

**Ministry of Agriculture and Agrarian Reform
Syrian Arab Republic**

**Syrian Arab Republic
Project on Development of Efficient
Irrigation Techniques and Extension Phase II
in Syria**

Final Report

July 2012

Japan International Cooperation Agency (JICA)

Appropriate Agriculture International Co., Ltd.

NTC International Co., Ltd.

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Executive Summary

1. Introduction

The DEITEX II Project (hereinafter “the Project”) was started in December 2008 aiming to expand and deepen the achievement of the former DEITEX I in the promotion of modern water-saving irrigation in five focused governorates of Rural Damascus, Daraa, Hama, Aleppo and Raqqa. Deterioration of security conditions in Syria made Japanese experts unable to work in the country since April 2011, however, almost all project activities were completed in July 2012 as it was scheduled.

This Final Report describes details of the project implementation, achievements of the Project, and lessons learned through the execution of the Project.

2. Water Crisis in Syria

Available water resources in Syria have been depleted because of rapidly increasing of water demand. Particularly, water balance in groundwater use falls into too much excess of requirement. It causes remarkable hindrances like rapid groundwater lowering and depletion everywhere in the country. It is very critical situation in fact.

Irrigated agriculture consumes water about 89% of the total water use in Syria, it hinders to provide available water to other sectors such as industry and domestic water use.

While irrigated agriculture has to be expanded in order to ensure future food security in Syria, there are contradictory signs of “rising demand of irrigation area expansion” in one side, and “accelerating for shortage and/or depletion of water resources” in the other side. In this context, saving water in irrigated agriculture is still one of the top priority issues of the country, because the measure of saving water can relieve the both difficulties at the same time. Water issue is a fatal condition of Syria in viewpoints of her natural and geographical features. The Project was authorized to implement on the scope of a Japan’s project type technical cooperation on humanitarian grounds, in order to make water use in irrigated agriculture in Syria sustain.

3. Project Implementation

The Project was started under the basic strategy that it is more effective and sustainable in the long run to adopt the approach that farmers naturally selects water-saving irrigation method according to their ability and awareness improved by “extension” rather than being enforced by “control or regulation”.

Since “extension activities” requires skilled extension workers, “training” must be an important component in the Project. Furthermore, training/extension has need of appropriate modern irrigation “know-how/expertise” which is knowledge of modern irrigation, skills of modern irrigation operation and techniques of modern water management.

In these respects, the key points of the strategy of the Project are to establish appropriate irrigation technology at farmer's field level by means of field survey and reviewing existing research results, and to disseminate relevant technologies and mind-setting for saving water through training and extension activities.

Project implementation is outlined as follows:

Items	Substances		Remarks
Project Period	December 2008 ~ July 2012		Approx. 3.5 years (43 months)
Syrian Implementing Organizations	MAAR; GCSAR MAAR; Directorate of Extension MAAR; Directorate of Training and Qualification MAAR; DMIC		GCSAR is the supervising organization of which Director General plays the project manager of the Project. ANRR of the GCSAR deals with research activities of the Project.
Inputs	Japanese experts and Syrian counterparts	Long and Short term experts Syrian central counterparts Syrian local counterparts	Japanese expert: 6 Central counterparts: 21 Local counterpart: 39
	Procurement of necessary equipment	Equipment for general purpose Irrigation equipment Equipment for training Office machineries Measuring instruments	<ul style="list-style-type: none"> • Vehicle : 4, Copy machine: 2 • Modern irrigation net: L.S. Land laser leveling: 2 • Projector etc.: L.S. • Office computer : 5 • Current meter : 4
Project Area (Governorate)	Hama (for strategic crops)		Previous RMI : 50.5%(2008)
	Rural Damascus (for tree crops and olive etc.)		Previous RMI : 32.7%(2008)
	Daraa (Vegetables, grape etc.)		Previous RMI : 52.5%(2008)
	Aleppo (Strategic crops, wheat etc.)		Previous RMI : 17.1%(2008)
	Raqqa (Cotton, sugar beet etc.)		Previous RMI : 3.0%(2008)
Project Purpose	The capability of extensionists and staffs of related agencies on extension of water-saving irrigation are improved, and proper amount of irrigation water is used for each crop in the Project Sites (Project sites were selected at one or two in each governorate).		
Principal Project Activities	Review of Phase I Project, Baseline Survey		Implemented during 2008
	Training activities for extensionists and engineers		Implemented during from 2008 to 2012
	Extension activities for modern water-saving irrigation promotion		Implemented during from 2008 to 2012
	Demonstration activities at the demonstration farms		Implemented during from 2009 to 2012
	Research activities on the several subjects of modern water-saving irrigation		Implemented during from 2010 to 2012
	Collaborations between international research organization and universities		Implemented during from 2010 to 2012
Additional Activities on Technology transfer	Training in Japan		Implemented 3 times for 4 groups of counterparts
	Third country training		Visited 2 countries
	Other activities for technology transfer		Implemented the training courses for Iraqi engineers by the C/Pa, and Joint-working in Amman

*RMI: Rate of Modern Irrigation area to total irrigation area

The Project consists of 8 implementing terms of “Preparation Work in Japan”, “1st Field Work”, “1st Work in Japan”, “2nd Field Work”, “3rd Field Work”, “4th Field Work/4th Work in Japan” and “5th Field Work/5th Work in Japan”. As for the 4th Field Work, it was interrupted after 3 months of starting the Field Work by a security reason in Syria. After that, Japanese experts cooperated to the counterparts’ efforts from Japan. Furthermore, the 5th Field Work is a project activity done in the third country of Jordan.

4. Project Activities and Technology Transfer

(1) Training Activities

The Project implemented the following works concerning training activities:

- 1) Implementation of training courses for water extensionists (WE) in Aleppo and Raqqa, including Improved Surface Irrigation (ISI),
- 2) Training SMS of Aleppo and Raqqa, and entrusting WE training courses to the governorates,
- 3) Implementation of training courses for WE in Rural Damascus, Daraa, and Hama under the initiative of local counterparts and SMS,
- 4) Implementation of follow-up training courses to expand capacity of WEs,
- 5) Monitoring WE training courses with utilizing evaluation system of trainer and training course,
- 6) Dissemination of the Project results to other areas through additional training activities (for ICARDA and Iraqi engineers and so on), and
- 7) Training in Japan and third country training for capacity building of counterparts

As succeeding to the previous DEITEX I, the DEITEX II Project trained significant numbers of WE and SMS. In addition to 71 of WE and 15 of SMS which had been certified during the DEITEX I period, 163 of WE and 37 of SMS were newly certified in the concerned governorates in this DEITEX II period, resulting 234 of WE and 52 of SMS in total.

The DEITEX II has established evaluation systems for trainer and training course, in order to assess trainer capability and training course efficiency. In accordance with entrusting WE training course management to the governorates, evaluation of trainer and training course has also been given to local C/Ps. In addition, as one of role sharing between central and local counterparts, some of governorate WE training courses were monitored by central counterparts. The DEITEX evaluation system was applied in the monitoring activity. Central C/Ps observed courses and evaluate trainers and training courses by making use of the evaluation system.

(2) Extension Activities

Taking the lessons learned through reviewing the extension activities during the DEITEX I into consideration, principal contents of extension activities of the Project were established as

follows:

- 1) Implementation of model extension activities in the model extension units,
- 2) Implementation of extension activities in the ordinary extension units,
- 3) Implementation of competition for modern irrigation farmers and irrigation note campaign,
- 4) Preparation and utilization of extension tools,
- 5) Evaluation of extension activity and establishment of extension cycle, and
- 6) Establishment of Water Extensionists Assembly (WEA).

The Project implemented the model extension activities in the 9 model extension units, of which 5 model extension units organized farmers' group as extension target. The subjects of the extension activities were widely chosen concerning to "hardware", "software" and "mind-sets" taking various methods of extension like field day, seminar and practical demonstration etc. In 2010, extension activities were implemented at 48 times in the model extension units and 352 times in the ordinary extension units. Since 2011, the number of the implemented extension activities has decreased due to the difficult situation of the country. All the parties concerned wish an early recovery of more frequent extension activities by the settlement about the situation in Syria.

The Project emphasized to carry out the evaluation of extension activities by (i) participated farmers, (ii) implemented extensionists and (iii) observers from outside. The evaluation by observers has been performed as routine activities by using evaluation criteria formulated. While, the evaluation by participated farmers and implemented extensionists are on the way of being performed as routine activities.

(3) Demonstration Activities at the Demonstration Farms

Within the selected project sites, demonstration fields were established to demonstrate the appropriate modern water-saving irrigation techniques and its management to the neighboring farmers as well as the interested people. The demonstration fields were classified into three types, namely demonstration farm for Aleppo and Raqqa, demonstration experimental plot for the Irrigation Research Stations in these two governorates, and satellite plot for the on-going governorates of Hama, Rural Damascus and Daraa.

Monitoring for the demonstration activities has been conducted in irrigation and farming manner targeting for all cultivated crops at the demonstration farms and specified crops at the satellite plots. Irrigation Notebook and Digital Irrigation Note (DIN) developed by the Project were effectively applied for the monitoring procedure. For smooth implementation of the supporting and monitoring activity, the Project distributed those extension tools for concerned farmers and WEs.

In addition to the demonstration activities, the demonstration farms were actively utilized as a

field of training and extension activities. Within the scope of the training activities, the demonstration farms were effectively used for site visit under the WE training courses, and also used for site inspection in the various training courses. As a result of the demonstration effect, it was reported that many neighboring farmers of the demonstration farms have introduced modern irrigation system and techniques.

(4) Research Activities

As the part of research activities of the Project, eight (8) themes of experiments have been conducted at the several Irrigation Research Stations in the concerned governorates and at the some project sites in order to promote water-saving irrigation in Syria. At the same time of being conducted as a component of the Project, those experiments were authorized as the official duty experiment under the ANRR's research program. These 8 themes of experiments were generally classified into three groups of research activities according to the background and procedure of the experimentation. Three groups were namely 1) activity for improving surface irrigation methods, 2) activity collaborated with universities, and 3) activity for improving pressurized modern irrigation methods.

(5) Preparation of Technical Manual

Technical Manual was prepared aiming to establish a standardized technical guideline of modern water-saving irrigation for the convenient use of Syrian engineers/technicians. In 2008 when DEITEX I was phased out, Technical Manual (version 1) had been provided. The Technical Manual was revised the manual version 1 updating its contents and reinforcing with the latest knowledge and lessons learned during DEITEX II.

Modern irrigation applying improved surface irrigation and pressurized modern irrigation including large scale irrigation were taken up in this new technical manual.

(6) Collaboration between International Research Organizations/Universities

Based on the discussions, the project team decided the target subjects for the joint-working with the research organizations, and arranged time schedule of preceding cooperation and collaboration each other. On the basis of the agreements between the Project and each research organization concerned, concrete collaborations have been progressed.

In addition to the cooperation with external organizations mentioned above, DEITEX II project team had an opportunity to participate international conference on the subject of modern irrigation which was "21st International Congress on Irrigation and Drainage (ICID) /8th International Micro Irrigation Congress" held in 15 – 23 October 2011, in Tehran.

(7) Capacity Development and Technical Transfer

One of the significant project achievements in capacity development was the improvement of capability of WE and SMS of conducting training and/or extension activities, which was

realized by providing opportunities for them after completing the training courses. Through conducting post-training activities, they utilized their knowledge and skills obtained from the training courses, which was significant experiences to improve their capability. Especially during the DEITEX II period, many SMSs in each governorate worked as trainers in the WE training courses, since management of the training courses have been entrusted to the governorates.

In order to enhance the C/Ps' capacity of managing and pursuing duties in irrigation modernization, the Project made "on-the job" and "off-the job" training for C/Ps. C/P Training in Japan and the Third Country Training were the characteristic project activities for capacity building and technical transfer to C/Ps. In addition, as a remarkable "on-the job" training for the same purpose to C/Ps, Training Courses for Iraqi Trainees were carried out by C/Ps' initiative and management. And, Joint-Working in Amman was also made within the same scope.

5. Results and Products of the Project

The Project obtained a lot of results and products on the way of attaining the project purpose. Major outcomes/outputs are as follows:

Factors in PDM	Subject of Factors	Major Process of achievement	Project Outcomes/Outputs
Overall goal	To intensify the water-saving in the five governorates, and to expand the outcomes to the other governorates.	(Specific action was not given.)	Increasing the rate of modernization Hama: 50.5%(2008)->52.7%(2010) R.Damas : 32.7%(2008)->34.9%(2010) Daraa: 52.5%(2008)->64.6%(2010) Aleppo: 17.1%(2008)->22.4%(2010) Raqqqa: 3.0%(2008)-> 3.2%(2010) Nation-wide : 18.8%(2008)->22.2%(2010)
Project purpose	To realize water-saving in irrigation in the Projects Sites.	1) The usage of irrigated water for the crops in the Project Sites was reduced without a decrease in production. 2) The capability of extensionists and staffs of related agencies on extension of water-saving irrigation were improved.	The Project Sites show decrease of irrigation water in the range between 30-50% without decrease in production. Allocation sufficiency of WE in extension units reached at 48.9% on average of the five governorates.
Output 1	To expand modern water-saving irrigation to Aleppo and Raqqqa.	1) Amount of irrigation water used for each crop in the Demonstration Farms in Aleppo and Raqqqa Governorates were reduced. 2) The number of farmers adopting water-saving irrigation technique in the Project Sites in Aleppo and Raqqqa Governorates increased. 3) The frequency of regular extension activities implemented by the trained extensionists in Aleppo and Raqqqa Governorates increased. 4) Quality of extension activities by the trained extensionists became at a suitable level.	Rate of water saving in Aleppo: 43.7% Rate of water saving in Raqqqa: 28.6% Rate of modernization in Aleppo: 217% Rate of modernization in Raqqqa: 1,725% Number of activities in Aleppo: 26 times Number of activities in Raqqqa: 14 times The extension cycle introduced by the Project has been rooted.
Output 2	To intensify modern water-saving irrigation in the on-going three governorates.	1) The difficulties after the phase 1 Project were clarified and the countermeasures were established. 2) Number of irrigation farmers in the Project Sites adapting modern irrigation technique increased. 3) The frequency of regular extension activities	Among 11 identified subjects, 8 were improved and 3 were moderately improved. Rate of modernization in Hama: 20.6% Rate of modernization in R.Dams: 43.0% Rate of modernization in Draa: 61.2% Rate of increases in Hama: 432.0%

		implemented by the concerned organizations in Rural Damascus, Hama and Daraa Governorates increased.	Rate of increases in R.Dams: 39.3% Rate of increases in Daraa: 125.0%
Output 3	To cooperate with the international organization and universities.	Cooperation activities on dissemination of measures to improve and operate water-saving irrigation techniques were increased.	Following cooperation on modern water-saving irrigation was conducted. 1) cooperation in the implementation of research activities of the Project 2) exchanging ideas/opinions on the development of new extension tools 3) cooperation in the implementation of ICARDA's training course 4) participation in ICID's international congress, and presentation about DEITEX's achievement.

6. Current Situation in Syria and Future Project Management

The Project concentrated its project activities on the selected five governorates. Through the project implementation, new modality of modern water-saving irrigation has been rooted in every project site, and necessary tools such as training materials/program/guidelines, extension tools/contents, procedure of extension cycle, and technical manual have been established. Those are ready for being utilized to sustain the project activities by the Syria C/Ps deepening water-saving in the project areas and expanding the outcomes to other governorates.

The Japanese experts have supported C/Ps from Japan due to the security reason in Syria. Even being under the difficult situation, it is expected to maintain the project purpose and project activities as far as possible.

As one of remarkable outputs of the DEITEXII Project, the training system for water extensionists has been entrusted to the governorates including evaluation of trainer and training course. In addition, follow-up training system has been newly established to improve abilities of the trained extensionists. These training systems shall be duly sustained in the post-Project period as well, so that continuous training activities will be conducted in order to achieve the ultimate goal of saving water in agriculture.

Especially at the model extension units, the great efforts have been conducted to perform advanced, well-organized and functioned extension activities by the combination of WEs and SMSs under the good understanding of decision makers such as chiefs of unit, department and directorate. The necessary step for the time being is to establish the unit that can perform ideal extension activities to be suitable as a model unit by continuing the efforts so far tackled. In the next step, the model should be expanded for all the units to be able to carry out ideal extension activities. In order to manage extension organizations under the flow mentioned above, the proper allocation and the effective utilization of WEs and SMSs should actively be enhanced based on the following concepts.

As to the subject of research, the Project tried to guide C/Ps 1) to pay attention to the research themes meeting with farmers' needs, 2) to carry out appropriate research activities, and 3) to

widely and quickly release the outcomes to beneficiaries. The research organization is requested to hold sound research activities following those fundamentals in researching. In this relation, technical manual prepared by the Project is useful for going forward the doings in research and engineering of modern irrigation.

7. Conclusion and Recommendation

At the completion of the Project, achievements through the implementation of the DEITEX II Project are concluded as follows:

- (1) As for attaining saving-water in irrigation, there are two streams, namely “controlling and guiding by external authority/forces” and “intending saving-water and refraining wasting-water by farmers’ own initiatives”. Everyone prefers the latter manner because it is straight and sound way. The DEITEX I had taken the approach to focus on the latter way under the administrative background of regulations of water resources conservation and overuse of irrigation water. The DEITEX II has succeeded the policy and strategy of the DEITEX I.

Through project activities on training and extension, the DEITEX II Project proved that the later approach is effective, and it could be progressed more and more by the further training and extension activities.

- (2) Project Concept of DEITEX II declares to ensure a keen coordination and collaboration between the activities of “Research”, “Training” and “Extension”, which are the essential components to achieve the Project purpose. The Final Evaluation also pointed out synergy effects among these components to realize successful implementation of the Project. The integrated approach employed in the DEITEX II Project as well as DEITEX I will be applicable to other projects which aim to promote multi-sectoral public issues.

- (3) Counterpart organizations of the DEITEX II Project include four different bodies, which worked closely together in order to achieve the Project purpose. It was rather difficult to realize good collaboration works among different organizations in Syria, however, the counterpart organizations of the Project have been cooperating in good manner to conduct the Project activities successfully. There are three reasons behind the successful realization of the cooperation as follows:

- (a) The objective of the Project as a common goal is very clear and crucial, which was saving water in irrigated agriculture,
- (b) The Project activities included cross-sectional subjects, which are rather easy to be involved by the counterpart organizations even though they had own duties as existing individual organizations, and

- (c) The role of each organization is carefully considered based on its mandate, so as to realize efficient collaboration works under the Project.

The collaboration works and the coordination system which have been achieved in the DEITEX Project will provide good suggestions to conduct other project activities with coordinating several different organizations in Syria in future.

- (4) The conclusion of the achievement of the Project was given through the Final Evaluation Study so that the Project kept producing its outputs with a satisfactory level, and completed its period by achieving the Project Purpose by the end of the Project.
- (5) According to the observation of current trend of modern water-saving irrigation in Syria, expansion of modern water-saving irrigation to entire Syria is hopeful. Modality of DEITEX Project should be taken over next generations in Syria.
- (6) By the Project's analysis on the breakdown of irrigation modernized areas by types of farming, the structure of irrigation modernization was clarified. In future promotion of irrigation modernization, the potentialities for irrigation modernization by the types of farming should be considered.
- (7) The DEITEX II Project prepared "Technical Manual" for the convenience of technicians and extension workers when they try to improve the current water-wasting irrigation. This is the revised version based on the manual prepared during DEITEX I Phase. The technical manual is expected to be kept on among technicians and extension workers concerned.
- (8) The DEITEX II Project developed and extended systematic training/extension methods and system for its operation. The project team also revised "Training Guidelines" and "Extension Manual" which covered every aspect in training/extension activities and training/extension methods available.
- (9) Through the implementation of DEITEX II as well as DEITEX I, the Project cultivated a partnership between the organizations concerned and a friendship between the colleagues engaged in the Project such as C/Ps, WEs, trainers, researchers and farmers. Such close and wide-ranging human relationship is precious. The cultivated relationship by the DEITEX Project should serve in any situation of future development in Syria.

In addition to the recommendations given by the Final Evaluation Study Team, the DEITEX II Project also provides the following suggestions so that project cycle of the Project will be managed in good and sustainable manner:

- (1) The reaction against the recommendation which was given through the Final Evaluation study is directed namely, 1) to jointly carry out a field survey to find out the real

achievement in future, 2) to form a National Training Team within the MAAR, 3) to add a training item on “attitude” to the curriculum, and 4) to be sustained the research activities for the other measures than pressurized irrigation on managerial, institutional and agronomical approaches. Syrian Government is requested to follow the recommendation in the course of post-implementation of the DEITEX II Project, and to pursue the plan for the reaction as it was directed.

- (2) As it is related with the recommendation (4) given in the Final Evaluation study, there are some effective measures to reduce quantity of water use in agricultural purpose as enumerated as follows:
- (a) Introducing draught-tolerant crops (including improving draught-tolerance of crops by means of breeding research)
 - (b) Physical and chemical treatments reducing water consumption of crops
 - (c) Reducing area of irrigation
 - (d) Optimizing cultivation period and selecting less water consuming crops
 - (e) Minimizing waste water and leakage by means of improving water management
 - (f) Minimizing conveyance and delivery losses of water by means of improving irrigation facilities
 - (g) Introducing modern irrigation method (method by handy pressurized irrigation equipment, method by large-scale pressurized irrigation devices, Improved surface irrigation method)

The DEITEX II Project dealt with several methods of modern irrigation which are categorized into (g) mentioned above. Irrigation farmers are recommended to apply the most suitable irrigation methods to meet the actual conditions of their farming and managing skills.

- (3) It is undeniable that groundwater use is subject to be dominated by its physical and hydro-geological characteristics. As far as lifting much groundwater above its capacity, irrigation water supply could not be sustainable, even though applying modern irrigation methods. Modern irrigation is certainly manageable to realize saving water, however, it is beyond its management when some basic conditions and circumstances are not allowable.
- (4) The Syrian Government is required to work out more accurate and strategic planning of irrigation modernization on the basis of the latest hydrological and hydro-geological data, and to update it time by time.
- (5) Organizations concerned to extension work in central and local level are required to effectively utilize the training/extension manuals in their duties, which were prepared within the Project.

- (6) During the project period, DEITEX II held DEITEX Seminar/Workshop in every year for the purpose of publicizing the project outcomes and enhancing mutual friendship among project partners. C/Ps sometime mentioned their intension to hold DEITEX Workshop even after the termination of the Project. It is suggested that DEITEX Workshop will be given periodically in future by the effort of Syrian side.
- (7) In order to dissolve the water issue, it is necessary to secure national stable conditions so that concerned personnel can concentrate on their duties. Social and administrative stability is a great desire for Syria.

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ACRONYM

ANRR:	Administration of Natural Resources Research
ACSAD:	Arab Center for the Studies of Arid zones and Dry lands
C/P:	Counterpart (of the Project)
DEITEX I:	Development of Efficient Irrigation Techniques and Extension Project in Syria, Phase I
DEITEX II:	Development of Efficient Irrigation Techniques and Extension Project in Syria, Phase II
DMIC:	Directorate of Modern Irrigation Conversion
DIN:	Digital Irrigation Note
ED (or DoE):	Extension Directorate
GCSAR:	General Commission for Scientific Agricultural Research
GDP:	Gross Domestic Product
GNP:	Gross National Product
GOS:	Government of Syria
GOJ:	Government of Japan
IC	Irrigation Calendar
ICARDA:	International Center for Agricultural Research in Dry Areas
JICA:	Japan International Cooperation Agency
MAAR:	Ministry of Agriculture and Agrarian Reform
MOI:	Ministry of Irrigation
OJT:	On the Job Training
PCM:	Project Cycle Management
PDM:	Project Design Matrix
PIU:	Project Implementation Unit
PO:	Plan of Operation
R/D:	Record of Discussions
SC:	Steering Committee
SMS:	Subject Matter Specialist (in irrigation)
SP(SYP):	Syrian Pound
SPC:	State Planning Committee
TQD:	Training and Qualification Directorate
WE:	Water Extensionist
WEA:	Water Extensionist Assembly
WUA:	Water Users Association

Efficient Irrigation: Modernized/rationalized water-saving irrigation which uses less water without reducing the productivity comparing to traditional irrigation methods

Project Area (Target Area): Five governorates of Rural Damascus, Daraa, Hama, Aleppo and Raqqa

Project Site: Selected farmlands within the Project Area for especially focusing project activities

Demonstration Field*: Farmlands selected within the Project Site being equipped modern irrigation equipment/facilities under the Project

*: “Demonstration Farm” is applied for the case of Aleppo and Raqqa, otherwise “Satellite Plot” is used for Hama, Rural Damascus and Daraa. In addition to these, “Demonstration Experimental Plot” is used for the equipped plots within the Irrigation Stations for the purpose of an experiment. “Demonstration Field” is a general term for these three terms.

1. Introduction

Phase I Project on Development of Efficient Irrigation Techniques and Extension in Syria (DEITEX I) was successfully completed under the cooperation of Japanese Government (GOJ) in February 2008. The Government of the Syrian Arab Republic (GOS) requested GOJ to launch a succeeding technical cooperation project in order that proper amount of irrigation water is used through expanding the outcome of the DEITEX I to the remaining areas in Rural Damascus, Daraa, and Hama governorates and new target areas (Aleppo and Raqqa), improving surface irrigation technique and cooperating with international research organizations. Japan International Cooperation Agency (JICA) conducted pre-evaluation study in order to examine the request during the period from April to May, 2008. Based on the result of the study, both Syrian and Japanese sides agreed on and signed Record of Discussion (R/D) for the project implementation of the further phase in DEITEX I in October 2008. This Project on Development of Efficient Irrigation Techniques and Extension Phase II (hereinafter referred to as “DEITEX II” or “the Project”) was started in line with the R/D after the completion of its signing immediately.

