indicator 1). The research on the strip irrigation method for paddy area introduced by the SATREPS project for water saving has been continued as mentioned above. and was disseminated in El Tatalia village, Quosia District of Assiut governorate. (Indicator 2). The utilization of the research outcomes of the SATREPS project, namely the dissemination of strip irrigation method, was promoted by a technical cooperation project supported by JICA, the Improving Small-Scale Farmers Market Oriented Agriculture Project (ISMAP) (2014-2019),

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

There are some positive impacts of the project confirmed at the time of ex-post evaluation. The researchers of MWRI improved their capacities by the trainings on new devices and new techniques delivered by the SATREPS project. Several key ex-counterpart researchers got promoted after the project. Dr. Ezz El Din Abu Steit became the minister of Agriculture and Land Reclamation and others became the Head of the Agriculture Research Center, the main research arm of MWRI, the Dean of the Hiliopolic University, the Cultural Attaché of the Embassy of Egypt in Japan, and so on. Some researchers presented the research outputs at conferences and gave lectures using the materials developed by the project as well as published a book and articles. Other researchers received scholarships for the Ph.D. courses in Japan and a project fund from the United Nations University. Furthermore, Sony Computer Science Lab, a Japanese private research institute, approached the ex-counterpart of Cairo University about their interest in the results of the SATREPS project. In addition, the team leader of the Japanese researchers engaged in the SATREPS project delivered the lectures for two courses under the Third Country Training Program (TCTP) supported by JICA for more than 100 participants from African countries since 2015.

<Evaluation Result>

Therefore, the effectiveness/impact of the project is fair.

Achievement of Project Purpose and Overall Goal

Aim	Indicators	Results
(Project Purpose) To propose the methods which realize efficient and sustainable agricultural production with efficient water management to respond the rapid population growth.	Indicator 1: Difference of evapotranspiration and crop yield under conventional and different water saving irrigation treatments is quantified.	Status of the Achievement: achieved (continued) (Project Completion) ● The difference in the proposed applicable irrigation methods, including the conventional irrigation (furrow irrigation), strip irrigation, drip irrigation and extended interval and mulching, for water saving in cultivation of the major crops in Egypt was identified. ● For example, yield of maize production increased by 27% with strip irrigation and 55% by drip irrigation compared to the conventional irrigation (Ex-post Evaluation) ● Refer to the indicator 2
	Indicator 2: An optimal water saving irrigation treatment is identified at the Marwa/Meska level by clarifying water management approaches, including water management scheduling, under different irrigation treatments.	Status of the Achievement: achieved (partially continued) (Project Completion) ● Rotation irrigation was identified as optimal water saving irrigation treatment for paddy area and continuous water delivery was identified for non-paddy area. (Ex-post Evaluation) ● Investigation in some water saving techniques, such as strip irrigation

		for rice crop has been continued.
	Indicator 3: An optimal method for the reuse of drainage water is identified in the middle delta.	Status of the Achievement: achieved (continued) (Project Completion) ● Mixing drainage water from upstream areas in the main canals of the delta was identified as an optimal method for the water reuse. (Ex-post Evaluation) ● Investigation in reuse of water from the start point has been continued.
	Indicator 4: Optimal cropping patterns are identified according to available water resources	Status of the Achievement: achieved (continued) (Project Completion) ● As a result of the survey conducted by the SATREPS project, it was found that the proposed option for water reuse by the SATREPS project did not largely affect cropping and cultivation pattern in the target water management area where the farmers preferred to cultivate rice in summer and wheat or sugar beet in winter. Therefore, it was concluded that the Project did not have to consider changes of cropping pattern and propose the optimal ones. (Ex-post Evaluation) ● Intercropping have been disseminated and introduced by ISMAP in Assiut Governorate (El Tatalia village, Quosia district)
(Expected Overall Goal) To contributed to increasing agricultural production and to expanding employment opportunities, as stated in the Socio-Economic Development Five-Year Plan, the National Water Resource Plan and Agricultural Production Plan for Egypt 2017.	(Indicator 1) The policy recommendations elaborated by the project are reflected in the Socio-Economic Development Five-Year Plan, the National Water resource Plan and the Agricultural Production Plan, and other relevant policies and programs which are elaborated after the project completion.	(Ex-post Evaluation) achieved ● The National Water Resources Plan (2017-2037) describes the necessity of water reuse and the importance of revising the code of reuse of wastewater to enable different uses for different treatment levels.
	(Indicator 2) The appropriate irrigation management system and crop production proposed by the project have been disseminated in Nile Delta.	(Ex-post Evaluation) Partially achieved. ● The investigation on the strip irrigation method for patty area has been continued after the project. ● Intercropping was disseminated by ISMAP in Assiut governorate but to no other areas.

Source : Terminal Evaluation Report, Interviews with NWRC/WMRI staff, field survey.

3 Efficiency

The both of project cost and the project period were exceeded the plan (the ratios against plan: 113%, 117%, respectively) since the project activities were interrupted by political turmoil in Egypt since January, 2011, and the damages on the Japanese research institutes by the Great East Japan Earthquake in March, 2011. However, the project outputs were produced as planned. Therefore, the efficiency of the project is high.