The Project started in December 2008 with the project period of three years and a half having five implementing terms for field working in Syria. Unfortunately, because of internal confusion in Syria caused since March 2011, the original formation of project implementing terms was modified in the last stage of the project implementation. Even though, the Project was completed successfully with significant attainment due to the efforts of Syrian counterparts and concerned organizations. This Final Report which was prepared at the time of closing of the project implementation, describes the course of project implementation and achievements of the Project.

2. The Project

2.1 Project Background

Hereinafter, it is described at the point of time when the Project was started.

Agriculture plays a dominant role in the Syrian economy by providing nearly 30% of gross domestic product (GDP). Syrian agriculture is also important as a source of employment and export earnings. The estimated population of the country is about 18,360 thousand in 2006, of which about 50% is in rural. Syria has a relatively high population growth rate of about 2.7% per year, which demands increase in food production and development of agricultural production system. Rainfed agriculture is still prevailing in Syria, which covers more than 75% of the total cultivated area. However, irrigated agriculture is more important in terms of the crop production, because of the uncertainty and the fluctuation of rainfed agriculture production. Thus, total irrigated area increased from 650 thousand ha in 1985 to 1,396 thousand ha in 2007 (it becomes at 1,238 thousand ha as of 2009). Irrigated agriculture consumes water about 89% of the total water use in Syria, it hinders to provide available water to other sectors such as industry and domestic water use.

In Syria, irrigation is essential particularly for summer cultivation in which no available rainfall can be expected. Current crop-wise irrigation ratio in Syria is summarized as follows:

Table 2.1.1 Crop-wise Irrigation Ratio by Seasons in Syria

Item	Cultivated Area (thousand ha)	Irrigation Area (thousand ha)	Irrigation Ratio (%)
Summer Crops	466	418	89.7%
Winter Crops	3,681	997	27.1%
Tree Crops	817	148	18.1%
Total	4,964	1,563*	31.5%

*: This figure is different from the figure of total irrigated area because the areas irrigated in both seasons are double-counted.

Irrigation type in Syria is categorized in official into three groups by the sort of water source and the difference in operation condition whether motored or not. For whole irrigation types, traditional surface irrigation method is still widespread which shows very low irrigation efficiency. Modernization of irrigation is still on the way in Syria.

Table 2.1.2 Features of Irrigation Practice in Syria

Item	1998		2002		2006	
	(ha)		(ha)		(ha)	
Irrigated Area	1,213,108		1,316,796		1,402,152	
Irrigated by well with motor	723,696	(59.6%)	816,371	(62.0%)	851,146	(60.7%)
Irrigated by river water with motor	214,828	(17.7%)	200,987	(15.3%)	215,446	(15.4%)
Irrigated by river water without motor	274,584	(22.7%)	299,438	(22.7%)	335,560	(23.9%)
Modern irrigation	69,393		204,472		235,943	
Ratio of modernization	5.9%		15.5%		16.8%	

The total irrigated area in Syria had increased significantly from 650 thousand ha in 1985 to 1,213 thousand ha in 2002, then it was followed by little increase due to lack of new source of water. More than 60 percent of all irrigated areas is currently irrigated by groundwater, of which almost all are privately developed and operated. The groundwater irrigated area increased rapidly during from 1990 to 1994, which contributed remarkable expansion of the irrigated area.

An experimental result shows that yield of irrigated crops is much higher than that of non-irrigated one, for example, irrigated wheat produces 3.5 ton/ha, whereas non-irrigated gives only 1.4 ton/ha. Irrigated agriculture seems to be essential in order to secure food sufficiency as food demand increases with population growth.

Many farmers in Syria had introduced modern irrigation system, however, they didn't save water because they did use the system in improper way. In this context, water saving irrigation had been initiated by the implementation of DEITEX I. The DEITEX I was started under the basic strategy that it was more effective and sustainable in the long run to adopt the approach that "farmers naturally selects water-saving irrigation method according to their ability and awareness encouraged by **extension** rather than being enforced by **control or regulation**". Project implementation of the DEITEX I is outlined as follows:

Table 2.1.3 Overviews of DEITEX I Project

Items	Description	Remarks
Project Period	March 2005 ~ February 2008	Approx. 3 years (36 months)
Syrian Implementing Organizations	MAAR; ANRR of (GCSAR) MAAR; Directorate of Extension MAAR; DMIC	DMIC has taken part in the project implementation since January 2007, after its establishment.
Formation of the Project Team	Japanese : Long-term and short-term experts	7 experts (irrigation, training, extension etc.)

Final Report of the DEITEX II Project

	Syrian: Counterparts in central government Counterparts in local governments	16 persons (incl. partly joining) 17 persons
Project Area (Governorate)	Hama (for strategic field crops)	RMI*: 49.2%(in 2005)
	Rural Damascus (for tree crop, olive etc.)	RMI*: 20.3%(in 2005)
	Daraa (for vegetables, grapes etc.)	RMI*: 50.1%(in 2005)
Project Purpose	Proper amount of irrigation water is used for each crop in the project sites, through adequate supports provided by the strengthened training/extension activities, <u>under the condition that</u> capability for promoting water saving modern irrigation is improved in the organizations /staffs concerning the project areas.	
Principal Project Activities	Executing “Baseline Survey” and analyzing related data and information	Implemented in 2005
	Justifying and improving “modern irrigation technology”	Implemented mostly in 2005
	Demonstration activities in the “demonstration farms”	Implemented during 2006~2007
	Training activities to extension workers and irrigation engineers	Implemented during 2005~2007
	Extension activities for irrigation modernization	Implemented during 2006~2007

*RMI: Rate of Modern Irrigation area to total irrigation area

Even though water saving irrigation had been initiated by the implementation of DEITEX I, efficient water use in agriculture is still one of the most important issues in Syria. At the time of phased out of DEITEX I, following issues were held over by Syrian counterparts and organizations concerned.

- 1) How does the Syrian Government get the sound irrigation modernization promoting more within the entire areas of the on-going Governorates?
- 2) Though DMIC has successfully started its operation disseminating modern irrigation particular for modern irrigation equipment to irrigation farmers, who does play the role of dissemination for “managing know-how” corresponding to the spread equipment and farmers’ mind-sets toward water saving?
- 3) Who does spread modern water-saving irrigation to other Governorates in the similar manner of DEITEX I Project?
- 4) How does the GOS push forward through public relations for modern water-saving irrigation of the DEITEX’s approach to the middle-East and other regions?

In these respects, the Syrian government requested technical cooperation to the Japanese government in order to address those issues head-on. Through concluding the R/D of new phase of the DEITEX I Project, the DEITEX II Project was launched and started its implementation.

2.2 Project Concept

While irrigated agriculture has to be expanded in order to ensure future food security in Syria, there are contradictory signs of “rising demand of irrigation area expansion” in one side, and “accelerating shortage and/or depletion of water resources” in the other side. In this context, saving water in irrigated agriculture is still one of the top priority issues of the country, because the measure of saving water can relieve both difficulties at the same time. From now onward, water saving in irrigation which was pioneered by DEITEX I, is more and more essential not only in the water sector but also in agriculture sector. Therefore, the project concept of DEITEX II is to pursue the same of DEITEX I as visually shown in **Fig.2.2.1**, in which the overall goal of the country could be attained by means of enhancing three major components of “(1) Know-how of modern water-saving irrigation”, “(2) Training” and “(3) Extension”.

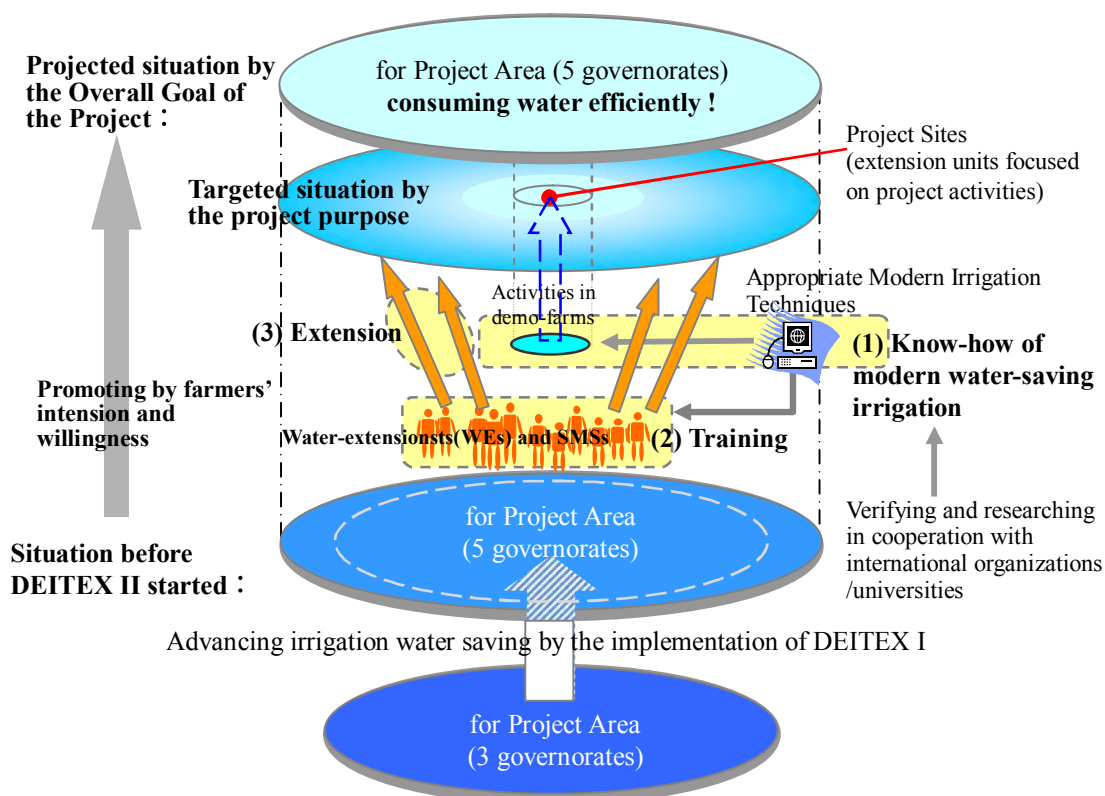


Fig.2.2.1 Schematic Views of Project Concept

In general, there are two streams of promoting saving water in irrigation, namely by administrative control and by farmers’ own accord. Taking current complexity in promoting water-saving by the administrative controlling in Syria into consideration, the Project ambitiously focuses its attention on farmers’ initiatives. The project concept was set “to make farmers to go for water saving irrigation by their own choice” through

adequate extension activities.

Since “extension activities” requires skilled extension workers, “training” must be an important component in the Project. Furthermore, training/extension has need of appropriate modern irrigation “know-how/expertise” which is knowledge of modern irrigation, skills of modern irrigation operation and techniques of modern water management. In those connections, project concept is visually schematized in the previous figure.

Furthermore, farmers are generally reluctant to proceed to save water under the existing irrigation condition as it is, because they feel few incentives to step forward. Utilizing modern irrigation equipment like drip or sprinkler and adopting advanced irrigation management can be defined as “Irrigation Modernization”, which gives remarkable water saving effects, and in addition, those are advantageous to farmers even in several views like reducing labor work in irrigation operation and enabling application of fertigation etc. As those advantages are due incentives for farmers to leave from present water wasting irrigation practice, introduction of modern irrigation is an expedient means to expand saving water in irrigation. In this respect, it is also adopted as an important concept of DEITEX II Project “to realize saving water in irrigation effectively by means of introducing modern irrigation method appealing those advantages in several fields”.

Even if farmers introduce the modern system, many of them do not save water correctly, because they don't have a good command of their “hardware” (modern irrigation system). In other words, acquirement of “the software” consisting of operating skills and knowledge is also necessary to utilize the hardware as it can be. In addition to those, “farmers' mind-set” so that farmers wish to sustain water resources and make success in irrigation, is essential to realize saving-water.

Considering the importance of each factor of the hardware, the software and the mind-set of farmers and harmonizing each other, the project strategy has been made up. The key points of the strategy are to establish appropriate irrigation technology at farmer's field level by means of field survey and reviewing existing research results, and to disseminate relevant technologies and mind-setting for saving water through training and extension activities.

2.3 Project Design

An essence of the Project is to ultimately ease high pressure on water resources in Syria by means of saving water in irrigation. Keeping it in mind, the Project was designed to

deal with the three components which were indicated in **Fig.2.2.1** and to cover the five governorates. A project design that was set at the beginning, could be revised at several times when it requires adjusting to the real demands. Base structure of the Project design that is never changeable is described hereunder.

Project components	for northern 2 Governorates	for on-going 3 Governorates	for extra areas
(1) Know-how of modern water-saving irrigation	Output 3: Water-saving irrigation techniques are extended through the cooperation with universities/international research organizations		
(2) Training	Output 1: Proper water-saving irrigation technique is devised, and the new water-saving irrigation technique is disseminated in the Project Sites in Aleppo/Raqqa.	Output 2: The appropriate utilization of small scale pressurized irrigation is disseminated widely in Rural Damascus, Hama and Daraa.	Overall Goal: Proper amount of irrigation water is used in the whole Target Areas, and, awareness of efficient irrigation is expanded to other areas in Syria.
(3) Extension			

Fig.2.3.1 Relation between Project Components and Covered Areas

During the project period, PDM was revised in several times when necessity arose. First edition of PDM (Version 0.0) was worked out in December 2008 when the Inception Report was prepared. After that, it was revised to PDM (Version 1.0) through negotiation with Syrian side. Then, it was again revised to PDM (Version 2.0) in March 2010 reflecting the results of the Advisory Study which was made by JICA. Lastly, it was finalized to PDM (Version 3.0) in December 2010 reflecting the discussions and recommendations made under the Mid-term evaluation. The revised PDM is shown in **ANNEX 2**.

(1) Overall Goal

Overall Goal is the development effect expected as a result of the achievement of Project Purpose. The overall goal of the Project can be represented by “Proper amount of irrigation water is used by means of adopting efficient water-saving irrigation in the Target Areas. And, awareness of efficient water-saving irrigation is expanded to other areas in Syria”.

The indicators to measure the success of overall goal are “Total amount of irrigation water per unit area decreases more than 10% without yield decrease in Target Area by the end of 2017” and “More than 50% of total farmers in the other governorates in Syria also recognize the importance and the necessity of water-saving in irrigation”. Those indicators are to be satisfied by the year of 2017 which is 5 years later after the Project

completed.

Data concerning to the indicator can be obtained through field measurement done by the concerned offices of ANRR, of the General Commission for Scientific Agricultural Research, MAAR.

(2) Project Purpose

Project Purpose is the objective that is expected to be directly achieved by the end of the project implementation. Referring to the result of DEITEX I completed in March 2008, the project purpose of the Project is decided as “The capability of extensionists and staffs of related agencies on extension of water-saving irrigation are improved, and proper amount of irrigation water is used for each crop in the Project Sites”.

Objectively, Verifiable Indicators has been identified so as to easily verify the achievement of Project Purpose from the viewpoint of quality and quantity. Taking the results of additional analysis into consideration, the verifiable indicators of the Project purpose are “The usage of irrigated water for the crops in the Project Sites is reduced by the Project (10 -20%)”, and “The capability of extensionists and staffs of related agencies on extension of water-saving irrigation are improved (number of certified extensionists become more than 40% to the required number of water extensionists)”. The data can be obtained from report and document on field measurement at the sites, and investigation and questionnaire survey to concerned farmers and organizations.

By referring the above indicators, it evaluates whether the training and extension service in the project sites have met the needs from water scarcity in Syria. As to the capability of the related agencies in the second indicator, it is presumed that WE trained by the Project are a “certified extensionist” to meet this specification. The achievement in this indicator could be assessed in comparison between the numbers of the assigned WEs of the Project to the numbers of total required posts of extensionsits.

(3) Outputs

Outputs are the concrete objectives leading to the Project Purpose achieved during the project period. The outputs stated in PDM are as follows:

1. Proper water-saving irrigation technique is devised, and the new water-saving irrigation technique is disseminated in the Project Sites in Aleppo and Raqqa Governorates. And, the training and extension system for the dissemination of the water-saving irrigation technique is established for the other areas in Aleppo and Raqqa Governorates.

2. The appropriate utilization of small scale pressurized irrigation is disseminated widely in Rural Damascus, Hama and Daraa Governorates.
3. Measures to improve and operate water-saving irrigation techniques are extended to the rest of Syria and to neighboring countries, through the cooperation with universities and international research organizations in Syria.

(4) Activities

Activities are specific actions intended to produce the outputs of the project by effective use of inputs. The activities in this project are below, and the detail is stated in PDM:

1. Subjects of dissemination of water-saving irrigation in Aleppo and Raqqa

- 1-1 Conduct a baseline survey reviewing the problems of irrigation practice in the Target Areas.
- 1-2 Clarify appropriate water-saving irrigation methods/appliances according to the situation of the Target Areas.
- 1-3 Prepare guidelines and manuals based on the result of the item 1-1 and 1-2 mentioned above.
- 1-4 Select suitable Project Sites in the Target Areas, and establish the demonstration farms selected within the Project Sites as required.
- 1-5 **< Small Scale Pressurized Irrigation >**
 - 1-5-1 Prepare a plan of training activities in accordance with the extension plan of the item 1-5-4.
 - 1-5-2 Revise the Technical Manual which were prepared by the Phase I Project according to the situation of the Target Areas.
 - 1-5-3 Implement the training courses on small pressurized irrigation techniques in collaboration with related agencies.
 - 1-5-4 Prepare the extension plan on the basis of the outcomes of item 1-1 and 2-3.
 - 1-5-5 Support extension activities to be done by the trained extensionists in line with the extension plan above.
- 1-6 **< Surface Irrigation >**
 - 1-6-1 Develop efficient surface irrigation technique and its related technology for water-saving.
 - 1-6-2 Prepare a plan of training activities and training tools in accordance with the training plan of the item 1-5-1 and the extension plan of the item 1-6-6.

- 1-6-3 Prepare the technical guideline and materials on surface irrigation technique.
- 1-6-4 Implement the training courses on water-saving surface irrigation techniques in collaboration with relative agencies in accordance with the item 1-6-2.
- 1-6-5 Prepare tools for extension activities in accordance with the extension plan of item (1)-6-6.
- 1-6-6 Prepare extension plan on the basis of the outcomes of item 1-1, 1-6-1 and 2-3.
- 1-6-7 Support extension activities to be done by the trained extensionists in line with the extension plan above.

2. Subjects of dissemination of water-saving irrigation in the Area of Phase I

- 2-1 Hold regular meetings on promotion of water-saving irrigation among the related agencies.
- 2-2 Conduct a baseline survey in the districts excluding the concerned districts which were covered by the Phase I Project.
- 2-3 Review the current performance of Phase I Project including the problems of irrigation practice in the Target Areas.
- 2-4 Establish satellite plots in the districts excluding the concerned districts which were covered by the Phase I Project on the basis of the outcomes of item 2-2 and 2-3.
- 2-5 Implement the training activities in line with the extension plan of item 2-6.
- 2-6 Revise the plan of extension for “modern irrigation promotion” prepared during Phase I Project.
- 2-7 Improve extension tools and methods.
- 2-8 Support extension activities to be done by the trained extensionists in line with the extension plan above.

3. Subject of the cooperation with universities and international research organization

- 3-1 Study on the collaboration with universities and international research organizations in Syria, regarding water-saving irrigation techniques.
- 3-2 Hold workshops on water-saving irrigation techniques with universities and international research organizations as far as holding relation with attainment of the project purpose.
- 3-3 Promote public relations on water-saving irrigation technique on the basis of the outcomes of item 3-1 and 3-2.
- 3-4 Accept trainees of the training courses arranged by other organizations.

- 3-5 Participate in the international conference on efficient water-saving irrigation as far as holding relation with attainment of the project purpose.

(5) Inputs from Japanese Side

1) Japanese experts

The Japanese experts which are nominated within PDM, are listed as follows:

Table 2.3.1 List of Japanese Experts

Term of assignment	Field	Name	Status
Dispatch of Japanese long-term experts	Irrigation/Leader	Shuichi MATSUSHIMA	Dr. of water use/irrigation
	Training/Sub-leader	Akira KOTO	M. of agriculture
	Extension	Hiroyasu OHNUMA	M. of agriculture
Dispatch of Japanese short-term experts	Socio-economy/Farmers organization	Naoki KOGA	M. of agriculture
	Irrigation system designing	Tomoki HOTTA	M. of agriculture
	Farming management	Masakazu NAKAYAMA	M. of agriculture
Team-coordinator	-	Masakazu NAKAYAMA	M. of agriculture

As far as long-term experts, the duties can be regarded as follows:

- To provide necessary recommendations and advice to the Project Director and the Project Manager on any matters pertaining to the implementation of the project,
- To give necessary technical guidance and advice to Syrian counterpart personnel on technical matters pertaining to the implementation of the project, and
- To cooperate on the project implementation giving full assistance to the implementing agency of ANRR.

Short-term experts of several fields as shown in above table were dispatched at an appropriate time with necessary term.

2) Provision of the equipment

The Government of Japan provided such machinery, equipment and other materials necessary for the implementation of the Project. Those are shown in **ANNEX 1** and summarized as follows:

- Cars to be used in the Project,
- Measurement Equipment for Irrigation Water Supply,
- Equipment for training activities, and
- Equipment and instrument for establishment of the demonstration farms.

The Syrian Arab Republic took the measures necessary to receive and use the equipment provided through JICA and equipment, machinery and materials carried in by the Japanese experts.

The Syrian Arab Republic took the measures necessary to supply or replace at its own expense machinery, equipment, instruments, vehicles, tools, spare parts and any other materials necessary for the implementation of the project other than the equipment provided through JICA.

3) Training in Japan

Syrian counterpart personnel received training in Japan according to the annual work plan of the Project within the budget of JICA allocated for technical cooperation. The training fields and term of the trainees were discussed between Syrian and Japanese side. On the basis of the discussion of training fields and term of the trainees between Syrian and Japanese side, selected counterparts participated the training courses in Japan in every year as shown in **ANNEX 4**.

4) Training in third countries

During the project period, Syrian counterpart personnel visited third countries for the purpose of study tour to learn efficient irrigation practice. On the basis of the discussion of country to visit and field of the trainees between Syrian and Japanese side, twice of training in third countries which are travels to Tunisia in 2009 and to Egypt in 2010, were executed.

5) Training in Syria

Syrian counterpart personnel frequently visited other parts of Syria for inspecting the real state of irrigation in such areas. The area and time to visit was decided through the discussion between Syrian and Japanese side.

(6) Inputs from Syrian Side

1) Staff allocation and input

An appropriate number of full-time counterpart personnel as well as administrative personnel were assigned according to the agreement in the R/D. The member list of counterpart and administrative personnel of the project is given in **ANNEX 1**.

2) Buildings, facilities and equipment

ANRR prepared the principal facilities for the implementation of the project, including (1) Rooms and spaces necessary for installation and storage of the equipment provided by the Japanese side, (2) Office spaces and necessary facilities for the Japanese experts, (3) Other facilities which are necessary to implementation the Project.

Electric power supply and other required utilities and consumables were arranged by

ANRR. The training equipment under the project was placed in each faculty building in accordance with the training and extension activities purpose.

(7) Important Assumption and Risk Analysis

Important Assumption is the conditions to avail the success of the Project. After the project purpose would be successfully attained, the necessary condition to achieve the overall goal were directed to two provisions of “Available amount of water resources for irrigation purpose dose not reduce.” and “Irrigated land is not expanded by illegal water source development”.

Even though achieving every output of the Project as required individually, attainment of the project purpose is still uncertain unless some important assumptions are in satisfaction. Two major provisions of “Farming environment in the Target Areas (five Governorates focused on the Project) is not deteriorated unexpectedly” and “Farmers in the Target Areas can establish and operate water-saving irrigation system easily as required in terms of quality and quantity” were finally decided as the important assumption for the attainment of the project purpose.

Furthermore, “There is major change in the working environment of extensionists, at least, farming environment in the Target Areas is deteriorated unexpectedly” and “Farmers in the Project Sites can not establish and operate water-saving irrigation system easily as required in terms of quality and quantity” were set as the risks to hamper achieving the project outputs in the Project.

(8) Prior Obligations and Prerequisites

Precondition is the necessary conditions that must be fulfilled before the project is initiated. If these conditions are not met, the project should not be started. Therefore, provision of “Relevant extensionists take part in the project activities” was set as the precondition in the Project.

2.4 Project Implementation

2.4.1 Project Implementation Stages

Period of cooperation of the Project was planned at 3 years and a half from December 2008 to July 2012. At the beginning of the Project, it was started with 6 implementation stages, namely, Preparatory Work in Japan, 1st Field Work, 2nd Field Work, 3rd Field Work, 4th Field Work, and 5th Field Work. However, an unforeseen political unrest broke out within the country of Syria after entering the year of 2011. The unstable circumstance forced to modify the final part of the original formulation of the

implementation stages. Finally, the Project was completed with the modified implementation schedule of which the project period consisted of 7 stages, namely, Preparatory Work in Japan, 1st Field Work, 2nd Field Work, 3rd Field Work, 4th Field Work/4th Work in Japan, and 5th Field Work/5th Work in Japan. Each project stage is put on calendar as follows:

Table 2.4.1 List of Project Stages

Project Stage	Period on calendar	Applied Japanese fiscal year	Remarks
Preparatory Work in Japan	December 2008	Year of 2008	
1 st Field Work (in Syria)	January 2009 to March 2009	Year of 2008	
2 nd Field Work (in Syria)	April 2009 to March 2010	Year of 2009	
3 rd Field Work (in Syria)	April 2010 to December 2010	Year of 2010	
4 th Field Work (in Syria)	February 2011 to April 2011	Year of 2010/2011	
4 th Work in Japan	April 2011 to December 2011	Year of 2011	Modified by the security reason in Syria.
5 th Field Work (in Jordan)	April 2012	Year of 2012	
5 th Work in Japan	February 2012 to July 2012	Year of 2011/2012	

2.4.2 General Flow of the Project Implementation

Flow of the project implementation grouping into major project subjects is outlined as shown in Fig.2.4.1.

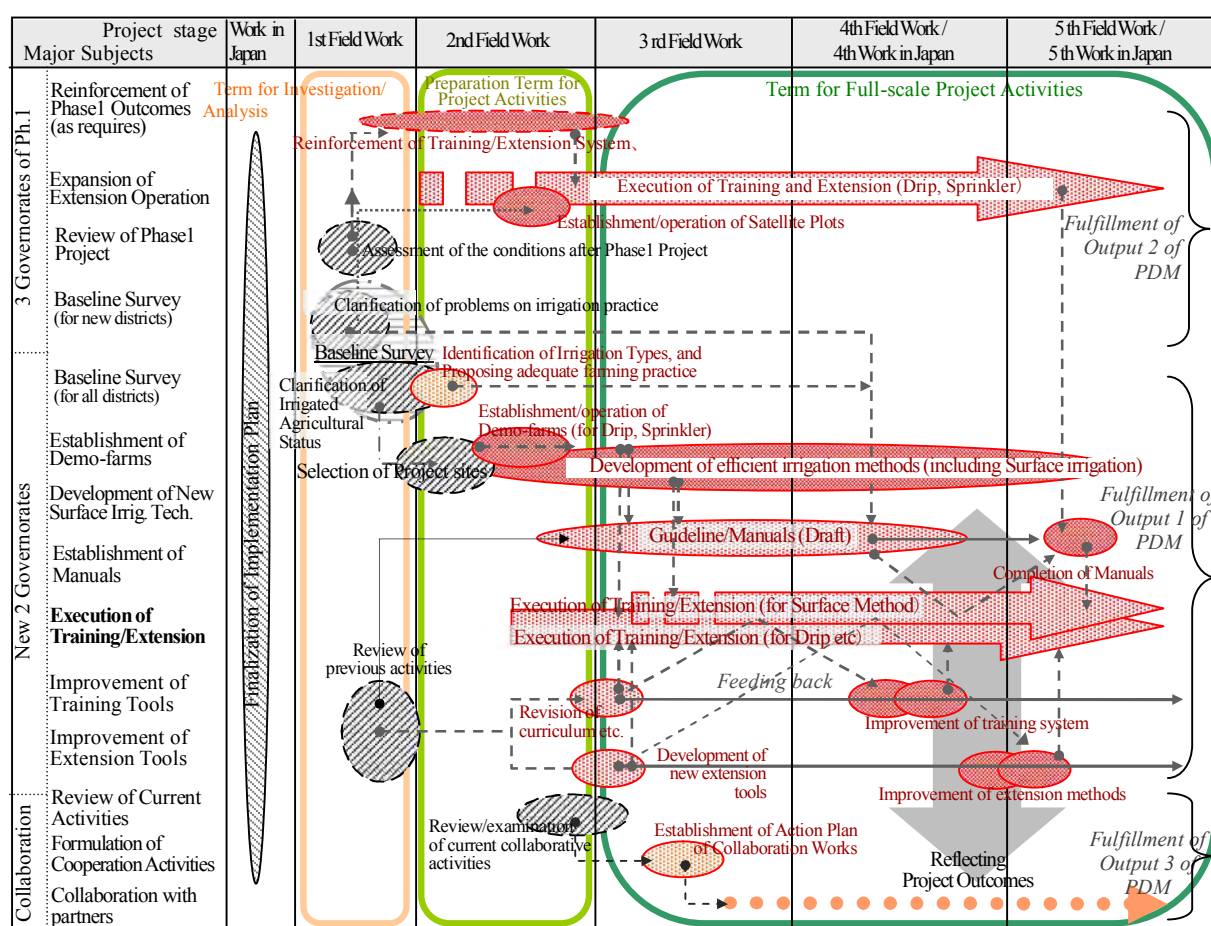


Fig.2.4.1 General Flow of the Project

To attain the project purpose, a series of tasks should be completed at every project stage. There are 27 tasks to be performed during whole project period. In the following section, each task to be completed for the success of the Project is summarized by the project stages.

2.4.3 Plan of Operation

The **Table 2.4.2** gives the final implementation schedule of the Project in order of the tasks, attached by corresponding codes of the activities shown in the tentative PDM.

2.5 Authority of the Project

2.5.1 Counterpart Organization

Administration of Natural Resources Research (ANRR) of GCSAR, MAAR, has been chosen as the competent counterpart organization of the DEITEX II Project.

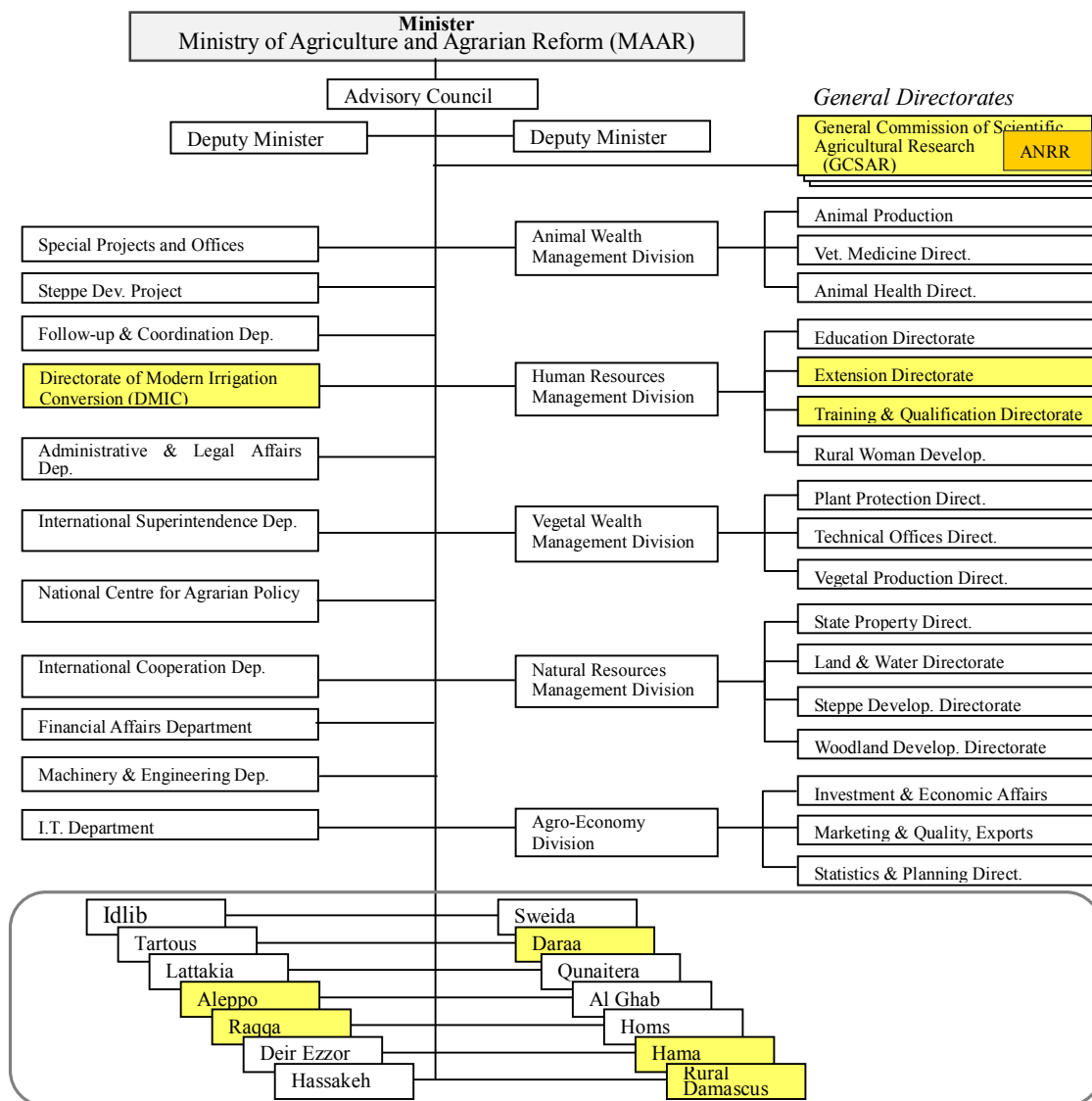


Fig.2.5.1 Organization of MARR

Extension Directorate, Training Directorate and DMIC of MAAR are counterpart agencies which take charge of the related fields of the Project. The organization of MAAR in which counterpart organizations belong to is shown in **Fig.2.5.1**.

GCSAR is one of general directorate which is whole responsible for agricultural research in comprehensive manner. Since newly organized in 2002 merging different Directorates of Irrigation & Water Use (DIWU) and Soil (DoS) and others, organization of GCSAR has been retained as it was. **Fig.2.5.2** shows general structure of GCSAR. Administration of Agricultural Natural Resources Research (ANRR) which is an acting counterpart agency of the Project is a vital unit of GCSAR.

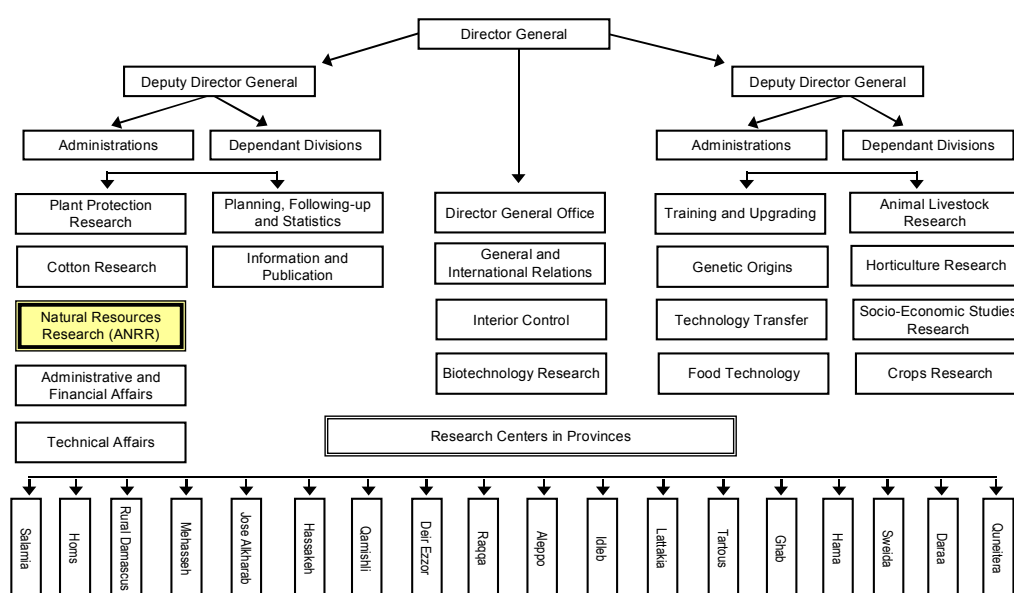


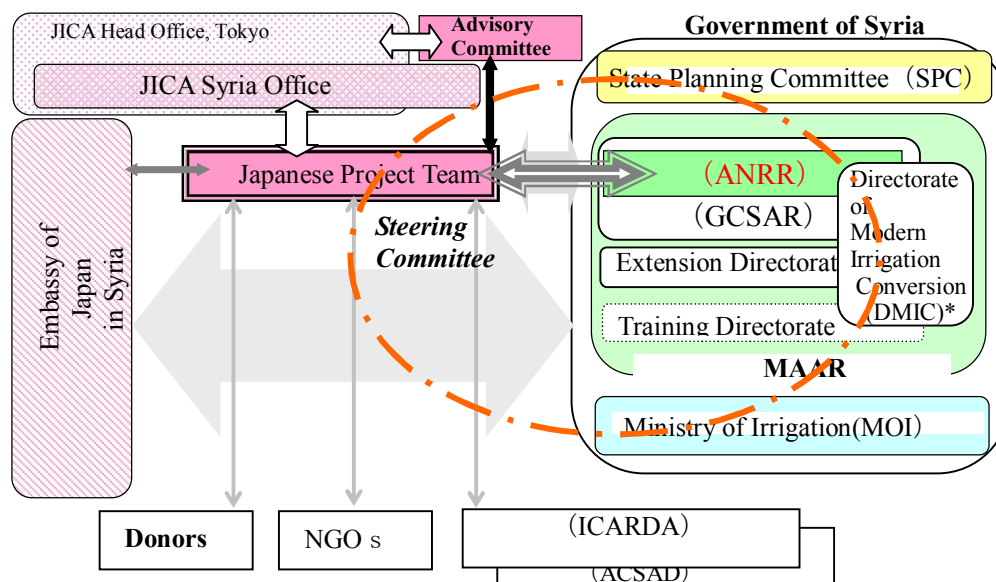
Fig.2.5.2 Organization of GCSAR since 2002

2.5.2 Structure of Project Implementation

DEITEX II Project has been implemented by ANRR and other C/P organizations under full assistance of JICA project team, in cooperation with other agencies concerned. Prior to the commencement of the Project, Steering Committee (SC), which consists of agencies directly related to the Project, was established for the effective and successful implementation for the Project. The SC meeting was held during each project term to evaluate and approve the achievement of the Project, and to exchange views on issues arising including modification of PDM and so on.

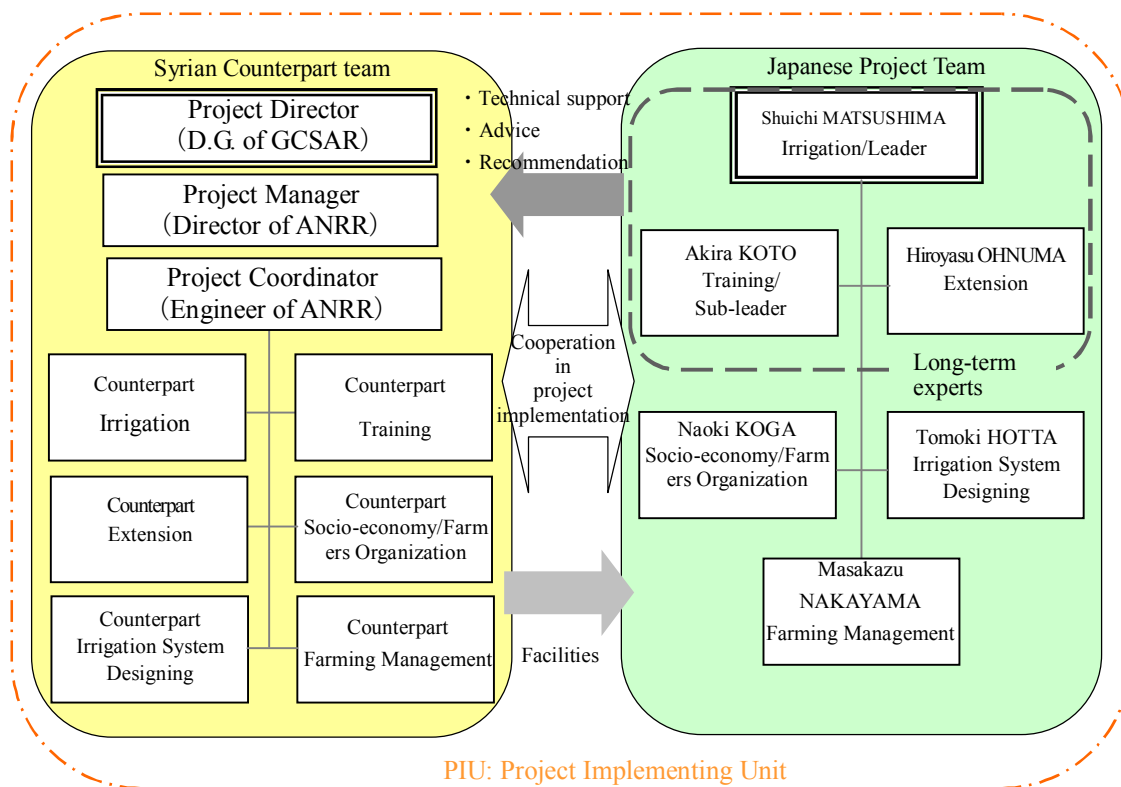
Furthermore, the Project Implementing Unit (PIU) was planned to establish in order to fulfill the project purpose in mutual cooperation with Japanese team and Syrian counterpart team. Organization on the SC and PIU are shown in **Fig.2.5.3** and **Fig.2.5.4**,

respectively.



*: DMIC joined the counterpart alliance in January 2007 on the basis of the agreement given in the steering committee.

Fig.2.5.3 Agencies Concerning the Project Implementation



PIU: Project Implementing Unit

Fig.2.5.4 Organization of PIU

On the project R/D concluded in October 2008, the Government of the Syrian Arab Republic agreed to provide full-time counterpart personnel and administrative personnel.

The organization of PIU shows every counterpart personnel in central level, who were nominated in the PIU. Besides the counterparts in central level, sub-counterparts in local level were nominated in each governorate concerned.

Names of the nominated local counterparts, and assignment period of both central and local counterparts are shown in the **ANNEX 1**.

3. Project Implementation

3.1 General Schedule of the Project Implementation

The plan of project implementation schedule was designed at the time when the Project started in December 2008. The implementation schedule was finalized with the modification during the previous stage periods of 4th Field Work and 5th Field Work as shown in Table 3.1.1.

Table 3.1.1 Finalized Project Implementation Schedule

Date: February 2012

Planned Tasks	1st Year												2nd Year												3rd Year												4th Year												5th Year																																				
	2008												2009												2010												2011												2012																																				
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7																																									
< 1st Year >																																																																																					
[AA] Preparatory Work in Japan	■																																																																																				
[A] 1st Field Work	■																																																																																				
[a] Finalization, Explanation and discussion for Inception Report	■																																																																																				
[b] Collect and analyze general/Agricultural data and information	■																																																																																				
[c] Review of Phase I Project	■																																																																																				
[d] Implementation of Baseline Survey	■																																																																																				
[e] Pre-selection of Project Sites and Pre-design of Demo-Farms	■																																																																																				
< 2nd Year >																																																																																					
[B] 2nd Field Work													■																																																																								
[f] Finalization of Baseline Survey Report													■																																																																								
[g] Selection of Project Sites													■																																																																								
[h] Establishment of Demo-Farms/Satellite Plots													■																																																																								
[i] Preparation of Guideline/Manual for Water-saving Irrigation													■																																																																								
[j] Investigation of Surface Irrigation Methods and Related Techniques													■																																																																								
[k] Implementation of Training Activities													■																																																																								
[l] Execution of Extension Activities													■																																																																								
[m] Examination of Cooperation with External Research Organizations													■																																																																								
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[C] 3rd Field Work																									■																																																												
[n] Drafting of Guideline/Manual for Water-saving Irrigation																									■																																																												
[o] Improvement of Surface Irrigation Method and Fatigation Measures																									■																																																												
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[q] Continuation of Extension Activities																									■																																																												
[r] Collaboration in Expansive Promotion of Water-saving Irrigation																									■																																																												
[s] Support to Mid-term Evaluation Study																									■																																																												
< 4th Year >																																																																																					
[D] 4th Field Work																																					■																																																
[t1] Continuation of Project Activities																																					■																																																
[D] 4th Work in Japan																																																	■																																				
[t2] Preparation of Training Course in Japan																																																	■																																				
[t3] Continuous Cooperation with External Research Organizations																																																	■																																				
[t4] Support to Project Activities in Syria																																																	■																																				
< 5th Year >																																																																																					
[E] 5th Field Work																																																	■																																				
[t5] Joint-working in Third Country																																																	■																																				
[E] 5th Work in Japan																																																	■																																				
[t6] Continuous Implementation of Project Activities																																																	■																																				
[v] Finalization of Project Outcomes																																																	■																																				
[u] Support to Final Evaluation Study																																																	■																																				

■ : Work in Syria (or third country) □ : Work in Japan

During the project period, the Project was timely and successfully implemented on schedule having minor changes as needs arose. Actual conditions of project

implementation are outlined hereinafter by project terms.

3.2 Preparation Work in Japan

Inception Report which is a fundamental text defining project and indicating method of project implementation was to be completed prior to starting field work in Syria. As an initial work term of the Project, “Preparation Work in Japan” was performed to draw out the implementation plan of the Project, and to prepare the Inception Report.

The Preparation Work in Japan was accomplished on schedule as summarized as follows:

Table 3.2.1 Salient Feature of Implementation of “Preparation Work in Japan”

Items	Proposed	Operated	Remarks
Implementing term	December 2008 (0.5 months)	December 2009 (0.5 months)	No change
Implementing tasks	Preparation of the draft implementation plan of the Project	Preparation of the draft implementation plan of the Project	No change
	Preparation of the Inception Report	Preparation of the Inception Report	
Inputs	Assignment Project Leader: 0.17M/M Training: 0.17M/M <u>Extension: 0.17M/M</u> Total 0.50M/M Others No procurement	Assignment Project Leader: 0.17M/M Training: 0.17M/M <u>Extension: 0.17M/M</u> Total 0.50M/M Others No procurement	No change
Outputs	Draft Inception Report (Prepared implementation plan is to be referred within the Inception Report)	Draft Inception Report (Prepared implementation plan was referred within the Inception Report)	No change
Achievement	-	-	Rate of project achievement (Achievement/required results)
Progress	-	0.5 %	Rate of progress (finished assignment/total assignment)

Necessary numbers of copies of the Inception Report were made and delivered as indicated by JICA.

3.3 1st Field Work

The 1st Field Work was commenced in January 2009, and it was implemented as planned in the implementation plan of the Project. Salient feature of the 1st Field Work is shown below.

Table 3.3.1 Salient Feature of Implementation of “1st Field Work”

Items	Proposed	Operated	Remarks
Implementing term	From January 2009 to March 2009 (3.0 months)	From January 2009 to March 2009 (3.0 months)	No change
Implementing tasks	Finalization, Explanation and Discussion for Inception Report	Finalization, Explanation and Discussion for Inception Report	No change
	Collect and analyze general/agricultural data and information	Collect and analyze general/agricultural data and information	
	Review of Phase I Project	Review of Phase I Project	
	Implementation of Baseline Survey	Implementation of Baseline Survey	
	Pre-selection of Project Sites and Pre-design of Demo-Fields	Pre-selection of Project Sites and Pre-design of Demo-Fields	
Inputs	Assignment Project Leader: 2.33M/M Training: 2.33M/M Extension: 2.33M/M Socio-economy 1.00M/M Irrigation system 1.83M/M <u>Farm management 0.67M/M</u> Total 11.0M/M Others Equipment listed within the Inception Report	Assignment Project Leader: 2.33M/M Training: 2.33M/M Extension: 2.33M/M Socio-economy 1.00M/M Irrigation system 1.83M/M <u>Farm management 0.67M/M</u> Total 11.0M/M Others “Office Machineries” and “measuring instruments” were procured	No change
Outputs	- Inception Report - Progress Report 1 - Results of Baseline Survey	- Inception Report - Progress Report 1 - Results of Baseline Survey	No change
Achievement	-	13.3 %	Rate of project attainment (Achievement/required results)
Progress	-	11.2 %	Rate of progress (finished assignment/total assignment)

After arriving in Syria for Japanese Team, firstly Kick-off Meeting was held on January 12, 2009. In the meeting, Draft Inception Report was submitted and explained its contents to the Syrian side. And counterparts of the Project were nominated in the response of the request of Japanese experts team.

The project team consists of the Japanese experts and Syrian counterparts was started their project activities. Following tasks were completed on schedule.

- Confirming the implementation plan on the basis of the tentative idea presented in the Draft Inception Report,
- Finalizing the Draft Inception Report through discussion with Syrian counterpart

- personnel,
- Collecting and analyzing data and information related to the Project,
 - Reviewing actual situation and problems on the project continuation since DEITEX I was phase out, analyzing the causes and countermeasures for the identified problems,
 - Implementing Baseline Survey for the purposes of benchmarking of indicators for project evaluation, confirming the adoptability of modern water-saving irrigation in the project target areas, and examining the forms of appropriate farming for the project target areas, and
 - Pre-selecting the sites of demonstration farms, and pre-designing the modern irrigation system to be newly installed.