4 Sustainability

<Policy Aspect>

As mentioned above, “the National Water Resources Plan” (2017-2037) contains some objectives to support the utilization of the research outputs of the SATREPS project. For example, the development of appropriate crop production and irrigation management system is related to the 4th pillar of the plan, “Enhance the management of water use”. The researchers involved in the SATREPS project were interviewed by the NWRP office and their acknowledge would be reflected into the policy.

<Institutional Aspect>

In Egypt, there is no clear national strategy for research, so the research works depends on the individual researchers more than it depends on a national strategy. Research themes also belong to individual researchers more that it belongs to the organizations. However, continual deeper research for efficient water use or water save agriculture is highly prohibited by the government of Egypt, because such scientific evidence is thought to negatively affect for water right negotiation with upper stream countries of Nile river (the Nile basin countries). On the other hand, small researches related with efficient water use or water save are welcomed because these 2 topics are important, however integration of such small results to lead political recommendation is very critical.

WMRC has researchers who have continued some water saving techniques such as strip irrigation for rice crop and in water reuse. For ARC as well, their usual research activities have been carried out, including researches on water saving methods and agriculture production.

In terms of the utilization of the research outputs, the Rice Research Training Center (RRTC) of ARC, and the Regional Training Sector for Water Resources and Irrigation (RTSWRI), a national training unit of the Ministry of Water Resource and Irrigation (MWRI), utilized the materials based on the research outputs related to rice cultivation for TCTP as mentioned above..

As for the operation and maintenance of the research equipment, the Flux measurement system has been operated and maintained by the Cairo University. Acoustic doppler current profiler has been utilized by WMRC for water flow measurements. In addition, the Food and Agriculture Organization (FAO) have utilized the data from the Flux Tower in irrigation field, installed by the project, for verifying the accuracy of their measurement method.

<Technical Aspect>

As mentioned above, the technical capacity of the ex-counterpart researchers was enhanced. However, the technical transfer has not done among Egyptian researchers because Egyptian researchers hate to share this kind of intelligent asset with their rivals. Only few examples have found in this project, like RRTC, MWRI. One of regrettable examples is utilization of the Flux measurement system. The person who in charge of this equipment in CU has been acquired how to use it well, however this person got resigned from CU. His resign

closes any chance to transfer any techniques.

<Financial Aspect>

There is no available data on the financial situation of any of the counterpart agencies. However, as mentioned above, some of the ex-counterpart researcher, on individual bases, have seek scholarships or fund for their researches from several universities and research entities, and some of them succeeded in that. The research budgets have been limited in universities and research institutes in Egypt.

For the operation and maintenance of the research equipment installed by the SATREPS project, the conditions of the majority of project equipment in Cairo University and NWRC are still in functioning condition and utilized by researchers and students with sufficient budget for operation and maintenance.

<Evaluation Result>

In the light above, there are problems of the research institutions from the institutional, technical and financial aspects. Therefore, the sustainability of the effects through the project is fair.

5 Summary of the Evaluation

The project was achieved the Project Purpose and partially achieved the Overall Goal through the researches on the water saving method for agricultural production. As for sustainability, the research institutes involved in the SATREPS project faced difficulty to continue and expand the research themes because of the national interests in the water use negotiation with the Nile basin countries and the technical transfer among the researchers have been limited due to the individualism. However, WMRC and ARC have sustained the researchers to be engaged in the researches on the water saving methods for agricultural production recommended by the project

Considering all of the above points, this project is evaluated to be satisfactory.

III. Recommendations & Lessons Learned

Recommendations for Implementing Agency:

[MWRC/ ARC and Cairo University]

- It is recommended to establish an efficient system for knowledge sharing and transferring through the research institutions and to encourage group work in order to enhance the sustainability of project effects, in particular for research technique including use of research equipment, in order to avoid discontinue the research activities related to the research outputs by the SATREPS project after the researchers left the institutions..

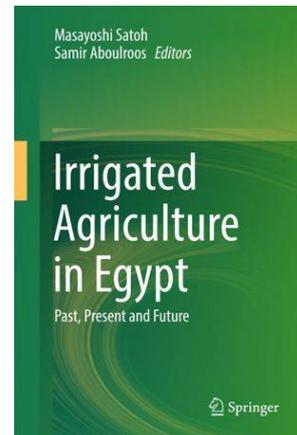
Lessons Learned for JICA:

- Policy endorsement and backup are essential to utilize the research outputs by the SATREPS projects, in particular in countries where the government controls research themes for the national interests. At the stage of project formulation for SATREPS projects, JICA should consider suitable counterpart agencies in Egypt from research institutes and centers, which have strong ties with policy makers, more than universities.
- When formulating new projects, JICA should consider limiting the counterpart agencies per project in Egypt, as it is difficult to coordinate between several entities of different ministries, and the project effects and impacts would be scattered and difficult to sustain.

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Lecture on “Water Management” within the TCTP for African participants in 2017 by using the output of the SATREPS project.



The book published on 2016, by two main authors: Professor Masayoshi Satoh, University of Tsukuba, and Professor Samir Aboulroos, Cairo University, in addition to 28 contributors from the researchers involved in the SATREPS project (Japanese and Egyptians)