Baseline Survey in the two governorates of Aleppo and Raqqa which were the governorates newly targeted, was carried out by the joint-working party with the project team and hired external engineers, while the survey in the governorates of Rural Damascus, Daraa and Hama was conducted mostly by Syrian counterparts who joined previous Baseline Survey during the Phase I Project. At the same time, the survey for the three governorates was focused on the areas excluding the districts implementing demonstration activities during the Phase I Project. The subjects of the study are outlined as follows:

Table 3.3.2 Major Study Subjects of Baseline Survey

Target Area	Party of Executio	(1) benchmarking of indicators for project evaluation	(2) confirming the adoptability of modern water-saving irrigation			(3)examining an appropriate farming formation of water-saving irrigated agriculture
			Analysis in social aspect	Analysis in economy	Analysis in irrigation techniques	
Aleppo and Raqqa	Project Team	Quantification of benchmark for the PDM indicators through analyzing collected data	- analysis about farmers' beliefs and norms on irrigation water use - analysis about collective action - analysis about farmers' beliefs and norms on agricultural farming	- analysis about farm-economy	- analysis of farmers' capability adopting water-saving irrigation - Identification of problems in water-saving irrigation introduction	Whole activities concerning to this subject
	Hired external engineers	- Collection/observation of reference data concerning to the indicators of project purpose in PDM - Collection/observation of reference data concerning to the indicators of project outputs in PDM	- collection of data/information, and analysis about general sociological characteristics	- analysis about marketing of agricultural products - Investigation of farmers economy - cost analysis of water-saving irrigation - benefit analysis of water-saving irrigation	- investigation of farmers' skill of current irrigation practice - investigation of farmers' capability of operation/maintenance in irrigation - investigation of farmers' adoptability of participation	—

Rural Damascus, Dara and Hama	Counterparts under the supports from the project team	- Collection/observation of reference data concerning to the indicators of project purpose and outputs in PDM Quantification of benchmark for the PDM indicators thorough analyzing collected data, under the full support of project team	- analysis about the subjects mentioned above (competing the analysis with reference to the results of Phase 1 project)	- analysis about the subjects mentioned above (competing the analysis with reference to the results of Phase 1 project)	- analysis about the subjects mentioned above (competing the analysis with reference to the results of Phase 1 project)	- Whole activities concerning to this subject (fulfilling the activities with full support of project team)
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In addition to the activities mentioned above, Progress Report 1 was prepared on March 2009 compiling the results and information about the progress of the Project.

3.4 2nd Field Work

The 2nd Field Work was implemented from April 2009 to March 2010, and it was completed as planned in the implementation plan. Salient feature of the 2nd Field Work is shown below.

Table 3.4.1 Salient Feature of Implementation of “2nd Field Work”

Items	Proposed	Operated	Remarks
Implementing term	From April 2009 to March 2010 (12.0 months)	From April 2009 to March 2010 (12.0 months)	No change
Implementing tasks	Finalization of Baseline Survey Report Selection of Project Sites Establishment of Demo-farms/Satellite Plots Preparation of Guideline/Manual for Water-saving Irrigation Investigation of Surface Irrigation Methods and its Related Techniques Implementation of Training Activities Execution of Extension Activities Examination of Cooperation with External Research Organizations	Finalization of Baseline Survey Report Selection of Project Sites Establishment of Demo-farms/Satellite Plots Preparation of Guideline/Manual for Water-saving Irrigation Investigation of Surface Irrigation Methods and its Related Techniques Implementation of Training Activities Execution of Extension Activities Examination of Cooperation with External Research Organizations Execution of Advisory Study for the Project	Additionally, Advisory Study for the Project was carried out by JICA during November 2009 for the purpose of monitoring the progress of the Project, consulting on the issues for smooth implementation of the Project, and confirming direction of activities during the remaining cooperation period.
Inputs	Assignment Project Leader: 6.00M/M Training: 8.00M/M Extension: 5.00M/M Socio-economy 4.00M/M Irrigation system 4.50M/M <u>Farm management 2.00M/M</u> Total 29.5M/M Others	Assignment Project Leader: 6.00M/M Training: 8.23M/M Extension: 4.77M/M Socio-economy 4.00M/M Irrigation system 4.50M/M <u>Farm management 2.00M/M</u> Total 29.5M/M Others	No change

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	<ul style="list-style-type: none"> - Irrigation equipment of the demonstration farms etc. - Implementation of training in Japan - Implementation of training in third country 	<ul style="list-style-type: none"> - “Irrigation equipment”, “Training equipment” and “Cars for project use” were procured - Implementation of training in Japan for 4 C/Ps - Implementation of training on third country (Tunisia) for 7 C/Ps 	
Outputs	<ul style="list-style-type: none"> - Baseline Survey Report - Progress Report 2 - Progress Report 3 - Establishment of Demonstration Farms with suitable modern irrigation system 	<ul style="list-style-type: none"> - Baseline Survey Report - Progress Report 2 - Progress Report 3 - Establishment of Demonstration Farms with suitable modern irrigation system - Newly developed extension tools (posters, new irrigation tools) - DEITEX News No.1 - 4 	No change
Achievement	-	40.4 %	Rate of project attainment (Achievement/required results)
Progress	-	41.3 %	Rate of progress (finished assignment/total assignment)

On the basis of the result of Baseline Survey, project sites were selected in every concerned governorate. Furthermore, demonstration farms (named as “satellite plots” for the on-going 3 Governorates) were selected in consideration with the result of pre-selection survey which was done within Baseline Survey during the 1st Field Work.

Table 3.4.2 Salient Feature of Selected Demonstration Farms

Governorate		Site	Type	Irrigation area	Major crops	Irrigation equipment	Farmer's name
Demonstration-farm, Demonstration-Experimental Plot	Aleppo	Jine	Demo- Farm	7ha	Wheat, Cotton, Sugar beet	Movable sprinkler Drip tube (GR) Gated pipe	Mr. Esmail Abdla
		Surbaya Irrigation Station	Demo-Experimental Plot	-	-	Small-scale modern irrigation Improved surface irrigation	-
	Raqqa	Sukkarie	Demo- Farm	11ha	Wheat, Cotton, Sugar beet	Movable sprinkler Drip tube (GR) Gated pipe	Mr. Ahamad Karil
		Ebb Quein Irrigation Station	Demo-Experimental Plot	-	-	Small-scale modern irrigation Improved surface irrigation	-
Ready Implemented Gov. Satellite Plots	Hama	Subbin	Satellite Plot	3ha	Wheat, water melon	Movable sprinkler Drip tube (GR)	Mr. Mhamoud Maruwan Al Husein
		Halfaya	Satellite Plot	4ha	Wheat, Potato	Fixed sprinkler	Mr. Suleman Mhamoud Hndawuy
	Daraa	Dael	Satellite Plot	10ha	Vegetable (Tomato, etc)	Fixed mini sprinkler Drip (GR)	Mr. Walid Alasmec
		Nawa	Satellite Plot	20ha	Vegetable (Tomato, etc)	Fixed mini sprinkler Drip tube (GR)	Mr. Bassam Jundi
	R Dams	Beit Sabar	Satellite Plot	1ha	Potato, Vegetable (Cucumber)	Fixed mini sprinkler Drip tube (GR)	Mr.Hassan Al Safadi

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	Surghaya	Satellite Plot	-	Fruit trees	Drip emitter	Mr.Homoud Qwaider Mr. Ameen Abd Al-Nabee
	Arne	Satellite Plot	6ha	Fruit trees	Drip emitter	55 farmers

After selecting demonstration sites in every governorate, appropriate modern irrigation systems were established by the end of January 2010.

Training course for water-extensionist is programmed consisting of four training sessions. Running of every training course was opened to whom it may concern in other governorates or in future. Details of the training are explained in **Chapter 4**.

3.5 3rd Field Work

The 3rd Field Work was commenced in April 2010, and it was implemented with some modification in the implementation duration. The implementation period of 3rd Field Work was changed from 12 months in original to 9 months for the convenience of management so as to be terminated at the end of the year 2010. Salient feature of the 3rd Field Work is shown below.

Table 3.5.1 Salient Feature of Implementation of “3rd Field Work”

Items	Proposed	Operated	Remarks
Implementing term	From April 2010 to march 2011 (12.0 months)	From April 2010 to December 2010 (9.0 months)	Changed in the implementation period
Implementing tasks	Drafting of Guideline/Manual for Water-saving Irrigation	Drafting of Guideline/Manual for Water-saving Irrigation	No change
	Improvement of Surface Irrigation Methods and Related Techniques	Improvement of Surface Irrigation Methods and Related Techniques	
	Continuation of Training Activities	Continuation of Training Activities	
	Continuation of Extension Activities	Continuation of Extension Activities	
	Collaboration in Expansive Promotion of Water-saving Irrigation	Collaboration in Expansive Promotion of Water-saving Irrigation	
	Support to Mid-term Evaluation Study	Support to Mid-term Evaluation Study	
Inputs	Assignment Project Leader: 6.50M/M Training: 8.00M/M Extension: 6.00M/M Socio-economy 2.00M/M Irrigation system 3.00M/M <u>Farm management 1.00M/M</u> Total 26.5M/M Others	Assignment Project Leader: 3.50M/M Training: 5.50M/M Extension: 3.50M/M Socio-economy 3.50M/M Irrigation system 3.50M/M <u>Farm management 0.50M/M</u> Total 20.0M/M Others	Changed in M/M corresponding to the change of the implementation period.

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	Implementation of training in Japan - Implementation of training in third country	- Implementation of training in Japan for 8 C/Ps - Implementation of training on third country (Egypt) for 6 C/Ps	
Outputs	- Progress Report 4	- Progress Report 4 - DEITEX News No.5 – 7 - Newly developed extension tools (posters, new irrigation tools)	No change
Achievement	-	62.4 %	Rate of project attainment (Achievement/required results)
Progress	-	61.7 %	Rate of progress (finished assignment/total assignment)

Training tools and extension materials once produced were modified during the 3rd Field Work based on the requirement and real attentions of the farmers/extensionists. Extension activities were also conducted with much related with training activities.

In addition to the project activities, Mid-term evaluation study was held in October 2010.

3.6 4th Field Work/4th Work in Japan

The 4th Field Work was once commenced in February 2011 having the implementation duration from February to December in the same year. On its way of implementation on 25 April 2011, the on-going 4th Field Work was broken to an end because all Japanese experts had to leave Syria by a security season. For the Japanese experts staying in Japan, there was a remedy backstopping the project implementation by making remote-assistance to Syrian C/Ps from Japan. Since Japanese experts could cooperate to the project implementation from Japan, the 4th Field Work was switched to the 4th Work in Japan. Having such transition within the implementation duration, the 4th Field Work/4th Work in Japan was progressed in an irregular form. Salient feature of the 4th Field Work/4th Work in Japan is shown below.

Table 3.6.1 Salient Feature of Implementation of “4th Field Work/4th Work in Japan”

Items	Proposed as original “4th Field Work”	Operated as rearranged “4th Field Work/4th Work in Japan”	Remarks
Implementing term	From February 2011 to December 2011 (11.0 months)	From February 2011 to December 2011 (11.0 months)	No change
Implementing tasks	Conclusion of Project Activities (training, extension and other planned activities of the Project)	Conclusion of Project Activities (training, extension and other planned activities of the Project)	Modified by the security reason in Syria

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	Support to Final Evaluation Study		
		Preparation of Training Course in Japan	
		Continuous Cooperation with External Research Organizations	
		Support to Project Activities in Syria	
Inputs	Assignment Project Leader: 5.17M/M Training: 7.00M/M Extension: 5.50M/M Socio-economy 3.00M/M Irrigation system 4.00M/M <u>Farm management 1.00M/M</u> Total 25.67M/M Others Implementation of training in Japan	Assignment Project Leader: 5.17M/M Training: 4.94M/M Extension: 4.27M/M Socio-economy 0.00M/M Irrigation system 2.67M/M <u>Farm management 1.00M/M</u> Total 18.05M/M Others - Implementation of training in Japan for 7 C/Ps - Participation ICID International Congress held in Iran for 2 C/Ps	Modified by the security reason in Syria
Outputs	- Progress Report 5 - Progress Report 6	- Progress Report 5 - Progress Report 6 - DEITEX News No.8– 9 - Newly developed extension tools (posters, new irrigation tools)	No change
Achievement	-	91.0 %	Rate of project attainment (Achievement/required results)
Progress	-	90.4 %	Rate of progress (finished assignment/total assignment)

Final evaluation study was postponed to the next implementation period due to a managerial reason.

3.7 5th Field Work/5th Work in Japan

Even after terminating of the implementation period of the 4th Field Work/4th Work in Japan, the situation in Syria did not bring to restart field work for Japanese experts. For the same reason in the previous implementation period, the original plan of 5th Field Work was modified to 5th Field Work/5th Work in Japan making cooperation from Japan. Salient feature of the 5th Field Work/5th Work in Japan is shown below.

Table 3.7.1 Salient Feature of Implementation of “5th Field Work/5th Work in Japan”

Items	Proposed as original “5th Field Work”	Operated as rearranged “5th Field Work/5th Work in Japan”	Remarks
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Implementing term	From February 2012 to July 2012 (6.0 months)	From February 2012 to July 2012 (6.0 months)	No change
Implementing tasks		Joint-working in Third Country (Amman, Jordan)	Modified corresponding to the change of implementation formation
		Continuous Implementation of Project Activities	
	Finalization of Project Outcomes	Finalization of Project Outcomes	
		Support to Final Evaluation Study	
Inputs	Assignment Project Leader: 4.33M/M Training: 5.00M/M Extension: 2.50M/M Socio-economy 0.0 M/M Irrigation system 0.0 M/M <u>Farm management 0.0M/M</u> Total 11.83M/M Others Not applicable	Assignment Project Leader: 2.60M/M Training: 2.60M/M Extension: 1.00M/M Socio-economy 0.0 M/M Irrigation system 0.50M/M <u>Farm management 1.60M/M</u> Total 8.3M/M Others Holding joint-working of C/Ps and Japanese experts in Amman, Jordan	Modified corresponding to the change of implementation formation
Outputs	- Final Report of the Project - Technical Manual for Modern Irrigation - Training tools - Extension tools	- Final Report of the Project - Technical Manual for Modern Irrigation - Training tools - Extension tools	No change
Achievement	-	100.0 %	Rate of project attainment (Achievement/required results)
Progress	-	100.0 %	Rate of progress (finished assignment/total assignment)

Remaining activities of every project field were completed by the end of the project period. Final Evaluation Study was successfully carried out in March 2012. Furthermore, Final Steering Committee Meeting was held on 19 March 2012, even it was connected through the video conference systems in Tokyo, Damascus and Amman. Furthermore, Joint-working between Syrian C/Ps and Japanese experts was carried out in Amman during from 2 April to 17 April 2012. The Joint-working consisting of five sessions, namely 1) Promotion of Project Activities of DEITEX II Project in 5th Year, 2) Implementation of "CUDBAS Workshop", 3) Discussion on Project Activities in Governorate level, 4) Discussion on Project Activities during Remaining Period, and 5) Discussion on How to Sustain the Project after July 2012, was successfully implemented having the attendances of 29 C/Ps and 3 Japanese experts.

3.8 Overviews of Implementation of the Project

In accordance with the actual schedule of project implementation, the Project was managed in controlled manner. Real conditions of implementation of the Project are overviewed hereinafter.

Concerning to project input, actual assignment of Japanese team members consisting of long-term experts and short-term experts are shown in Table A (refer to ANNEX 1). Procured equipment within the Project, counterpart training in outside countries including Japan, and conditions of assignment of counterparts consisting of central and local counterparts are shown in Tables B, C, and D (refer to ANNEX 1), respectively. Furthermore, expended local costs borne by Japanese side and Syrian side are shown in Table E (refer to ANNEX 1). Concerning to PDM of the Project, it was revised twice during project implementation. Besides of Version 0.0 which is original form of PDM, Version 2.0 which is the final version are given in ANNEX 2. In addition, records of Steering Committee Meeting were attached in ANNEX 3.

Even though some modifications were made in implementation schedule by the security reason in Syria as mentioned above, the Project was fruitfully completed on schedule and accomplished its project purpose.

3.9 Additional Activities taken within the Project

In addition to the achievements on the above-mentioned obligatory tasks of the Project, many un-predetermined activities were carried out according to the necessity arisen on occasion. Followings are the overview of the additional activities which were occasionally conducted within the project implementation period.

Table 3.9.1 Additional Activities taken within the Project

Category	Activities	Outlines	Remarks
Publicity work of the Project * it is also mentioned in the section 4.12.	Opening web-page of the Project	The web-page was established and maintained at the JICA web-site	http://project.jica.go.jp/syria/0800738/
	Preparation of "DEITEX News"	Nine(9) numbers of the news were prepared.	Presently, it has been managed by Syrian side.
	Contribution of articles in "Newsletter of JICA Syrian Office"	Three articles were contributed.	
	Contribution of articles in "Agricultural Magazine in Syria"	Three articles were contributed.	
Technology development	Preparation of technical reports	Eight(8) technical reports were prepared by concerned C/Ps.	Those were prepared on the course of research activities of the Project.

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	New extension tools for modern irrigation	Several extension tools which are applicable even for the outside of the Project, were developed.	These tools are referred in Section 6.4.
Inter-cooperation between sectoral organizations and donors	Participation to related seminars	The project team was participated to the related seminars managed by some donors.	
	Opinion exchange between concerned donors	In the occasions of interviewing, opinions were exchanged time by time.	DEITEXII Project has taken a mutual cooperation with several projects such as “North Eastern Region Rural Development Project (NERRDP)” and “Project for Rational Use of Natural Resources to improve Agriculture Productions”.
Training	Training for new staff of DMIC	Several training courses were given to the newly recruited staff of DMIC.	
	Training for Iraq engineers	Special training course was given to the Iraq engineers.	
Program approach	Collaboration with JOCV	In connection with program approach, the project made JOCV’s involvement.	
	Cooperating with other JICA projects	The project team sometimes participated in the activities made by the other JICA projects.	

4. Results of the Project

4.1 Review of Phase I Project

The DEITEX II was started its operation in December 2008, 10 months after DEITEX I had been phased out. During this 10 months absence of the Japanese technical assistance, Syria C/Ps continued project activities without substantial support from Japanese experts, which was a fortunate opportunity for Syrian C/Ps to verify the outcomes of DEITEX I and to identify difficulties or issues in urging irrigation modernization.

At the beginning of DEITEX II, a study for reviewing the Phase I Project was carried out by means of collecting information and interviewing to the concerned Syrian organizations/counterparts personnel. The interview study was done by the Japanese experts in 23 questions categorized by the subjects of institution, organization, human recourses, project activity, and others.

As the results of the reviewing study, it was clarified that the approach, modality and methods of DEITEX I were well applicable and successful for the promotion of water-saving. Nevertheless, on the other hand, following 11 issues in the fields of training and extension were identified. All of the identified issues were finally coped with by taking suitable countermeasures during the project period as mentioned within the table.

Table 4.1.1 Issues Identified by the Reviewing Study and Their Countermeasures

Field of Activities	No	Issued identified	Countermeasures/improvement taken by the Project
Training	1	Duration of training differs by the Governorates. It should be standardized unless there is a particular reason.	The differences are tried to minimize. Remaining small differences have been made according to Governorates' necessity to make the training effective.
	2	It is necessary for Syrian C/Ps to grow out of dependence to the Project (Japanese exoerts).	All training courses become to be conducted with the initiative of Syrian C/Ps in every governorate.
	3	It is necessary to modify a part of training curriculum and training materials.	Training curriculum as well as materials is improved like increasing exercise/practice in training hour.
	4	It is necessary to utilize Water-Extensionist (WE) and SMS more effectively.	WE and SMS become to participate to the training courses as trainer/training facilitator in every governorate.
	5	Follow-up training for existing WE and SMS is necessary.	Follow-up training for existing WE and SMS are established.
Extension	6	It is necessary to confirm effectiveness of farmers' competition events.	A competition for the best modern irrigation farmers is implemented in every governorate. And, the know-how of doing farmers' competition is transferred to Syrian C/Ps.
	7	Competition events for persons in charge of extension are necessary.	Systematic process and cycle of execution of extension activity is made a routine which is the aimed point through holding the competition events.
	8	It is necessary for WE to identify actual needs of irrigation farmers further more.	Establishing annual extension plan is systematized. Identification of farmers needs is considered as an important issue in the process of the annual plan.
	9	It is important to monitor behavior	The way of "group extension" was introduced, in which

		change for farmers as progressing extension service.	the behavior change of farmers is easy to monitor and recognize.
	10	It is necessary to consider farmer-to-farmer extension mechanism.	The Project tries to foster key-farmers by means of adopting “group-extension”.
	11	Economic aspect of farming should be considered more in the dissemination of irrigation modernization.	The Project appeals to encourage farmers incentive by showing advantages of modern irrigation in economic aspect. And, the data in economic aspect were prepared by referring the farmers’ records in DEITEX notebook.

4.2 Baseline and Impact Survey

4.2.1 Baseline Survey

Baseline Survey was carried out on the Target Area for the purpose of; (1) benchmarking of indicators for project evaluation, (2) confirming the adoptability of modern water-saving irrigation on the basis of the analysis about the present condition in irrigation, socioeconomic and agricultural economic aspects, and (3) examining appropriate farming formation of water-saving irrigated agriculture by Target Area.

As mentioned in **Chapter 3.3**, the survey purpose and methodology for the on-going 3 Governorates were different from those for the new 2 Governorates. Site survey and interviews were carried out during from January and February 2009, and the results were analyzed and finalized in May 2009. Results of Baseline Survey summarized as follows:

(1) Classification of Irrigated Agriculture for the Concerned Governorates

In order to have a general view of irrigated agricultural feature, current irrigation status of each governorate was tried to classify into several types of irrigated agriculture from the aspects of sorts of cultivated crops, irrigation methods and water sources, and degree of irrigation modernization. Detailed information and data in those aspects were collected at unit-wise which is the most detailed information available, then the collected data were arranged into a classification map. Taking the arranged maps by several aspects in the concerned governorates into consideration, feature of irrigated agriculture of the concerned governorates were classified into several typical patterns of groups as shown in **Fig.4.2.1** and **Table 4.2.1**. As the classification in irrigated agriculture is a cluster of irrigated zones having an uniformity in irrigation and farming, it was much constructive in formulating areal interchanging of farmers and extensionists in the events of training and extension and so on.

Table 4.2.1 Outline of Classified Types of Irrigated Agriculture in Concerned Governorates

Governorates	Classification	Classifying Factors			Urgency and Necessity of Water Saving
		Major Crops	Water Source	Current Irrigation Method	
Rural Damascus	Type I	Fruit trees	Well	Modern method (drip)	Extremely high
	Type II	Mixed of fruit trees, vegetables and wheat	Well	Modern method (sprinkler)	Extremely high
	Type III	Wheat, vegetables(partly)	Surface water, well (partly)	Surface methods	High
Daraa	Type I	Vegetables and wheat	Well	Modern method (drip)	Extremely high
	Type II	Fruit trees and wheat	Well	Modern method (drip)	Relatively high
	Type III	Wheat and fruit trees	Surface water	Surface methods	Extremely high
Hama	Type I	Vegetables consisting with the strategic crops	Well	Modern method (sprinkler)	Extremely high
	Type II	Wheat, vegetables(partly)	Well	Sprinkler and surface methods	Extremely high
	Type III	Wheat and fruit trees	Surface water, Well (partly)	Surface methods	High
Aleppo	Type I	Cotton and wheat	Well, Surface water (partly)	Modern method (sprinkler)	Extremely high
	Type II	Wheat, vegetables (potato, sugar beet)	Well, Surface water (partly)	Modern method (sprinkler)	Extremely high
	Type III	Cotton and wheat	Surface water	Surface methods	High
Raqqa	Type I	Wheat, Sugar beet, cotton(partly)	Well and surface water	Surface methods, Sprinkler(very partly)	High
	Type II	Cotton, wheat	Well and surface water	Surface methods, Sprinkler(very partly)	High
	Type III	Cotton, wheat	Surface water	Surface methods,	Relatively high
	Type IV	Wheat, Sugar beet, cotton(partly)	Surface water	Surface methods,	Medium

(2) Pre-selection of Unit Area of Extension

The pre-selection of project sites was proceeded in parallel with the implementation of Baseline Survey. For the case of new 2 governorates of Aleppo and Raqqa, “project site” means a priority site so as to successfully initiate an instructive modern irrigation with high impacts, where hold more advantageous characteristics for introducing modern irrigation. “Project site” of the on-going 3 governorates is synonymous with a model unit area of extension. It is aimed to create the model unit area of extension which is the advanced command area of well-organized and functioned extension unit in modern water-saving irrigation. Two of extension units for the candidates of project-sits were preselected by each governorate according to the selection criteria.

Table 4.2.2 Tentative Criteria of Selection of Project Site

Items		For the new 2 governorates	For the on-going 3 governorates
Definition of “Project site”		Pilot site for introducing modern irrigation	Model unit area of extension under the well-organized and functioned extension unit in modern water-saving irrigation
Selection Criteria	Suitability in agriculture/irrigation viewpoint	High representability of the regional irrigated agriculture/crops	High irrigation density area
		High adoptability of modern irrigation	

Suitability in successfulness viewpoint	High demonstration effect in terms of easy access and dense public relations	Availability of Water-Extensionists trained by DEITEX Phase I project
Suitability in farmers' cooperation/adoptability viewpoint	High cooperativeness of farmers to the Project or its purpose in general	Advanced area of farmers' apply to DMIC loan

(3) Questionnaire Survey

1) General Description

In order to fulfill the 3rd task of Baseline Survey, questionnaire survey for farmers was carried out in the areas of the pre-selected extension units.

Table 4.2.3 Outline of Implementation of Questionnaire Survey

Items	Outline of Implementation of Questionnaire Survey
Target areas for the interview to farmers of the baseline survey	Two (2) of extension units which were pre-selected as the project sites.
Numbers of interviewee farmers	Twenty-five (25) farmers were interviewed to each of the pre-selected area of extension unit.
Formation of survey team	One survey team was formed for each area of extension, of which 2 or 3 members were assigned. For the three on-going governorates, local counterparts were engaged in the interview survey. For the new 2 governorates, local consultants were employed as enumerators.
Backstopping structure of the implementation of questionnaire survey	Branch offices of counterpart organizations in each concerned governorate fully cooperated and supported to the implementation of the questionnaire survey.
Analysis system	Survey teams checked the interviewed results, and conducted primary analysis like summing up numbers of repliers for yes/no question.
Survey period	The questionnaire survey was completed in 2.2months from the beginning of January to the beginning of March.

Prior to interviewing to farmers in the sites, interviewee farmers were listed up excluding the extraordinary farmers in the scale and performance of farming on the basis of the information prepared by the concerned extension unit.

2) Results of the Questionnaire Survey

Major points identified through the questionnaire survey are enumerated as follows:

- As for land area and ownership, Aleppo and Raqqa is 2-3 times larger in comparing to the governorates covered during Phase I Project. Furthermore, the main crops cultivated in Aleppo and Raqqa are characterized by the extremely high rate of grain such as wheat and field crops including cotton and sugar beet.
- As for the experience and the willingness of farmers to participate in the group activities, higher percentage was observed in Rural Damascus. Moreover, the percentage of the farmers with the willingness to save water through group activities

is the highest in Rural Damascus.

Table 4.2.4 Current Situation in Group Activities by Governorates

Governorate	Share of farmers about group activities		Position in group action	Future measures corresponding
	having experiences	being interesting in group irrigation		
Raqqa	15%	55%	While less experienced, necessity of group action is fairly infiltrated into farmers.	Attaching to set about group activities in any cases, it is targeted to hold group action irrigation in future.
Aleppo	45%	25%	Nevertheless fairly experienced, necessity of group action is less infiltrated into farmers.	For the time being, necessity of group action in irrigation should be highlighted.
Hama	30%	40%	While not much experienced, necessity of group action is gradually infiltrated into farmers.	Enlightening farmers to group activities, group action in irrigation should be gradually applied.
R.Damas	75%	95%	With much experienced, necessity of group action is much highly infiltrated into farmers.	It is proposed to simply show a success model of group action in modern irrigation.
Daraa	60%	75%	With considerably experienced, necessity of group action is highly infiltrated into farmers.	It is proposed to show a success model of group action in modern irrigation giving related extension activities at the same time.

- Majority of farmers claimed the problems of “High prices of agricultural inputs”, “Low prices of selling products”, “High prices of irrigation equipment” and “Shortage of money for agricultural inputs”.
- According to the results of the cropping pattern and the average harvested area for each crop, it was clarified that the strategic crops such as wheat, cotton and sugar beet were cultivated in high proportion under rather large field in the northern governorates of Hama, Aleppo and Raqqa.
- As for the production cost and the net income, the net income obtained under the modern irrigation system is higher in many cases although higher production cost is required.
- Since the influence of diesel price increase is strongly felt by the majority of farmers especially in the northern governorates, saving fuel through saving irrigation water might be crucial for those farmers.
- Based on the detailed analysis of the production cost, the cost for the irrigation including pump, irrigation equipment and fuel is relatively higher for the strategic crops. Since the major crops in the northern governorates are those crops and the cost for pumping and fuel can be saved through saving irrigation water, the effect of water saving is expected to greatly improve the crop budget.

- As for the actions to be taken after the price increase of diesel fuel by the farmers, the answer of “Continue farming and save input prices for farming” is dominant in Daraa, Rural Damascus and Raqqa. On the other hand, the answer of “Change the crop” is dominant in Hama and Aleppo.
- According to the results regarding the support on the introduction of modern irrigation, farmers are not receiving sufficient support and also farmers are not satisfied with the available governmental support in general.
- Only limited number of farmers has the plan to get a loan from DMIC compared to the proportion of farmers who have information on the loan system. The activity of DMIC should also be improved in order for more farmers to apply for the loan system.
- Water shortage is the most serious problems of farmers. On-going 3 governorates show the tendency that farmers feel fear of water shortage more rather than Aleppo and Raqqa. The former shows at 67.5%, otherwise the latter is at 47.3%.
- Northern region highly depends on surface irrigation method in compare with on-going 3 governorates. Raqqa shows that more than 80% of farmers still apply surface method, while 25.1% of farmers in the on-going 3 governorates apply traditional surface.
- According to the interviewed results of the amount of supplied irrigation water, those are almost oversupplied more than 20 - 30% to the rational requirement of water. However, only wheat is extremely less supplied water in every governorate, of which farmers seem to be applied supplemental irrigation under fully utilizing available rainfall water. Furthermore, their irrigation for wheat might be under the condition of water shortage having somewhat water-stress.

In addition, PDM indicators were quantified on the basis of the results mentioned above.

4.2.2 Impact Survey

In order to identify the Project’s impacts in the project sites at the time of mid-term of the Project, Impact Survey was carried out prior to implementing Mid-term Evaluation Study. Preparation of Impact Survey was started from September 2010, and the full-scale study was conducted by counterparts and WE/SMS through October 2010. Around 300 interviewee farmers which were about 5 percentages of total households in

the project sites were selected through screening of eliminating the extraordinary farmers in land holding, scale of irrigated agriculture, irrigation manner etc.

Results of Impact Survey are summarized as follows:

- Situation of irrigated agriculture for each project site was investigated at the time of mid-term of the project period. General condition for each project site is summarized below.

Table 4.2.5 General Irrigation Condition of Project Sites Studied by the Impact Survey

Governorate	Name of project site (extension unit)	Average area of land holding (donum)	Average Cultivated area (donum)	Share of cultivation in owned land	Percentage of cultivated area by seasons and major crop			Irrigation modernization	
					Winter crop	Summer crop	Tree crop	Ratio of modernization*	Major method
Raqqa	Sukkarie	188.2	190.4	94.0%	73.2% Wheat	26.8% Cotton Sugar Beet	0.0%	13.8% (0.8%)	Traditional
Aleppo	Jine	108.5	122.8	81.5%	66.3% Wheat Sugar Beet	33.7% Cotton Sugar Beet	0.0%	36.9% (16.9%)	Traditional Sprinkler
Hama	Halfaya	65.5	60.2	100.0%	54.4% Wheat Sugar Beet	45.6% Potato Cucumber	0.0%	66.7% (55.3%)	Sprinkler
	Majdal	42.5	43.2	87.9%	54.8% Wheat	45.2% Potato Sugar Beet	0.0%	82.2% (-)	Sprinkler
R.Damas	Surghaya	34.6	34.6	100.0%	0.0%	0.0%	100.0% Apple Cherry	96.9% (-)	Drip
	Beit Saber	45.3	42.6	98.2%	76.0% Wheat	20.8% Potato	3.2% Olive	64.5% (45.1%)	Sprinkler
	Arne	2.1	2.1	100.0%	0.0%	0.0%	100.0% Apple Cherry	- (55.6%)	Drip Traditional
Daraa	Dael	57.2	37.1	96.2%	25.8% Potato	17.4% Tomato	56.8% Olive Grape	100.0% (-)	Drip
	Nawa	51.4	89.0	36.9%	10.2% Wheat	86.7% Tomato Potato	3.1% Olive Peach	86.4% (53.4%)	Drip

*: Figures in () are the data obtained in the previous Baseline Survey. For some project sites, the data was not investigated because the Baseline Survey had been implemented before the project sites were specified.

- Amount of used water for irrigation at the time of mid-term of the Project was obtained for several typical crops by governorates. For the case of farmers who transferred to modern irrigation, drastic reduction of using water was observed in Hama, Aleppo and Raqqa as showing high water saving ratio from 34.5% to 50.9%.
- Even for farmers who introduced modern irrigation before starting the Project, significant reduction of using water was reported in Hama, Rural Damascus and Daraa as showing high water saving ratio from 14.4% to 50.2%.
- Crop yield were increased by introducing modern irrigation. Comparing crop yields between with and without modern irrigation, increase in yield was 8.3% and 5.4% in Hama for sugar beet and wheat, respectively. Similarly, yield increase of cotton was

15.7% and 39.4%, in Aleppo and Raqqa, respectively.

- The percentage of farmers who did not receive sufficient support from DMIC in all aspects indicated at 50-60%, which decreased from 70% of the same previously investigated in Baseline Survey. Ratio of farmers satisfied with the DMIC's support increased in comparing with the Baseline Survey.
- While more than 80% of farmers in the on-going 3 governorates already have information on the loan system of DMIC, farmers in Aleppo and Raqqa shows less percentage at 20-40%.
- As to the question about troubles they had to go through to perform irrigation, more than 50% of interviewee replied as they held somewhat problems in every governorate. "Water shortage" is the most serious problem among them, and the next most serious was "decreasing availability of water". Particularly, salt water problem was raised in Raqqa.
- A series of questions concerning feeling and attitude to scarcity or save water were made to interviewees in order to judge whether they were motivated or aware of saving water in irrigation by scarcity of water. More than 40.0% of the farmers of the on-going 3 governorates were judged as motivated to saving water, however, Aleppo and Raqqa showed the rate at 20.0% and 6.5%, respectively.

4.3 Demonstration Activities

4.3.1 Project Sites and Demonstration Fields

(1) Selection of Project Sites

The Project was designed to concentrate its extension activities to the project sites within the concerned five governorates of Hama, Rural Damascus, Daraa, Aleppo and Raqqa. The project sites were selected on an existing extension unit in consideration with suitability and applicability to other areas as mentioned in **Section 4.2.1** "Baseline Survey". Through a fair-minded and scientific process of selection, one each of project site was selected in Aleppo and Raqqa, and a few numbers of project sites were chosen in the on-going governorates of Hama, Rural Damascus and Daraa for which DEITEX I had been implemented. The outline of the selected project sites are summarized below.

Table 4.3.1 List of the Selected Project Sites

Governorate	Name of Project Site	Location	Status as Extension Unit		
			Belonging <i>Daira</i>	Total Area (ha)	Type of Irrigated Agriculture**
Aleppo	Jine	West of the governorate	Jabal Saman	1,922	Type I
Raqqa	Sukkarié	Northwest of the governorate	Tal Abiyad	9,095	Type I
Hama	Majidal*	Center of the governorate	Mharde	108*	Type II
	Halfaya	North the governorate	Mharde	3,978	Type I
Daraa	Dael	South of the governorate	Tafas	9,100	Type III
	Nawa	West of the governorate	Nawa	13,567	Type I
Rural Damascus	Beit Sabar	West of the governorate	Haramoun	1,715	Type II
	Surghaya	North of the governorate	Zabazani	13,850	Type I
	Arne	Northwest of the governorate	Qatana	3,532	Type I

*: As to the project site of “Majidal” in Hama, the Project is focused on the area of the village “Subbin” only because Majidal is too much varying in irrigated agriculture to be dealt with one project site.

** : These types of irrigated agriculture are followed the classification which was clarified in the Baseline Survey as shown in **Table 4.2.1**.

(2) Spot Selection of Demonstration Fields

Within those project sites, Demonstration Field was established to demonstrate the appropriate modern water-saving irrigation techniques and its management to the neighboring farmers as well as the interested people. The Demonstration Fields were classified into three types, namely Demonstration Farm for Aleppo and Raqqa, Demonstration Experimental Plot for the Irrigation Research Stations in the same governorates, and Satellite Plot for the on-going governorates of Hama, Rural Damascus and Daraa.

1) Objective of Demonstration Farm

Aleppo and Raqqa which has been newly involved into the DEITEX are naturally less advanced in irrigation modernization than the on-going governorates of Hama, Rural Damascus and Daraa. Moreover, the two fresh governorates are in the different condition of irrigated agriculture from those of the on-going governorates. Taking the differences in irrigation into consideration, the Demonstration Farm in Aleppo and Raqqa was applied an improved surface irrigation as well as the pressurized modern irrigation which has been introduced since DEITEX I. Because the improved surface irrigation must be advantageous depending on the applying crop, farming scale and farmers' ability in irrigation practice and so on.

2) Objective of Demonstration Experimental Plot

Even in the present state, some subjects for research and development has remained on the technology of improved surface irrigation. Research on the improved surface irrigation should be continued while the existing techniques of improved surface irrigation have been demonstrated at the Demonstration Farms. For the purpose of the research activities, the Project established Demonstration Experimental Plots within the compound of Irrigation Research Stations of ANRR in Aleppo and Raqqa.

As the Demonstration Experimental Plots have a role of demonstration of the advanced modern irrigation, a set of small-scale pressurized modern irrigation was also installed within the experimental plots for those purposes.

3) Objective of Satellite Plot

Three on-going governorates have shown steady progress in dissemination of modern irrigation since DEITEX I was implemented. In addition, a governmental loan service to the intended farmers which is managed by DMIC seems to contribute to the progress of the irrigation modernization. Taking the progressed situation in irrigation modernization into consideration, those governorates could be observed to enter a self-reliable stage for irrigation modernization. It must be a proper cooperation of the Project for the on-going governorates to assist on the specified subjects in which necessity arises.

In such sense, the Project keeps off an assertive involvement in demonstration activities for those on-going governorates so as to take account of their self-motivation. By this reason, the selected farms for demonstration in those governorates are named “Satellite Plot” instead of “Demonstration Farm”. The Satellite Plots would be operated for verification of a practical solution for the technical issues at the site.

4) Features of Selected Demonstration Fields

In each project site, Demonstration Fields were selected taking the physical and social suitability as well as farmers’ intension into consideration. Features of the selected Demonstration Fields are summarized as follows:

Table4.3.2 Selected Spots of Demonstration Fields

Governorate		Site	Type	Irrigation area	Major crops	Present irrigation method	Farmer’s name
Demo-farms and Demo-Experi	Aleppo	Jine	Demo-Farm	7ha	Wheat, Cotton, Sugar beet	Traditional surface irrigation	Mr. Esmaille Abdla
		Surbaya Irrigation Station	Demo-Experimental Plot	-	-	-	-

	Raqqqa	Sukkarie	Demo-Farm	11ha	Wheat, Cotton, Sugar beet	Traditional surface irrigation	Mr. Ahamad Karil
		Ebb Quein Irrigation Station	Demo-Experimental Plot	-	-	-	-
Satellite Plots For the on-going governorates	Hama	Subbin	Satellite Plot	3ha	Wheat, water melon	Sprinkler Drip tube (GR)	Mr. Mhamoud Maruwan Al Husein
		Halfaya	Satellite Plot	4ha	Wheat, Potato	Sprinkler	Mr. Suleman Mhamoud Hndawuy
	Daraa	Dael	Satellite Plot	10ha	Vegetable (Tomato, etc)	Mini sprinkler Drip (GR)	Mr. Walid Alasmec
		Nawa	Satellite Plot	20ha	Vegetable (Tomato, etc)	Mini sprinkler Drip tube (GR)	Mr. Bassam Jundi
	R Dams	Beit Sabar	Satellite Plot	1ha	Bean, Potato,	Mini sprinkler	Mr.Hassan Al Safadi
		Surghaya	Satellite Plot	-	Fruit trees	Drip emitter	Mr.Homoud Qwaider Mr. Ameen Abd Al-Nabee
Arne		Satellite Plot	6ha	Fruit trees	Drip emitter	55 farmers	

(3) Demonstrating Themes and Subjects of Demonstration Fields

The objective of Demonstration Field is to verify the adoptability and effects of the modern irrigation at the demonstration sites, and to disseminate the fine practice of modern irrigation. The followings are the themes and subjects which were highlighted at each Demonstration Field:

Table4.3.3 Themes and Subjects of Demonstration Fields

Governorate		Site	Demonstrating Theme	Major Demonstrating Subjects
Demo farm	Aleppo	Jine	- Dissemination of modern irrigation system	<ul style="list-style-type: none"> - Demonstrating practically small scale pressurized modern irrigation system: Movable sprinkler and drip tube (GR) - Demonstrating practically improved surface irrigation equipment: gated pipe. - Demonstrating pipeline network that allows farmers to apply proper irrigation method/system flexibly according to cultivated crops - Demonstrating control unit for proper operation and maintenance of modern irrigation system.
	Raqqqa	Sukkarie	- Dissemination of proper irrigation and farming management for introduced modern irrigation system	<ul style="list-style-type: none"> - Demonstrating on-farm water management based on irrigation schedule: recomendable interval days and irrigation hour. - Demonstrating proper management for fertigation. - Rationalizing irrigation and farming management by proper record keeping.
Demo-Experimental Plot	Aleppo	Surbaya Irrigation Station	- Development and demonstration of improved surface irrigation	<ul style="list-style-type: none"> - Verifying water-saving effect and adoptability of intermitted irrigation. - Verifying water-saving effect and adoptability of siphon irrigation: spile irrigation. - Verifying water-saving effect and adoptability of gated pipe irrigation. - Verifying adoptability of fertigation device for surface irrigation.
	Raqqqa	Ebb Quein Irrigation Station	- Technical support for extension of training activities on modern irrigation techniques	<ul style="list-style-type: none"> - Utilizing recommendable small scale pressurized modern irrigation net for the purpose of training and demonstration activities.
Satellite Plot	Hama	Subbin	<ul style="list-style-type: none"> - Dissemination of drip tube(GR) irrigation - Dissemination of proper on-farm water management technique. 	<ul style="list-style-type: none"> - Demonstrating advantage of drip tube (GR) irrigation for cotton cultivation. - Demonstrating proper water management by means of control unit.

	Daraa	Halfaya	<ul style="list-style-type: none"> - Dissemination of drip tube (GR) irrigation - Dissemination of proper on-farm water management technique 	<ul style="list-style-type: none"> - Demonstrating advantage of drip tube (GR) irrigation for vegetable cultivation. - Demonstrating proper water management by means of control unit.
		Dael	<ul style="list-style-type: none"> - Dissemination of proper fertigation technique - Dissemination of proper on-farm water management technique. 	<ul style="list-style-type: none"> - Verifying the adoptability of venture type fertigation. - Verifying the adoptability of movable control unit.
		Nawa	<ul style="list-style-type: none"> - Dissemination of frequent irrigation with small amount of water. - Dissemination of proper on-farm water management technique. 	<ul style="list-style-type: none"> - Verifying advantage of frequent irrigation with small amount of water. - Demonstrating irrigation rationalization by proper record keeping.
	R Dams	Beit Sabar	<ul style="list-style-type: none"> - Dissemination of mini sprinkler irrigation - Improvement of clogging of irrigation net 	<ul style="list-style-type: none"> - Demonstrating mini sprinkler irrigation net for vegetable and other crops. - Demonstrating improvement of clogging of irrigation network by adding cyclone filter.
		Surghaya	<ul style="list-style-type: none"> - Improvement of clogging of irrigation net - Dissemination of proper fertigation technique 	<ul style="list-style-type: none"> - Demonstrating improvement of clogging of irrigation network by adding cyclone filter. - Verifying the adoptability of venturi type fertigation.
		Arne	<ul style="list-style-type: none"> - Enhancement of conversion to modern irrigation system for group irrigation. 	<ul style="list-style-type: none"> - Demonstrating water-saving effect and improvement of water management by converting to modern irrigation system with drip emitter, pipeline network and control unit.

(4) Design and Installation of Modern Irrigation System

In line with the operating concept of the Demonstration Fields described above, a modern irrigation system which is worthy of being expanded was designed and installed in each Demonstration Field during the 2nd Field Work of the Project.

1) Demonstration Farm

The modern irrigation systems of Jine Demonstration Farm in Aleppo and Sukkarie in Raqqa were designed to satisfy the following conditions:

- a. To enable one-stop operation and maintenance for modern irrigation system, a control unit was installed close to the water source like well pump.
- b. To minimize water distribution losses and realize flexible application of irrigation method at each farm plot, a pipeline network was built up having single hydrant by approximately one hectare.
- c. To adopt proper irrigation method for whatever crops are applied, not only small-scale pressurized modern irrigation equipment such as movable sprinkler/drip tube (GR) but also improved surface irrigation equipment such as gated pipe were prepared.

Typical feature of the modern irrigation system installed at the Demonstration Farms is shown in **Fig. 4.3.1**. Moreover, the scenes of major modern irrigation equipment in the

Demonstration Farms are shown in the following pictures:

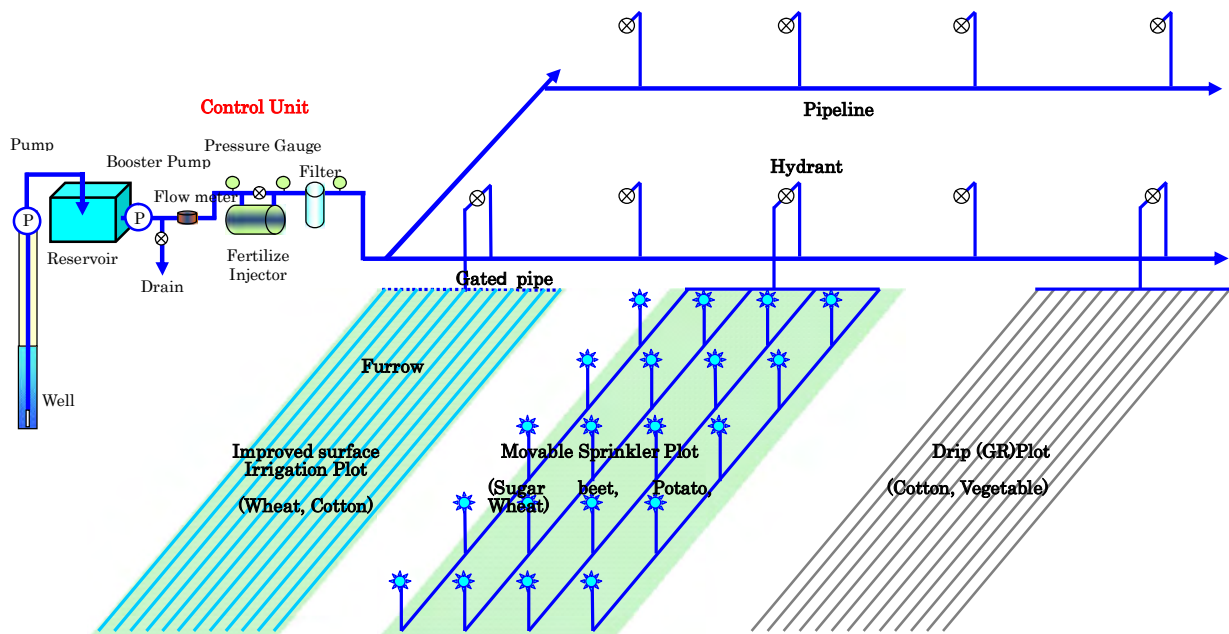


Fig. 4.3.1 Typical Feature of Modern Irrigation System Installed at Demonstration Farm



Control unit (front) and Movable sprinkler irrigation system (back)







Hydrant (front right) and Drip irrigation system: distribution pipe and drip tube (GR)



Improved surface irrigation system of gated pipe

2) Demonstration Experimental Plot

Improved surface irrigation system was installed at the Demonstration Experimental Plots in Surabaya and Ebb Quein Irrigation Research Stations, so that various types of improved method can be examined. As being described in the **Chapter 4.6**, some research activities of the Project have been carried out utilizing the installed irrigation system at the Demonstration Experimental Plots in the Irrigation Research Stations. The following pictures show the scenes of operating the research activities of the Project at the Demonstration Experimental Plots utilizing the installed improved surface irrigation system:

Name of Demonstration Experimental Plot	Executed research activities	
Demonstration Experimental Plot in Surbaya Irrigation Station (Aleppo)	<p>Experimental plot No.1 Verification of water-saving effect and adoptability on intermitted irrigation (Surge flow)</p> 	<p>Experimental plot No.2 Verification of water-saving effect and adoptability on siphon irrigation (Spile irrigation)</p> 
Demonstration Experimental Plot in Ebb Quein Irrigation Station (Raqqqa)	<p>Experimental plot No.3 Verification of water-saving effect and adoptability on gated pipe irrigation.</p> 	<p>Experimental plot No.4 Verification of adoptability on fertigation device for surface irrigation.</p> 

3) Satellite Plot

Satellite Plots were established at the selected private farmlands where have been introduced and currently managed small-scale pressurized modern irrigation with good manner in the on-going governorates. Inputs from the Project in terms of hardware such as irrigation equipment and facilities were minimized so as not to upset their current irrigation management. As for demonstration activities on the Satellite Plots, software aspects like irrigation water management and farming management were much highlighted to improve the productivity in irrigated agriculture. For that reason, irrigation equipment related to control unit was basically set up, and modern irrigation net with drip tube (GR) was procured and installed when necessity arises.

Comparing with other Satellite Plots, Arne site is a particular case. Arne is an irrigated district for apples by a group of farmers providing irrigation water from single natural spring, however they face difficulty of water scarcity due to practicing a traditional water-wasting irrigation. Scheme of Arne Satellite Plot was planned to

promote water-saving at a unit of water users by means of modernizing its group irrigation net and water users association (WUA). The Project covered the cost for common use facilities such as control unit, main pipeline and others. On the other hand, the beneficiary farmers covered the cost for individual facilities like pipeline and drip emitters at on-farm level. The following pictures show the scenes of irrigation systems installed at Satellite Plots:



Drip tube(GR) in Subbin (Hama)



Control unit in Halfaya (Hama)



Movable control unit in Dael (Darra)



Control unit with cyclone filter in Beit Sabar (Rural Damascus)



Cyclone filter in Surghaya (Rural Damascus)



Control unit with cyclone filter in Arne (Rural Damascus)

4.3.2 Irrigation and Farming Plan in Demonstration Fields

(1) Cropping Calendar

For the case of Demonstration Farm, the Project concerned about not only improving current irrigation practice but also modernizing performance of farming, because the concerned governorates seems to be still behind in irrigated agriculture rather than the on-going governorates. Therefore, current cropping calendar was examined by the Project when the operation plan was set for Demonstration Farms. In order to establish suitable cropping calendar for the Demonstration Farm, several factors of demonstration purpose, intension of farmers, and possibility and constraints in irrigated agriculture were taken into consideration. Through the process of examination, following cropping patterns were established for each Demonstration Farm:

Table 4.3.4 Cropping Pattern of Demonstration Farm in Jine, Aleppo

Area(ha) by rotation blocks	Year 2010											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Block 1(3.1ha)	Wheat(Sprinkler)											
Block 2(1.0ha)	Garlic(Sprinkler)			Cotton(GR)								
Block 3(1.0ha)	Garlic(Sprinkler)			Cotton(Gated pipe)								
Block 4(1.0ha)	Sugar beet (Sprinkler)											
Area(ha) by rotation blocks	Year 2011											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Block 1(3.5ha)	Wheat(Sprinkler)											
Block 2(0.5ha)	Wheat(GR)											
Block 3(1.0ha)	Garlic(Sprinkler)			Cotton(GR)								
Block 4(1.0ha)	Garlic(Sprinkler)			Cotton(Gated pipe)								
Block 5(1.0ha)	Sugar beet (Sprinkler)											

Table 4.3.5 Cropping Pattern of Demonstration Farm in Sukkarie, Raqqa

Area(ha) by rotation blocks	Year 2010											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Block 1(5.5ha)	Wheat(Traditional)											
Block 2(0.8ha)							Cotton(GR)					
Block 3(0.6ha)							Cotton(Gated pipe)					
-							Cotton(Traditional)					
Block 4(1.5ha)							Watermelon					
Block 5(2.5ha)	Sugar beet (Traditional)											
Area(ha) by rotation blocks	Year 2011											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Block 1(2.0ha)	Wheat(Sprinkler)											
Block 2(3.0ha)	Wheat(Traditional)											
Block 3(1.5ha)							Cotton(GR)					
Block 4(1.5ha)							Cotton(Gated pipe)					
-							Cotton(Traditional)					
Block 5(1.0ha)				Cumin(Sprinkler)								
Block 6(1.7ha)	Sugar beet (Traditional)											

Besides Demonstration Farms, the Project was rather reluctant to involve in the decision of cropping calendar for Satellite Plots, because those farmers are at a level of farming to succeed agriculture by their efforts.

(2) Irrigation Scheduling Plan

To undertake proper water management meeting with sound crop water requirement

according to the factors of crop kinds, growth stage and irrigation method, the Project shows the concerned farmers a guideline in irrigation scheduling which includes irrigation factors such as irrigation depth, irrigation hours and interval days to etc.

Fig. 4.3.2 shows a typical guideline that indicates recommendable irrigation hours in the specified interval days for cotton cultivation under drip tube (GR) irrigation in Jine Demonstration Farm of Aleppo. In addition, the Project developed Irrigation Calendar by which farmers could know easily a proper irrigation scheduling for their modern irrigation systems. The Irrigation Calendar (shown in **Fig.4.3.3**) has been utilized by the concerned farmers during project implementation, and it contributes toward progressing water-saving in their irrigation. The detail of Irrigation Calendar is described in the **Section 6.4.2**.

For Arne Satellite Plot, the Project proposed irrigation scheduling plan for modernized irrigation system with drip emitters on the WUA’s operation basis, where had practiced a traditional group irrigation called “*Adaan*”.

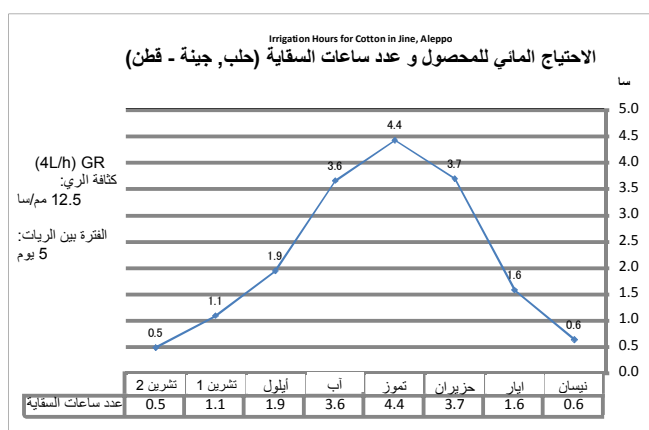


Fig. 4.3.2 A Typical Irrigation Scheduling Plan (for the case of Jine Demonstration Farm)



Fig.4.3.3 A Typical Irrigation Calendar (for the case of Jine Demonstration Farm)

(3) Supporting and Monitoring of Demonstration Fields

Monitoring has been conducted in irrigation and farming manner targeting for the every cultivated crop at the Demonstration Farms and specified crops at the Satellite Plots. The Project has made supporting and monitoring under the supporting and monitoring structure as shown in **Fig. 4.3.4**.

As described in **Chapter 6.4**, the Project developed some extension tools for modern irrigation including Irrigation Notebook and Digital Irrigation Note (DIN). Irrigation Notebook is a handy type notebook to help farmers keep necessary recording about irrigation hour, consumed amount of fertilizer, income and expenditure on a daily basis.

DIN is a computer program which can digitalize recorded data on Excel sheet and display the analysis result visually on the screen. For smooth implementation of the supporting and monitoring activities, the Project distributed those extension tools for concerned farmers and WEs.

The WEs of the concerned extension units have inputted the data which were recorded by the demonstration farmer into DIN, and then feeds back the analyzed result to the farmer. This routine process helps to improve irrigation and farming manner.

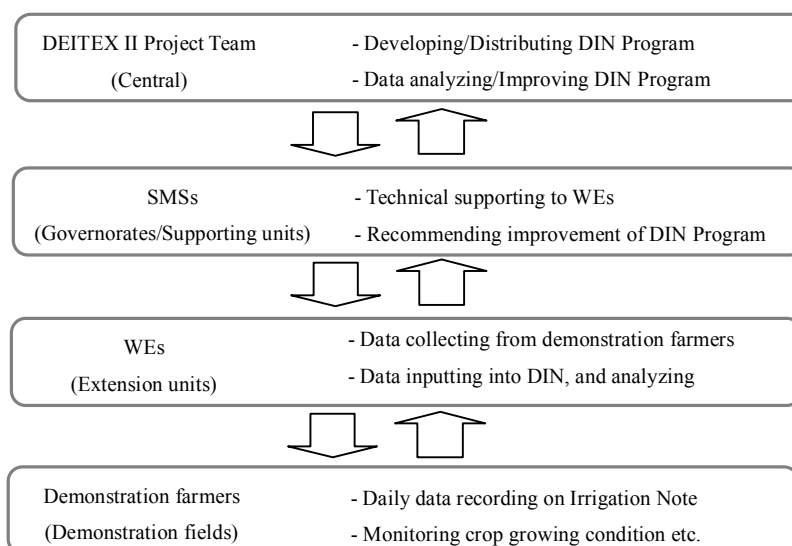


Fig. 4.3.4 Supporting and Monitoring Structure of Demonstration Field

4.3.3 Monitoring Result and outputs on Demonstration Fields

Since the 3rd Field Work of the Project, demonstration/monitoring activities have been undertaken continuously under excellent cooperation with concerned farmers, extension unit and irrigation station at each Demonstration Farms and Satellite Plots.

(1) Demonstration Farm

The cooperative farmers of Demonstration Farms in Aleppo and Raqqa have accustomed to proper modern irrigation practice by means of keeping accompany with the Project's demonstration activities. Those farmers have punctually measured and recorded irrigation and farming practices in line with the guidance on monitoring scheme. Cotton is one of the major crops in northern Syria, and large amount of water could be saved by the introduction of modern irrigation to cotton cultivation. To verify water-saving effect on the cotton cultivation, two types of irrigation methods of drip tube (GR) and gated pipe irrigation were applied in Jine Demonstration Farm in Aleppo, and three types of irrigation methods of drip tube (GR), gated pipe and zigzag irrigation

(traditional surface irrigation) were applied in Sukkarie Demonstration Farm in Raqqa.

Based on the monitoring results of the demonstration farms, the consumed irrigation water amount is typically shown in **Table 4.3.6** by the irrigation methods. Drip irrigation and gated pipe irrigation showed drastically less consumed water amount compared with traditional surface irrigation. Water-saving effects of modern and/or improved surface irrigation were successfully verified and demonstrated at both Jine and Sukkarie demonstration farms.

Water use efficiency is generally used as an indicator of evaluating water-saving effect in Syria, which could be obtained by dividing crop yield (kg/ha) by consumed irrigation water amount (m³/ha). As shown in **Fig. 4.3.5**, water use efficiency of drip irrigation was highest, 0.47 - 0.54, followed by gated pipe irrigation 0.36-0.41, and traditional irrigation was lowest, 0.17. The advantage of drip and gated pipe irrigation was clearly proved by the result.

Table 4.3.6 Observed Irrigation Water Amount (for a case of Cotton cultivation in 2011)

Demonstration Farm	Modern Irrigation of Drip tube(GR)	Improved Surface Irrigation of Gated pipe	Traditional Surface Irrigation	
			Zigzag Irrigation	Crop water requirement
Jine (Aleppo)	7,800 m ³ /ha	8,760 m ³ /ha	-	16,800 m ³ /ha
Sukkarie (Raqqa)	8,190 m ³ /ha	9,920 m ³ /ha	15,600 m ³ /ha	19,062 m ³ /ha

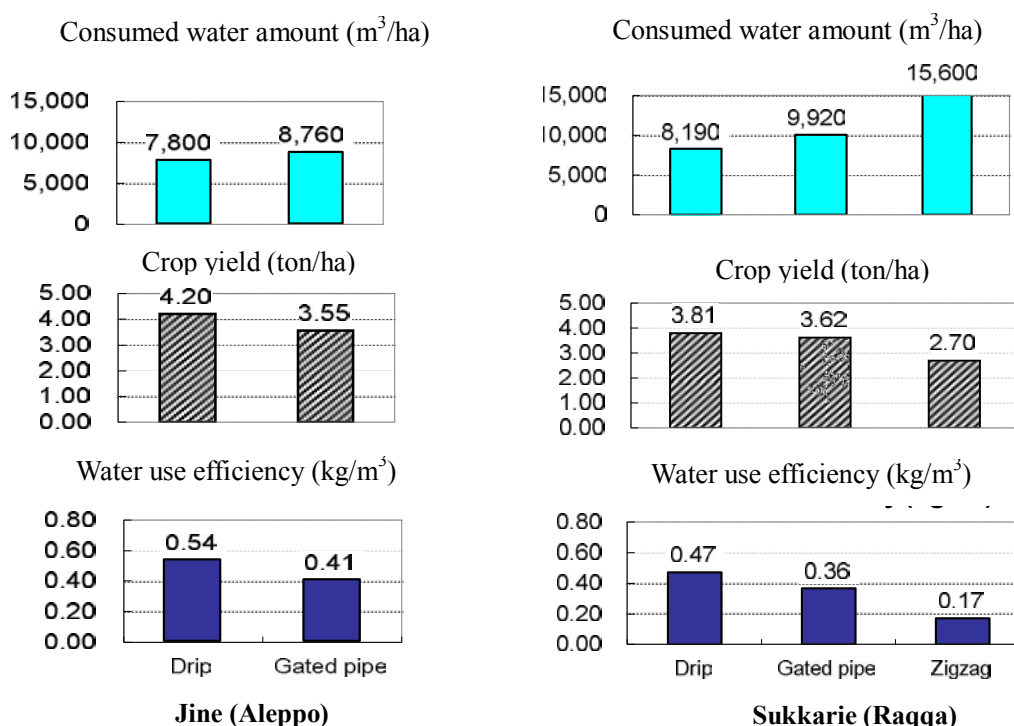


Fig.4.3.5 Monitoring result of Demonstration Farms (for a case of Cotton cultivation in 2011)

In addition to the demonstration activities, the Demonstration Farms were actively utilized as a field of training and extension activities. As for training activities, the Demonstration Farms were effectively used for site visit of Water Extensionist training course, and also used for site inspection of the training courses such as training program managed by ICARDA. For extension activities in disseminating water-saving irrigation techniques, several numbers of field day and/or field visit were organized at the Demonstration Farms. As a result of demonstration effect, it was reported that many neighboring farmers of the Demonstration Farms have introduced modern irrigation system and techniques.

(2) Demonstration Experimental Plot

The research activities on improved surface irrigation have been implemented for three years since 2010 in the Demonstration Experimental Plots established in Surabaya (Aleppo) and Ebb Quein (Raqqa) Irrigation Station. The result is summarized in the **Chapter 4.6**.

Recommendable small scale pressurized modern irrigation net set within the same experimental plots was also effectively used for the field practice of Water Extensionist training course.

(3) Satellite Plot

As mentioned before, demonstration activities focusing on proper water management have been undertaken at the Satellite Plots. It includes proper operation and maintenance with control unit, practice of proper water management based on crop water requirement and improvement of farming management with water-saving irrigation. Both Irrigation Notebook and Digital Irrigation Note (DIN) have been fully utilized as extension tools at the Satellite Plots. With those tools, recording and analyzing of irrigation and farming practices have been undertaken by a joint work of the demonstration farmers and WEs concerned. The outcomes and lessons learned through the demonstration works at the Satellite Plots were reflected into the technical manual which was prepared within the Project.

Group irrigation with modern irrigation system started from 2010 irrigation season at Arne Satellite Plot. At the same time of introducing modern irrigation, existing water users' organization was also officially renovated and registered as Water Users Association (WUA). In line with rotation irrigation scheduling plan provided by the Project, the WUA of Arne modern irrigation scheme has carried out proper irrigation

management by their initiatives.

Under the implementation of demonstration activity as Arne Satellite Plot, Arne modern group irrigation scheme has been successfully implemented, and also gave the proof that modernization of group irrigation was an effective solution to water shortage in these areas. Furthermore, the success of this Arne modern group irrigation scheme contributes to encourage neighboring groups of irrigation famers/organizations to convert traditional irrigation system into modern irrigation system.

4.4 Training Work

4.4.1 Outline of Training Activities

The **Table 4.4.1** summarize outline of training activities during the project period of DEITEX II, which consist of the following works:

- 1) Implementation of training courses for water extensionists (WE) and the same for Improved Surface Irrigation (ISI) in Aleppo and Raqqa,
- 2) Training SMS of Aleppo and Raqqa, and entrusting WE training courses to the governorates,
- 3) Implementation of training courses for WE in Rural Damascus, Daraa, and Hama under the initiative of local counterparts and SMS,
- 4) Implementation of follow-up training courses to expand capacity of WEs,
- 5) Monitoring WE training courses with utilizing evaluation system of trainer and training course,
- 6) Dissemination of the Project results to other areas through additional training activities (for ICARDA and Iraqi engineers and so on), and
- 7) Training in Japan and third country training for capacity building of counterparts

Table 4.4.1 Outline of Training Activities during the Project Period of DEITEX II

Governorate	operated by Central C/P	by Local C/P / SMS	Remarks
Aleppo			Central and local C/Ps shared roles in conducting the training activities.
Raqqa			
Hama			- ditto -
RDamascus			
Daraa			
Others; ICARDA and Iraq			- ditto -

The **Table 4.4.2** shows role sharing among central CP, local CP and SMS in the training activities during the project period of DEITEX II.

Table 4.4.2 Role Sharing among Central C/P, Local C/P and SMS in Training Activities

Players	for WE Training (Aleppo & Raqqa)	for WE Training (R.Damas, Daraa & Hama)	for SMS/TOT Training	for Follow-up Training	Others (ICARDA/Iraq)
Central C/P	Trainer	Advisor and monitor	Supervisor and trainer	Supervisor and trainer	Trainer
	Advisor /monitor				Supervisor/ trainer
Local C/P	Observer	Supervisor	Observer	Observer	-
	Supervisor				
SMS	Trainer	Supervisor and trainer	-	-	-

4.4.2 Entrusting WE Training Course Implementation to the Governorates

One of the most important Project results is establishment of WE training system in the target governorates, which is managed by local counterparts and trained SMS of the governorate. And based on the system, major characteristics of the training activities in DEITEX II are horizontal and vertical expansions of the DEITEX training-extension system to the governorates. Accordingly, WE training course implementation has been entrusted to the governorates. In addition, in order to implement WE training courses successfully and effectively, training curriculum and teaching materials developed during the DEITEX I period have been fully utilized.

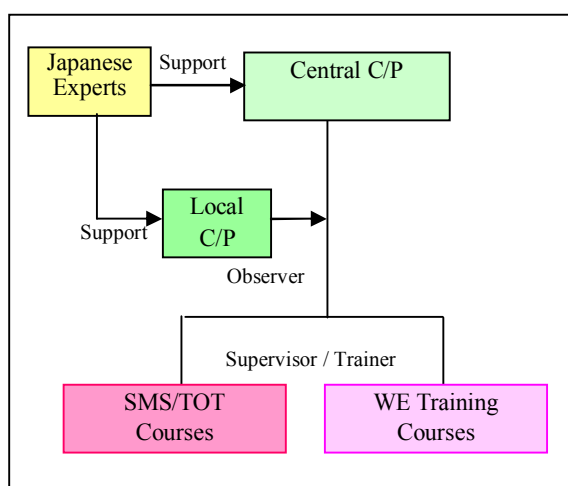


Fig. 4.4.1 WE/SMS Training System during DEITEX I

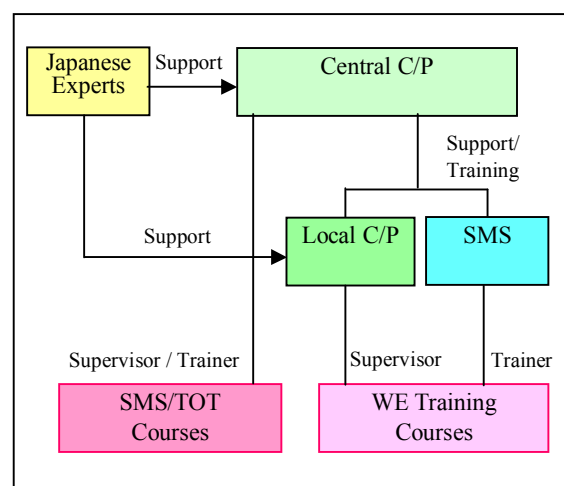


Fig. 4.4.2 WE/SMS Training System during DEITEX II

The horizontal expansion of the DEITEX system applied to the northern governorates, Aleppo and Raqqa, in order to disseminate the Project results to these newly incorporated governorates. Firstly, central counterparts trained water extensionists in these

governorates, and then after completing SMS/TOT training, selected SMSs worked as trainers of the WE training courses. On the other hand, as the vertical expansion of the DEITEX system, WE training courses have been incorporated to their own activities in Rural Damascus, Daraa, and Hama, where local counterparts and SMSs managed and conducted the WE training courses by themselves with some assistance from the central counterparts.

As one of the remarkable achievements of the DEITEX I and II Project, the WE training courses of the target governorates have been integrated to the annual training plan which is authorized by the Training Directorate. In addition to the administrative measure, combined approaches have brought successful implementation of training activities, which include human resource development in the governorates, technical support by the central C/Ps, and effective use of teaching materials. The **Table 4.4.3** summarizes the combined approaches to establish the WE training system in the governorates.

Table 4.4.3 Establishment of WE Training System in the Target Governorates

Item	Description
Administrative measures	WE training courses have been integrated to the annual training plan which is authorized by the Training Directorate.
Human resource development for the local C/Ps	Implementation of the WE training courses has been entrusted to the governorates. Local counterparts supervise the training courses, and SMSs conduct the training courses successfully.
Supporting system by the central C/Ps	Governorate training courses were supported and monitored by the central counterparts when necessary.
Utilizing training materials	Training curriculum, teaching materials and training guideline developed by the DEITEX Project were fully utilized.

4.4.3 Strengthening of SMS/TOT Training Implementation System and Preparation of Training Guidelines

During the DEITEX II period, SMS/TOT courses were conducted two times in 2009 and 2011, which were managed by central counterparts with the assistance of Japanese experts. Through these experiences, the central C/Ps have become capable enough to implement the training courses effectively.

The SMS training course is aimed to provide advanced knowledge and skills regarding designing and installation of modern irrigation system, which includes lectures, exercises, and field practices. On the other hand, the TOT course is prepared to be able to conduct the WE training courses effectively. After completing the SMS/TOT courses, qualified SMSs are expecting to teach and support water extensionists both in training and

extension activities. Therefore, contents of the training courses have been carefully examined and prepared so that the participants obtain necessary information and skills which is useful for their future activities as SMS.

In order to support trainers and supervisors of the SMS/TOT training courses, training guidelines have been prepared, which describe how to use teaching materials of the courses. The guidelines include structure and objective of the training course, typical training program, and explanation of each slide of Power Point presentations for lectures. More details about the guidelines are described in the **Chapter 6.2**.

4.4.4 Creating Follow-up Training Scheme

In addition to the four steps of WE training courses, it is necessary for the extensionists to acquire additional and/or higher level of abilities, in order to conduct extension activities more effectively and successfully with focusing on farmer's problems and requirements. Therefore, follow-up training scheme has been newly created. The follow-up training will be divided into two categories as follows:

a) Training course focusing on the characteristics of irrigated agriculture of the area

Surface irrigation is still dominant in the northern governorates such as Aleppo and Raqqa, where introduction of the modern irrigation is relatively low. Improved surface irrigation (ISI) is one of the reasonable solutions to save irrigation water for these areas. Accordingly, ISI training course has been newly established especially focusing on these governorates.

b) Training course to improve/expand capability of WEs

Through conducting extension activities even after completing the WE training courses, WEs may realize that they need more abilities in order to make extension activities more effectively and successfully. Accordingly, they need further training to acquire more abilities, which will be the subjects of the follow-up training course.

In order to establish a follow-up training course, a method of curriculum development based on ability structure (CUDBAS) has been newly applied. In this method, job scope for target people (trainees) is discussed firstly, which is supposed to be training goals. Secondary, necessary abilities to achieve the training goals are identified by writing abilities on a card. The abilities include knowledge, skills and attitude. Then, ability cards shall be placed and sorted on a table, to produce a duty-ability matrix, which will be

utilized to conduct ability assessment and to formulate training programs.

The application of the CUDBAS method clarified not only the contents of necessary follow-up training, but also validity of the existing WE training programs. The following table shows possible subjects of the follow-up training course.

Table 4.4.4 Subjects and Training Goals of Possible Follow-up Training Courses

Subject	Expected Training Goals
Editing Extension Movies	Editing movies by using the Movie Maker program to produce extension movies.
CWR and Irrigation Schedule	Teaching farmers appropriate irrigation amount and irrigation hours based on CWR for certain crop (by using the irrigation disk and the irrigation note).
Maintenance of the Modern Irrigation System	Having knowledge and skills about maintenance of the modern irrigation system.
Improving Communication Skills	Improving communication skills to deal with farmers in better way.

4.4.5 Establishment of Evaluation System for Trainer and Training Course

The DEITEX II has established evaluation systems for trainer and training course, in order to assess trainer capability and training course efficiency. In accordance with entrusting WE training course management to the governorates, evaluation of trainer and training course has also been given to local C/Ps.

In addition, as one of role sharing between central and local counterparts, some of governorate WE training courses were monitored by central counterparts. The DEITEX evaluation system was applied in the monitoring activity. Central C/Ps observed courses and evaluate trainers and training courses by making use of the evaluation system. Brief explanation of the DEITEX evaluation system is mentioned as follows, and more details are described in the training guidelines.

a) Evaluation of trainer

Evaluation sheet of trainer consists of 28 items covering teaching skills, teaching mind, relation with trainees, and preparation of training activity. Each item of the evaluation sheet shall be ranked according to the five grade evaluation system. The evaluation result will be analyzed by radar chart to identify trainer's capability. The size of the radar chart shows the capacity of trainer abilities, and the shape of the radar chart points out strong and/or weak points as a trainer.

b) Evaluation of training course

Evaluation sheet of training course consists of two different categories such as "Impact of the training course" and "Overall evaluation of the training course", in order to

assess effectiveness of the training course. Similar to the trainer evaluation, training course is also assessed according to the five grade evaluation system.

The results of training course evaluation will be summarized in table and/or radar chart, which is basically utilized to evaluate the impact and/or effectiveness of one training course. In addition, it is possible to compare different courses, for example, the four steps of WE training course conducted for the same trainees. It is also applicable to compare the same training course (i.e. the 1st training course for WE) conducted in different governorates.

c) Evaluation of capability of water extensionist

The ultimate aim of the WE training courses is to improve ability of water extensionists in conducting extension activities related to saving water and modern irrigation. Therefore, in addition to the results of examinations, it is notably necessary to evaluate capability of WEs in planning and implementing extension activities based on problems and needs of farmers. A questionnaire sheet for this evaluation has been prepared on trial. The questionnaire includes 6 items including mentioning problems which irrigated farmers are facing, formulating an action plan of extension activity to solve farmer's problem, preparing questions as pre and final evaluation of the extension activity, methods to know the needs of farmers, methods to understand behavior modification of farmers, and necessary subjects of future training courses for WEs.

4.4.6 Achievement of Training Activities

Succeeding to the DEITEX I, DEITEX II turned out significant numbers of WE and SMS in the concerned governorates. The following table shows the number of trained personnel in the target governorates. The **Tables 4.4.5** and **4.4.6** indicate that 71 of WE and 15 of SMS were trained during the DEITEX I period. In addition, 163 of WE and 37 of SMS have been trained in this DEITEX II period, resulting 234 of WE and 52 of SMS in total.

The number of the extension units with assigned water extensionist(s) is 131 since some extension unit has more than two WEs, which meets 46% of the requirement. On the other hand, the total number of the trained SMS is 46 (excluding SMS who belongs to DMIC). Since total number of supporting units is 45 in the targeting five governorates, enough number of SMS has been trained as a whole. However, only 11 out of 45

supporting units have assigned SMS currently. So, it is desirable to assign more SMS to supporting units as many as possible. List of the trained SMS and WE are shown in ANNEX 5.

Table 4.4.5 Number of the trained water extensionists in the target Governorates

Governorate	Total Number of Extension Units	Number of Units selected by Extension Chief (a)	Number of the Units which Water Extensionist is assigned (b)	The Ratio of b to a (%) (b / a)	Number of Water Extensionists trained by DEITEX		
					P-I	P-II	Total
R Damascus	63	52	29	56 %	16	39	55
Daraa	63	38	26	68 %	22	27	49
Hama	74	72	31	43 %	20	28	48
Aleppo	111	80	25	31 %	0	28	28
Raqqa	55	40	20	50 %	0	31	31
Subtotal	366	282	131	46 %	58	153	211
DMIC/GCSAR	-	-	-	-	13	10	23
Total	-	-	-	-	71	163	234

Table 4.4.6 Number of the trained irrigation SMS in the target Governorates

Governorate	Total number of supporting units (c)	Number of the Supporting Units which SMS is assigned (d)	The Ratio of b to a (%) (d / c)	Number of SMS trained by DEITEX		
				P-I	P-II	Total
R Damascus	13	4	31 %	5	6	11
Daraa	6	3	50 %	2	9	11
Hama	9	2	22 %	5	5	10
Aleppo	10	1	10 %	0	8	8
Raqqa	7	1	14 %	0	6	6
Subtotal	45	11	24 %	12	34	46
DMIC	-	-	-	3	3	6
Total	-	-	-	15	37	52

4.5 Extension Work

4.5.1 Strategy of Extension Activity

(1) Lessons Learned at the Phase I Project

In order to reflect the lessons learned obtained through the extension activities during DEITEX I into the extension strategy of the project activities of DEITEX II, the DEITEX I was reviewed as mentioned in **Chapter 4.1**, and the results concerning to the subject of extension can be summarized in the following manner:

a) From the viewpoint of Organization Structure

- Since training and extension divisions were organized under the same umbrella of human resource department, the smooth cooperation can be accomplished between these two divisions.
- In case of extension and DMIC, the smooth cooperation can also be accomplished because extension units were involved in the DMIC activities since its initiation of activities.
- In case of GCSAR, on the other hand, the cooperation with other organization is

improving gradually but widely varies from governorate to governorate.

- The role of support unit was further strengthened and the role of SMS staff was clearly defined to supervise the extension activities in the ordinary unit.
- The intention of decision makers such as the chief of unit, department and directorate becomes more important for the full function of the competent WEs and SMSs trained under DEITEX Project.

b) From the viewpoint of Extension Activity

- It was revealed that the extension activity should be designed in order to change farmers' behavior by providing them with useful information and let farmers feel the advantage of modern irrigation practically.
- It was also revealed that the performed extension activity should be evaluated in order to utilize the experiences from one activity to the next activity. Furthermore, the behavior modification of farmers should also be monitored in order to judge the effect of extension activity.

(2) Remarks based on the Lessons Learned

Based on the lessons learned as mentioned above, the general strategy of extension work in DEITEX II was established in the following manner:

a) Extension Activities in the Model Unit

Based on the distribution of Support Unit, available SMSs and competent WEs trained under DEITEX I and II Project, the Project selected the model unit as an advanced, well-organized and functioned extension unit in modern water-saving irrigation. As the conclusion, the model units finally accorded with the project sites.

In those model units, ideal extension activities were carried out by the combination of WEs and SMSs under the good understanding of decision makers. In practice, the group farmers were selected around the Demonstration Farms/Satellite Plots and the activities were fully supported by the Project in order to change farmers' behavior. Those units were subsequently considered as a model for the surrounding extension units.

b) Extension Activities in the Ordinary Unit

In addition to the model units, the extension activities related to modern water-saving irrigation were also carried out at the ordinary units as routine extension activities. The project also tried to promote extension activities for the farmers in this extension target through the distribution of useful information by publicity works including posters and

brochures and also through activation of day-to-day conversation with project related farmers.

c) Competition for Modern Irrigation Farmers and Irrigation Note Campaign

It was observed that the competition of irrigated farmers applying the modern irrigation system conducted by the Extension Directorate during Phase I period really enhanced the awareness of the subject. The Project therefore decided to carry out the similar competition to enhance the capability of surveyors (WEs and DMIC staff) to properly evaluate the irrigation system and farmers' behavior more precisely and to further strengthen the relation between extension and DMIC. This consequently contributed to change farmers' behavior by giving them the practical idea of efficient irrigation system.

In order for farmers to understand the importance of record keeping and the effectiveness of such record to clarify the financial advantage of modern irrigation system, the project decided to carry out the Irrigation Note Campaign. This campaign was useful for the surveyors (SMSs and WEs) to understand the problems which farmers are facing. Furthermore, the sample result showing the financial advantage of modern irrigation can be used for the extension materials in order to change farmers' behavior.

d) Preparation and Utilization of Extension Tools

The Project decided to prepare various tools that are useful for effective extension activities such as discharge measurement kit, irrigation calendar, irrigation note and digital irrigation note as described in **Chapter 6.4**. In addition to those irrigation tools, the Project also produced posters, brochures, reports and guidelines in order to promote publicity activities.

e) Evaluation of Extension Activity and Establishment of Extension Cycle

The Project emphasized to evaluate the extension activities in order (i) to enhance the collaborative works among WEs, SMSs and administrative staff including unit chief, department and directorate staff aiming at the capacity development of the extension organization, (ii) to improve the next extension activities and (iii) to establish the extension cycle of plan-do-see in general extension activities.

f) Establishment of Water Extensionists Assembly

As described in the **Chapter 4.11**, the Project recommended organizing Water Extensionists Assembly (WEA) by the extensionists working in the adjacent area for effective information sharing and transmission of useful information and experiences for

improving future extension activities.

(3) Strategy of Extension Activity

Lessons learned at the DEITEX I and the strategy based on the lessons learned mentioned above can be illustrated in the **Fig. 4.5.1** as shown below.

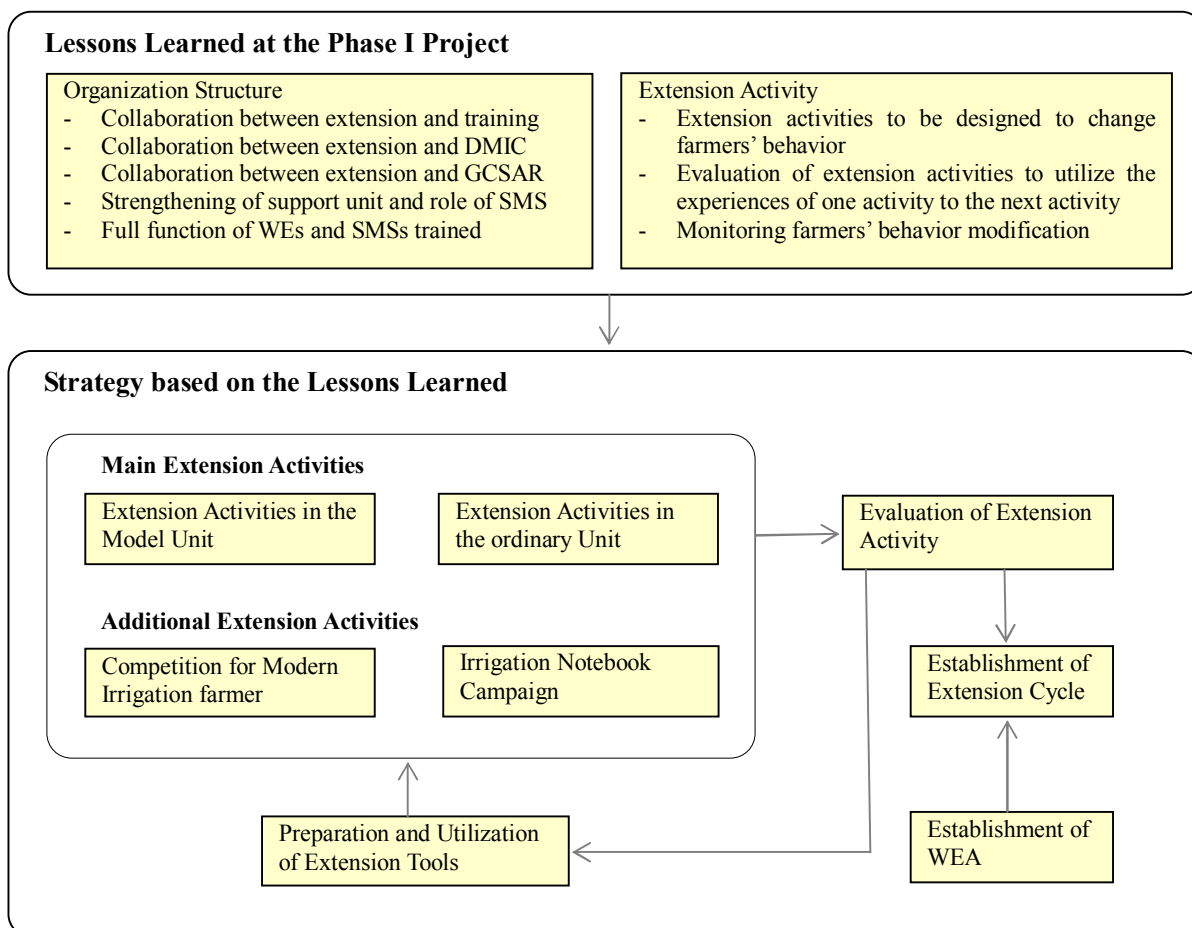


Figure 4.5.1 Lessons learned at the DEITEX I and Strategy based on the Lessons

4.5.2 Extension Activities in the Model Unit and the Ordinary Unit

Extension activities within the Project have been implemented in wide-ranging and multiply-layered levels, which were divided into 4 statuses as follows: (A) Extension target for the concerned farmers of the Demonstration Fields, (B) Extension target for the individual/grouped farmers around the Demonstration Fields, (C) Extension target for farmers within the model extension units, (D) Extension target for farmers within the concerned governorate excluding the model extension units. In demonstration activities at status A, it is expected to give propagation effect for recommended technologies on efficient irrigation or saving water. In group activities and non-group activities levels at

status B, full-scale extension activities have been carried out by both WE and SMS. Group activities, in particular are considered to be new challenge for fixed members of farmers to disseminate systematic and organized knowledge and skills on saving water. In the project site levels at status C, extension activities on irrigation management and recording agricultural practices using irrigation notebooks and irrigation calendars as a tool were accelerated in the unit. In the project area levels at status D, posters and brochures were continuously distributed to the relevant organizations. The following table shows the number of extension activities in the model unit and also in the governorate in the year 2010, 2011 and 2012. Data of year 2009 is not referential because there were no graduated WEs in Aleppo and Raqqa.

Table 4.5.1 Extension Activities in the year from 2010 to 2012

Governorate	Name of Model Unit	Group or Non-Group	Number of Extension Activity					
			2010		2011*		2012**	
			Model Unit	Governorate basis	Model Unit	Governorate basis	Model Unit	Governorate basis
Aleppo	Jlne	Non-group	5	90	8	26	5	21
Raqqa	Sukkarie	Non-group	6	54	5	14	2	24
Hama	Majidal	Group	3	133	2	10	3	8
	Halfaya	Non-group	4		0		3	
Rural Damascus	Beit Saber	Non-group	4	39	2	26	5	41
	Surghaya	Group	6		2		3	
	Arne	Group	4		4		3	
Daraa	Dael	Group	7	36	3	25	6	90
	Nawa	Group	9		6		10	
Total	-	-	48	352	32	101	40	184

*: In 2010, extension activities were implemented under unusual situation in Syria

** : Data in 2012 are the figures according to the ‘Implementation Plan of Extension Activities in 2012’

According to the **Table 4.5.1**, 5 out of 9 model units organized farmers’ group as extension target. Quite considerable numbers of extension activities were carried out in the year 2011 in spite of the difficult situation of the country. In 2012, the number of extension activity is going to be increased both in the model units and also in the governorate. As to numbers of implementation, the figure in 2010 is a possible level if it is under usual situation. All the parties concerned wish an early recovery in the frequency of extension activities by the settlement of the situation in Syria.

Followings are the results obtained through extension activities in the model unit and in the ordinary unit.

(1) Extension Activities in the Model Units

Followings are the results obtained through extension activities carried out in the model extension units.

1) Extension Plan

In general, extension plans were carefully designed by considering local problems and seasonal activities of farmers and also the irrigation system of demonstration fields. On the contrary, the subject of each extension activity was not satisfactorily established based on the results of need assessment such as farm survey and problem analysis. The Project therefore insisted to design extension activities based on the need assessments. This was partly performed in some of the model extension units judging from the fact that the background of the extension activity was precisely described in the activity reports for some extension activities.

2) Extension Method

The Project always insisted to select suitable extension method appropriate to the subject of extension activity according to the characteristic of each extension method. In many extension units, however, most of the extension activities are being carried out as Field Day. While, in some model extension units, practical demonstrations and seminars were clearly differentiated according to the subject that are either practical or theoretical. Furthermore, unique activities such as religious talk and video show were promoted in some of the model extension units. Video show was promoted by utilizing the results of follow-up training courses conducted for editing video.

3) Group or Non-group Extension Activity

Through several discussions among central and local C/Ps, a common understanding that it is essential to conduct continuous and persisting extension activities for saving water to the same target farmers continuously, has been obtained. The Project therefore recommended carrying out the extension activities for the farmers' group of fixed members. Since group extension activity was suitable to provide comprehensive knowledge with the members of farmers group, this method was useful to grow core farmers who can act for farmer-to-farmer extension afterwards. For some model units, it was difficult to organize the fixed farmers' group and non-group extension activity was employed. Non-group extension activity was effective for the general instruction to the unspecified majority. WEs should carefully decide which way to be employed by considering the characteristics of group and non-group extension activities, easiness of group formation and the situation of each governorate.

4) Preparation Works

The Project also emphasized the importance of preparation works for the extension

activities including preparation of time table, extension tools and others especially the implementation of rehearsal. According to the results of the evaluation of extension activities, it was clarified that the execution of rehearsal during the preparation period always gives good effects to the quality of extension activity. Many C/Ps and WEs have become understand the importance of rehearsal through DEITEX project.

5) Role Distribution among Extension Staff

The allocation of WE and SMS was carefully adjusted in some governorate and WEs in charge of extension activity were technically and mentally supported by SMSs allocated in the responsible support units and the ideal team work was performed under such structure. In case SMS is still not in service, the formation of regional group of WEs was useful for effective extension activities especially in northern governorates. In this way, the lessons learned through extension activities at the model unit were easily utilized at the surrounding units by a member of WEs group.

6) Participants to the Activity

In some cases, the quality of extension activity was negatively affected by uncooperative participants and/or noisy visitors. It was thus learned that WEs and SMSs should have the strong communication skill to control the participants in order to perform the activity as planned. On the other hand, the extension activity can positively be improved by involving the parties concerned in proper manner. For example, the measurement of emitter discharge was effectively carried out by the assistance of village children with the supervision of researchers from experimental station for the extension activity at the model unit in Hama.

7) Pre and Final Evaluation

Pre and final evaluation for the participated farmers were generally carried out in an acceptable manner in order to judge the effect of extension activity performed. In some cases, however, the results of pre-evaluation were good enough as if the participants have no problems for the selected subject. WEs were sometimes too stick to carry out pre and final evaluation and this might be the negative effect that project strongly insisted the importance of such evaluation. WEs should remind that the questionnaire for pre and final evaluation be prepared according to the specific problems that the participants are facing. WEs should also concentrate on the technical transfer to the participants, pre and final evaluation should additionally be carried out to just monitor the understanding level of participants.

(2) Extension Activities in the Ordinary Units

This is the extension target for farmers who are under the jurisdiction of whole extension units of the concerned governorates excluding the model extension units. Farmers in this extension target might have received useful information through publicity works including posters and brochures distributed in village culture centers and schools and also day-to-day conversation with project related farmers. Due to unavailability of SMSs in the northern governorates, WEs near around the project site collaborate each other to implement the extension activities. The experiences obtained through the non-group extension activities can easily be applied for the other group in the governorate. Through various activities mentioned above, the project concept is gradually penetrating into all the extension units distributed in the governorate.

4.5.3 Competition for Modern Irrigation Farmers and Irrigation Note Campaign

(1) Competition for Modern Irrigation Farmers

Followings are the results obtained through competition for modern irrigation farmers carried out under the collaboration between Extension Directorate and DMIC.

a) Preparation of Evaluation Criteria

- The evaluation criteria were prepared by the central and local C/Ps and finalized through pretest tried in the field.
- This process of criteria preparation was useful to enhance the capability of C/Ps to properly evaluate the irrigation system and farmers' behavior.

b) Implementation of Competition

- The general operation of the competition was carried out under the initiative of DMIC and the target farmers were selected from the farmers who introduced modern irrigation system through DMIC loan system.
- Field survey and data processing were carried out by C/Ps in order to choose the best 3 farmers in each governorate and the results were utilized to identify the characteristics of the average farmer in each governorate.
- Best 3 farmers of each governorate were awarded during DITEX Seminar in February 2010 with the presence of media and related organizations and this really enhanced the awareness of the subject by farmers.
- Those processes were also useful to enhance the capability of C/Ps to operate the competition including the field survey and data processing.

c) Publicity Works of the Results

- All the detailed process of the competition and the lessons learned from the competition were reported into small booklet and distributed as a reference for the future competition activities.
- The interview survey for the first prize farmer in each governorate was carried out under the cooperation between DEITEX and the media section of the Extension Directorate.
- All the materials obtained in the above survey were effectively utilized for the preparation of video program and brochure for water saving promotion.

(2) Irrigation Note Campaign

Followings are the results obtained through irrigation note campaign carried out mainly by SMSs and WEs in each governorate.

a) Preparation of Irrigation Notebook

All the detailed information about the contents of the irrigation notebook is described in **Chapter 6.4**. The contents of irrigation notebook were modified according to the experiences of farmers' record keeping during trial period. The brochure showing how to use the irrigation notebook was also prepared.

b) Irrigation Notebook Campaign

The campaign was started in the five governorates by distributing the irrigation notebooks and brochures thus produced to the farmers through extension units after discussing the significance of this activity among C/Ps at the Task Force Meeting in April 2011. Extension directors in the five governorates distributed roles among their staff of SMS and WE in order to deliver the notes to farmers, observe and help them in keeping records. Central C/P managed the campaign by collecting and processing the information on (i) name of extension unit involved, (ii) name of extensionist in charge, (iii) number and name of farmers and (iv) comments and suggestions, if any.

c) Results of the Campaign

Some of the recorded data were already collected by the extensionists and some of the data were analyzed as shown in the **Chapter 6.4**. Based on the activities so far carried out for this campaign, the roles of the campaign were actually confirmed by the related staffs. Promising roles of the campaign pointed out by them were (i) farmers to understand the importance of record keeping, (ii) obtain sample record showing the

advantage of water saving, and (iii) use the sample record for extension activities. This campaign was thus considered effective under the proper guidance to the extensionists to assist farmers for record keeping and how to analyze and utilize the recorded data.

4.5.4 Preparation and Utilization of Extension Tools

Since the detailed information and the structure of extension tools especially for irrigation tools are described in the **Chapter 6.4**, the effective roles of extension tools for the good extension activities are mentioned in this chapter.

1) Posters

Total 5 kinds of posters were prepared and 150 posters of each kind were distributed to each governorate to further distribution to extension units, village culture centers and schools. These posters were effectively utilized as publicity materials by exhibited in various locations. Some of the posters were prepared by modifying the qualified products from the preparation of extension materials courses in the WE training. Since the name of the designer was printed on the poster, the WE who produced the poster was highly encouraged.

Table 4.5.2 Distributed Posts for the Prepared Posters

Title	Source	Contents
Equipment in Control Unit	3 rd Training for WE	Utilization of stored equipment
Advantage of Modern Irrigation	3 rd Training for WE	Economical advantage of modern irrigation system
Proper Irrigation Amount	3 rd Training for WE	Better growth of crops by modern irrigation system
Training Activities	Training Activities	Introduction of Training Activities of DEITEX
Extension Activities	Extension Activities	Introduction of Extension Activities of DEITEX

2) Brochures

One brochure was prepared based on the ideas from improved surface irrigation and the other brochure was the information collected from the farmer who won the best water saving farmer competition. A total of 2,000 brochures for each kind were distributed in the 5 governorates. These brochures were also utilized as effective publicity materials to disseminate the information into public.

Table 4.5.3 Distributed Farmers Posts for the Prepared Brochures

Title	Source	Contents
Improved Surface Irrigation	Surface Irrigation Training	Advantage of improved surface irrigation
Best Water Saving Farmer	Water Saving Competition	Ideas of best water saving farmers

3) DEITEX News

DEITEX News is being issued every 3 months in order to introduce the up to date activities by the Project. Each issue was mainly arranged by the counterparts of extension directorate including editing, printing and distributing to the governorates. Many articles were also prepared by SMSs and WEs mainly based on their field activities.

4) Reports and Guidelines

The following reports and guidelines were prepared based on the lessons learned obtained through competition, evaluation of extension activities and general extension activities. These materials can effectively be utilized for the future extension related activities.

Table 4.5.4 Reports and Guidelines Prepared

Report/Guideline	Title	Contents
Report	Best Saving Farmer Report	Report on the completion of best water saving farmer
Report	Extension Activity Evaluation Report	Report on the evaluation of sample extension activity
Guideline	Extension Manual	Necessary steps of effective extension activities for WEs

5) Irrigation Tools

All the detailed information about the contents of the irrigation tools is described in **Chapter 6.4**. The developed tools have been occasionally utilized in the extension activities of the Project. Besides, those are being used in the daily works of farmers and extensionists.

4.5.5 Evaluation of Extension Activity and Establishment of Extension Cycle

(1) Evaluation of Extension Activity

The Project emphasized to carry out the evaluation of extension activities by (i) participated farmers, (ii) implemented extensionists and (iii) observers from outside. However, the evaluation by participated farmers and implemented extensionists were not yet performed as routine activities. While, the evaluation by observers has been performed as routine activities by using evaluation criteria formulated. Based on the sample activities implemented in 3 governorates of Rural Damascus, Daraa and Hama as shown below, the report on evaluation of extension activity was prepared. According to the lessons learned described in the report mentioned above, the general recommendation

can be summarized as follows:

Table 4.5.5 Sample activities for the evaluation of extension activities

Governorate	Unit	Date	Kind of Activity	Title
R. Damascus	Surghaya	14 Jul '09	Practical Demonstration	Importance of even emitter discharge
	Taibeh	13 Oct '09	Practical Demonstration	Filter maintenance and cleaning
Daraa	Inkhel	20 Aug '09	Field Day	Measuring emitter discharge
	Namer	14 Oct '09	Field Day	Maintenance of modern irrigation system
Hama	Tizeen	23 Jul '09	Field Day	Measuring emitter discharge
	Halfaya	5 Oct '09	Field day	Maintenance of drip irrigation system

a) Need Assessment

An appropriate need assessment is the base of good extension activity. Water Extensionists together with irrigation SMS should improve their observing ability to find out specific problems to which farmers are facing in their irrigation practices.

b) Target Group

Farmers who are suffering from specific problem should be selected as a target group and the extension activity should be conducted for them to be able to solve such problems by applying the knowledge and skills to be obtained through the extension activity.

c) Pre and Final Evaluation

Extensionists should be aware of the strong and direct relationship among need assessment, target group and pre & final evaluation results. In case the needs assessment and the target group selection were properly carried out, there will be a great progress the evaluation results.

d) Attracting Participated Farmers

More efforts should be given to attract the participated farmers by not only organizing ordinary field days and practical demonstrations but also through other activities such as various competitions, farmers meetings, exchange visits, mobile theaters and video shows.

e) Rehearsal

Extensionist should notice that the execution of rehearsal during the preparation period always gives good effects to the quality of extension activity.

f) Proper Distribution of Roles among Execution Staff

Extensionist should notice that the proper distribution of roles among execution staff

always gives good effects to the quality of extension activity.

g) Utilization of Photographs and Video Clips

Photographs and video clips taken during the activity should be attached to the report for better understanding by evaluators and also to be utilized as future extension tools.

h) Software Extension and Necessary Tools

Since most activities are concentrated in hardware related subjects, the subject on software such as proper irrigation amount and proper fertigation technique should be promoted. Appropriate materials useful for farmers related to the crop water requirement should be prepared.

i) SMS Allocation

Since appreciable extension activities were performed under the effective supervision by irrigation SMS, it is highly recommended to allocate irrigation SMS in all support units for assisting the WEs for their effective extension activities.

j) Monitoring

Since there are no sufficient monitoring plans in almost all activities, more efforts should be given to establish follow-up plan to investigate farmers' behaviour modifications to be occurred by the effect of extension activities.

(2) Establishment of Extension Cycle

Since many extension activities were properly evaluated by the observers including C/Ps and decision makers, the collaborative works among WEs, SMSs and administrative staff were enhanced and the flow of extension activities were gradually improved. It was also considered that the extension cycle of plan-do-see in general extension activities have also gradually been established.

4.5.6 Establishment of Water Extensionists Assembly (WEA)

As described in **Chapter 4.11**, the formation of WEA was recommended at the annual seminar held at GCSAR in April 2011. General recommendation was just given from the Project by suggesting the following advantages of forming WEA by the extensionists working in the adjacent areas.

- Information sharing in general among extensionists,
- Information sharing especially on the lessons learned through extension activities, and

- Transmission of useful information and experiences for improving future extension activities.

According to the minutes of meetings reported from each WEA, it was revealed that members discussed not only about extension activities but also many subjects including irrigation notebook campaign, coordination with DMIC and the method of problem analysis. The Project is further recommending to compile the group profile and also to suggest to the promising group for producing their own newsletter based on the results of their discussions and activities.

4.6 Research Activities

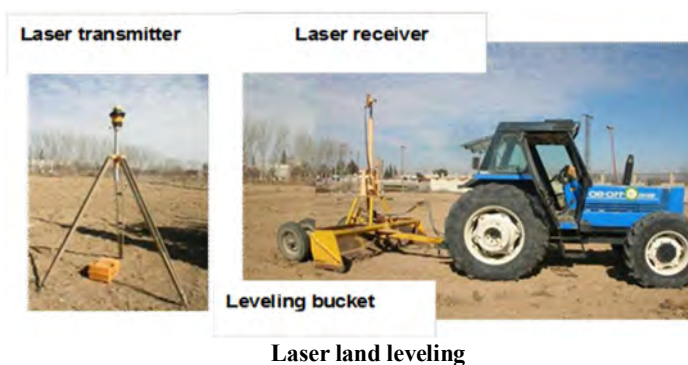
4.6.1 General Description of Research Activities

As the part of research activities of the Project, eight (8) themes of experiments have been conducted at the several Irrigation Research Stations in the concerned governorates and at the some project sites in order to promote water-saving irrigation in Syria. At the same time of being conducted as a component of the Project, those experiments were authorized as the official duty experiment under the ANRR's research program. These 8 themes of experiments were generally classified into three groups of research activities according to the background and procedure of the experimentation. Three groups were namely 1) activity for improving surface irrigation methods, 2) activity collaborated with universities, and 3) activity for improving pressurized modern irrigation methods.

(1) Activity for improving surface irrigation methods

The activity consisted of 4 research experiments conducted in northern part of Syria, Aleppo (Surbaya research station) and Raqqa (Ebb Quien research station). Farmers in the region generally own huge cultivated area comparing with southern governorates and engage surface irrigation for the strategic crops in common. Target crops of the experiments were cotton and maize which are important crops in both Aleppo and Raqqa. The experiments have been conducted for 3 years since 2010.

The experiments were tried some improved surface irrigation techniques like laser land leveling, surge flow irrigation, siphon irrigation, spile irrigation, and gated pipe irrigation in order to investigate the adaptability of these improved



surface irrigation methods.

In Raqqa, new fertigation device for surface irrigation was also investigated in the scope of the research activities of the Project.

Laser land leveling of which equipment shown in the right picture is an easy technique of land grading by using laser beam. In the case of surface irrigation, land grading improved water use efficiency dramatically.

Surge flow irrigation is an irrigation technique in which water is applied intermittently into furrows for improving uniformity of water distribution on the field. Siphon irrigation is one of the furrow irrigation methods providing irrigation water into farmland by gravity through a siphon action. Spile irrigation is similar to the siphon irrigation, but PVC pipes are buried instead of hoses in siphon irrigation. Gated pipe irrigation is another type of furrow irrigation, which is sometimes called as “Ras Al Ain Type” because it was initially developed by the Ras Al Ain Project.

As irrigation water is delivered through pipes, the gated pipe method needs suitable water pressure inside the pipe. Gated pipe method is usually utilized on the field which has a power source of pressuring like pump well.



Surge flow irrigation



Siphon irrigation



Spile irrigation



Gated pipe irrigation

(2) Activity collaborated with universities

Three (3) of 8 research activities were conducted under the technical support from Damascus University and Aleppo University. Two (2) activities conducted in Rural Damascus in collaboration with Damascus University, one was in Nashabie Research Station and the other was Arne Satellite Plot. The activity in Arne was the survey on the performance of modernized WUA established by the Project on the scope of Arne Satellite Plot. The other activity was conducted in Surabaya research station collaborated with Aleppo University.

(3) Activity for improving pressurized modern irrigation method

Hama and Daraa governorates were relatively modernized irrigation area in Syria. Two (2) research experiments for improving irrigation and fertigation management on drip irrigation were conducted in Tizeen Research Station in Hama and Jileen Research Station in Daraa, respectively.

(4) Outline of Research Activities of the Project

Every experiment has been conducted by the researchers of ANRR who were nominated for these purposes. The Project has played roles of advisor and supporter to succeed those research activities. Outline of all experiments are summarized as follows:

Table 4.6.1 List of research activities

No.	Theme	Place and Period	Objective	Remarks
1	Effect of different surface irrigation methods on yield of cotton and maize.	Surbaya research station (Aleppo) 2009-2012 (ongoing, to be continued even after the Project)	Study on the effect and adaptability of improved surface irrigation methods like laser land leveling and surge flow irrigation.	Improved surface irrigation Collaboration with Aleppo University
2	Study on the effect and adaptability of spile irrigation.	Surbaya research station (Aleppo) 2010-2012 (ongoing, to be continued)	Establish a suitable irrigation method for spile irrigation and also surface irrigation.	Improved surface irrigation
3	Study on the effect and adaptability of gated pipe irrigation.	Ebb Quien research Station (Raqqa) 2010-2012 (ongoing, to be continued)	Compare with the 2 different types of gated pipe irrigation method.	Improved surface irrigation
4	Development of new fertigation device for surface irrigation.	Ebb Quien research station (Raqqa) 2010-2012 (ongoing, to be continued)	Study on the effect and adaptability of a fertigation device developed for surface irrigation.	Improved surface irrigation Improving irrigation management
5	Study on deficit irrigation.	Nashbie Stasion (R.Damascus) 2009-2010	Study on the effect of potassium amount and water stress on yield and quality of maize.	Collaboration with Damascus University
6	Study on the management of group irrigation system.	Arne (Project site) (R. Damascus) 2010-2012	Study on the establishment and management of Water User Association. Study on the planning of irrigation schedule and participatory extension approach.	Collaboration with Damascus University
7	Establish irrigation schedule based on tensiometer.	Tizeen research station (Hama) 2010-2012 (ongoing, to be continued)	Study on adaptability of irrigation management based on soil water content by using tensiometer.	Improving modern irrigation
8	Study on fertigation management under drip irrigation.	Jileen research station (Daraa) 2010-2012 (ongoing, to be continued)	Study on suitable fertigation management.	Improving modern irrigation

4.6.2 Results of Research Activities

(1) Experiment No.1 at Aleppo Surbaya Research Station (2009-2012)

Two types of improved surface irrigation methods, laser land leveling and surge flow irrigation, have been studied under the cultivation of sunflower and maize since 2009.

Table 4.6.2 Effects of Surge Flow Irrigation and Laser Land Leveling

Year	Crop	Treatment	Irrigation amount (m ³ /ha)	Yield (kg/ha)	Water Use Efficiency (kg/m ³)
2009	Sunflower	Surge flow irrigation with laser land leveling	5,863	2,990	0.51
		Typical furrow irrigation without laser land leveling	7,086	2,480	0.35
2010	Maize	Typical furrow irrigation with laser land leveling	7,820	5,233	0.67
		Typical furrow irrigation without laser land leveling	9,197	3,233	0.35
2011	Maize	Typical furrow irrigation with laser land leveling	7,603	5,100	0.67
		Typical furrow irrigation without laser land leveling	10,038	3,017	0.30

More than anything, traditional surface irrigation without laser land leveling showed the lowest efficiency in water use. Under the condition of surface irrigation, execution of laser land leveling improved the water use efficiency significantly whatever improved surface irrigation method was applied. In addition to the execution of land leveling, adoption of a sophisticated irrigation method such as surge flow irrigation method increased the efficiency rather than others.

These tendencies seem to be unrelated with the type of crop.

(2) Experiment No.2. at Aleppo Surbaya Research Station (2010-2012)

Siphon irrigation method which provides irrigation water by siphon hoses is one of the irrigation applications in furrow irrigation. Siphon irrigation can be managed without water pressure sources, but siphon device traditionally utilized needs a lot of labor works in setting many hoses by hand. Therefore, in order to make siphon handling easier, the Project studied on the adaptability of spile irrigation which was used buried PVC pipe instead of hoses under cotton cultivation. In the year 2010, two treatments with adopting different diameters of PVC pipes were executed. On the other hand, two different methods of furrow irrigation management were studied in 2011, including Syrian conventional method and FAO's recommended method.

Table 4.6.3 Effect of Pipe Diameter on Cotton (2010, Aleppo)

Diameter	Discharge (lit/sec)	Irrigation amount (m ³ /ha)	Yield (kg/ha)	WUE (kg/m ³)
1.0 inch	0.53	9,490	2,723	0.29
1.5 inch	1.25	8,933	2,923	0.33

Table 4.6.4 Effect of Furrow Irrigation Method on Cotton (2011, Aleppo)

Treatment	Irrigation amount (m ³ /ha)	Yield (kg/ha)	WUE (kg/m ³)
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Conventional	7,769	2,978	0.38
Theoretical (FAO)	8,953	3,511	0.39

According to the result of the experiment in 2010, suitable diameter of siphon pipe was suggested to be 1.5 inch in diameter of PVC. Furthermore, there was no significant difference between conventional and theoretical methods of furrow irrigation managements in the experiment of 2011. The experiment on furrow irrigation management will be continued even after finishing the Project.

(3) Experiment No.3. at Raqqa Ebb Quien Research Station (2010-2012)

Farmers in Raqqa generally owned huge cultivation area and had been slow to adapt to modern irrigation. In consideration of the agricultural situation in Raqqa, adaptability and performance of gated pipe irrigation was studied under cotton cultivation. Cotton is one of the highest water consumption crops in Syria because of long irrigation period during the hot and dry season from April to September.

In 2010, 2 types of gated pipes, valve type and Ras Al Ain type, were compared, and in 2011, furrow irrigation managements were studied in the same way as Surabaya research station in Aleppo.



Valve Type



Ras Al Ain Type

Table 4.6.5 Comparison between 2 types of Gated Pipe (2010, Raqqa)

Gated pipe	Irrigation amount (m ³ /ha)	Crop Yield (kg/ha)	WUE (kg/m ³)	Remarks
Valve Type	7,743	1,207	0.16	The crop yield was affected by the high temperature in 2010.
Ras Al Ain Type	7,809	1,220	0.16	The crop yield was affected by the high temperature in 2010.

Table 4.6.6 Effect of furrow irrigation methods on yield and WUE of cotton (2011, Raqqa)

Treatment	Irrigation amount (m ³ /ha)	Yield (kg/ha)	WUE (kg/m ³)	Remarks
Conventional	11,093	3,150	0.28	Recession and advanced phase were not considered.
Theoretical	11,968	3,510	0.29	Recession and advanced phase were not considered.
Farmer's method	13,750	2,900	0.21	Zigzag irrigation was applied.

There was no significant difference in yield and WUE between 2 types of gated pipe, but from the aspect of workability, valve type was better than Ras Al Ain type. In the

experiment of furrow irrigation methods, the result was similar to the experiment in Aleppo. This experiment is also conducted in 2012.

(4) Experiment No.4. at Raqqa Ebb Quien Research Station (2010-2012)

Fertigation devices on modern pressurized irrigation have been developed and are familiar with farmers at the time being.

However, there are no fertigation devices for improved surface irrigation in practice. In order to remedy the situation, the Project has studied the adaptability of the new fertigation device for surface irrigation since 2010 in Ebb Quein research station.



The fertigation device for surface irrigation

The mechanism of the new device was that dissolved fertilizer in a tank was uniformly added irrigated water on the field by using siphon action.

Table 4.6.7 Effect of Fertigation Device for Surface Irrigation on Cotton Yield

Research Items	2010	2011	Remarks
By Manual application	2,257 kg/ha	3,200 kg/ha	-
By using new fertigation device	2,282 kg/ha	3,590 kg/ha	The workload was significantly deduced

Yield of cotton was slightly increased under the fertigation device and workability was also improved comparing with ordinary manual application. These results suggested that the new fertigation device was practicable.

(5) Experiment No.5. at Rural Damascus Nashabie Research Station (2009-2010)

Effect of potassium amount on WUE under deficit irrigation of maize cultivation was studied by the Project and Damascus University jointly. The combination of 2 factors consisting of 4 levels of potassium amount (0 kg/ha, 70 kg/ha, 140 kg/ha, and 210 kg/ha) and 3 levels of irrigation amount (100% of CWR, 80% of CWR, and 65% of CWR) was compared in the experiment.

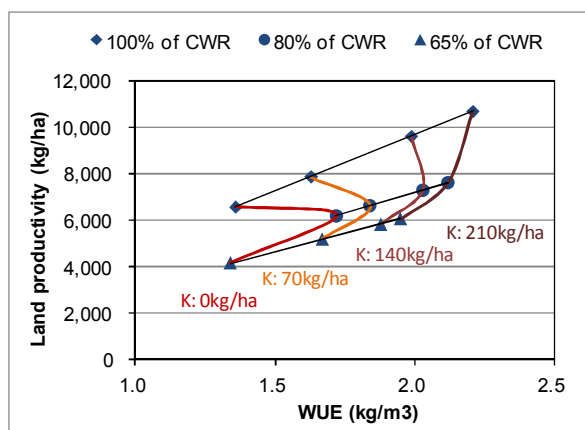


Fig.4.6.1 Effect of different amount of irrigation and potassium on WUE and production under Maize cultivation

WUE was apt to be increased under the 80% of CWR regardless of potassium amount. In the case of applying the same amount of water, more potassium application led to higher production.

This experiment could suggest that a fine combination between irrigation and fertilization management is a key to success of water-saving irrigation.

(6) Experiment No.6. at Arne Satellite Plot in Rural Damascus

Scheme of group irrigation managed by Water User Association (WUA) is much highlighted for the promotion of irrigation modernization on global views in Syria. A modern WUA was established in Arne in the scope of demonstration activities of the Project, and it started group irrigation operation by 55 farmers as at April 2010. The group operation by the WUA has been rationally managed in accordance with a guideline in technical aspect in modern irrigation and a criterion of WUA management.

The experiment No.6 is to monitor the performance of Arne WUA and analyze its observation result in order to improve their routines and to establish a proper modality of operation and management of modern WUA. This experiment has been implemented under the supervision of Damascus University.

(7) Experiment No.7. at Hama Tizeen Research Station (2010-2012)

Irrigation schedule was generally decided based on evapotranspiration estimated by using local climate data in Syria. Only research station sometimes monitores soil water content by neutron probe for the purpose of research activities.

Tensiometer which is easy and reasonable soil moisture sensor was compared with neutron probe in order to study the adaptability of tensiometer under water melon cultivation with drip irrigation.

The experiment had 3 treatments. Under the first treatment, One was water melon was irrigated according to tensiometer installed at 30cm under the soil surface. Under the second and third treatments, the crop was irrigated according to tensiometer installed at 60cm under the soil surface, and irrigated based on the class A pan, respectively.

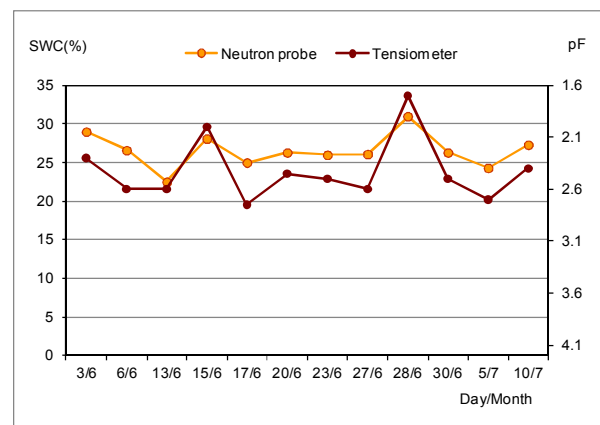


Fig. 4.6.2 Correlation between Neutron Probe and Tensiometer Readings

Table 4.6.8 Yield and WUE of water melon under the different irrigation indicators

Year	Treatment	Irrigation amount (m ³ /ha)	Yield (kg/m ³)	WUE (kg/m ³)
2010	Tensiometer (30cm)	2,288	46,160	20.2
	Tensiometer (60cm)	4,097	54,980	13.4
	Class A	2,363	46,570	20.6
2011	Tensiometer (30cm)	2,182	60,680	25.2
	Tensiometer (60cm)	2,416	63,490	23.0
	Class A	2,585	61,280	20.7

The readings of tensiometer had high correlation with those of neutron probe. Tensiometer installed at the depth of 30cm provided the highest WUE. Therefore, tensiometer was practicable to use as an indicator of irrigation management.

(8) Experiment No.8. at Daraa Jileen Research Station (2010-2012)

Daraa is one of the most advanced governorates in modern irrigation and most farmers in Daraa cultivate vegetables by using drip irrigation. These farmers usually apply fertilizer by mixing with irrigation water by using fertilizer tank as fertigation. However, only a few research on fertigation was conducted in the research station. The Project has conducted the experiment on fertigation for tomato cultivation in order to establish suitable fertigation method for tomato in Daraa since 2010. The experiment focused on the amount of N fertilizer and the timing of application.

Two levels of N fertilizer amount were established in the experiment, such as 100% of GCSAR recommendation and 70% of the recommendation. In addition, fertilizer was applied by two different frequencies, including full fertigation adding fertilizer in all irrigation, and alternative fertigation adding fertilizer alternated with irrigation. In the result of preceding study, full fertigation provided higher yield.

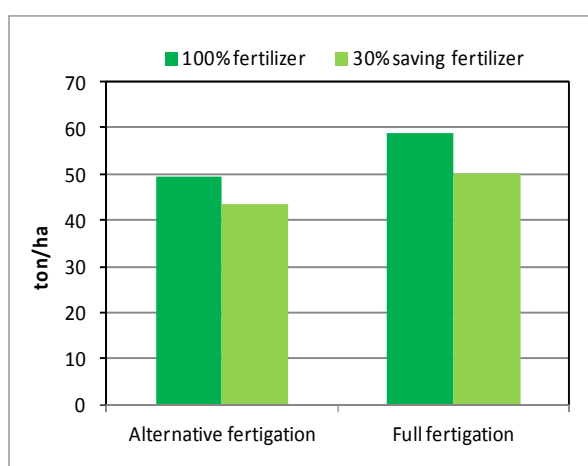


Fig. 4.6.3 Effect of Fertilizing Frequency on Tomato Yield

This experiment has been continued even after the Project to get more accurate results.

4.7 Collaboration with International Organizations/Universities

Since the beginning of DEITEX II Project, the Japanese experts and C/Ps held a series of discussions with the concerned organizations at expert level for the collaboration between the Project and international organizations/universities. Based on the discussions, the Project team decided the target subjects for the joint-working with the research organizations, and arranged time schedule of preceding cooperation and collaboration each other.

On the basis of the agreements between the Project and each research organization concerned, concrete collaborations have been progressed. The progress during the full project period is shown as follows:

Table 4.7.1 Outline of Project Activities with External Research Organizations

Cooperated organizations	Remarkable Activities	Notes
ICARDA	<ul style="list-style-type: none"> - The Project and ICARDA held a joint-discussion at the D.G. Office of ICARDA in the procedure of the Mid-term review study of the Project in November 2010. - ICARDA gave an occasion for C/Ps and Project team to observe the advanced facilities/laboratory of ICARDA in November 2010. - ICARDA gave support to C/Ps of DEITEXII on the technical training for Iraqi engineers/farmers made in February 2011. - The Project cooperated to the implementation of JICA-ICARDA training course on “Improving Water Productivity in Agricultural Systems” in May 2011. 	Cooperation was made between the DEITEX II Project and responsible scientists of ICARDA by the focused subjects as well as topics concerning modern irrigation.
ACSAD	<ul style="list-style-type: none"> - ACSAD gave technical advices to the implementation of DEITEXII Project at periodical events including the Mid-term review study of the Project. - The Project and ACSAD had a series of technical discussion about extension methods and activities. 	Cooperation was made between the DEITEX II Project and responsible scientists of ACSAD by the focused subjects, when the necessity arises.
Damascus University (Rural Eng., Faculty of Agr.)	<ul style="list-style-type: none"> - The Project supported to the students of Damascus University in their preparation of graduation thesis. - The concerned professors of Damascus University supervised the irrigation experiments conducted within the DEITEX II Project. 	Experiments of No.5 and No.6 have been progressed under the adequate supervision of the concerned professors of the University
Aleppo University (Rural Eng., Faculty of Agr.)	<ul style="list-style-type: none"> - The concerned professors of Aleppo University supervised the irrigation experiments conducted within the DEITEX II Project. - DEITEXII Project team trained and educated the students of the university for their graduation study in every year. 	Experiments of No.1, No.2 and No.3 have been progressed under the adequate supervision of the concerned professors of the University. The researcher of ANRR in Aleppo got the master degree on the experiment No.1 from Aleppo University.

In addition to the cooperation with external organizations mentioned above, DEITEXII Project team had an opportunity to participate international congress on the subject of modern irrigation. The International Commission on Irrigation and Drainage (ICID) organizes triennially World Irrigation and Drainage Congresses. In the year of 2011, a world international congress titled as “21st International Congress on Irrigation and Drainage /8th International Micro Irrigation Congress” was held in 15 – 23 October 2011, in Tehran, Iran having many participants from more than 50 countries.

The participants of DEITEXII Project team made a presentation in the 8th International Micro Irrigation Congress at the title of “Challenges of Converting to Efficient Water Saving Irrigation in Syria”. The presentation was successfully made at the Conference Hall No.1 on October 21, 2011. The participants endeavored to speak to foreign participants about the achievement of DEITEX II Project before and after the presentation during the term of the congress.

4.8 Preparation of Technical Manual

Technical Manual was prepared aiming to establish a standardized technical guideline of modern water-saving irrigation for the convenient use of Syrian engineers/technicians. In 2008 when DEITEX I was phased out, Technical Manual (version 1) had been provided. Technical Manual was revised the manual version 1 updating the contents and reinforcing with the latest knowledge and lessons learned during DEITEXII.

Modern irrigation applying improved surface irrigation and pressurized modern irrigation including large scale irrigation are taken up in this manual. The table of contents of the revised Technical Manual is shown below.

Table 4.8.1 Table of Contents for Technical Manual

Category	Chapter	Sub-chapter
General Subjects	I. Water-saving in Irrigated Agriculture	I.1 Irrigation Water Use and Water Balance in Syria
		I.2 Advantages of Modern Irrigation Method
		I.3 Outline of Water Policy and Water Right in Syria
		I.4 Outline of Government Policy in DMIC
	II. Rationalized Farm Management under Modern Irrigation	II.1 Water-saving in Irrigated Farming
		II.2 Advantages of Modern Irrigation Farming
II.3 Point in Farming Practices under Modern Irrigation		
Engineering	III-1. General Descriptions for Planning of Improved/Modern Irrigation System	III-1.1 Setting Target of Irrigation Modernization
		III-1.2 General Procedure of Irrigation System Design
		III-1.3 Site Investigation
		III-1.4 Crop Water Requirement (CWR)
		III-1.5 Irrigation Scheduling
	III-2. Planning and Designing of Modern Irrigation System (Pressurized system)	III-2.1 Irrigation System Design
		III-2.2 Irrigation Equipment
		III-2.3 Installation
		III-2.4 Operation and Maintenance

		III-2.5 Water management
		III-2.6 Considerations for pressurized irrigation system
	III-3. Planning and Designing of Improved Surface System	III-3.1 Outline of Improved Surface Irrigation
		III-3.2 Improved Surface Irrigation Techniques
	III-4. Planning and Designing of Large Sprinkler System	II-4.1 Outline of Large Scale Irrigation System
		II-4.2 Large Scale Irrigation Equipment
Supportive Information	IV. Extension of Efficient Irrigation Techniques	IV-1 Loan Support for Procuring Irrigation Equipment
		IV-2 Extension Support on Irrigated Agriculture
		IV-3 Other Technical Supports
	V. Crafting WUA in combination with Irrigation Modernization	V-1 Merit of Water Users Association
		V-2 Promotion of Water Users Associations
		V-3 Motivating Farmers for Organization of Water Users Associations
		V-4 Modernization of Arne Group Irrigation

4.9 Institutional Arrangement

In addition to implementing the project activities which had been specified within the original PDM, the Project was involved in various institutional arrangement in order to strengthen the grounds of project implementation. The Project thought that satisfaction in three circumstances is important to activate extension activities, namely (1) Central and local officials should work together in harmony, (2) Research, extension and training agencies should cooperate each other, and (3) The extension activities promoting the modern water-saving irrigation should be linked together with the other rural development activities. The Project tried to reinforce these points by some institutional arrangement together with implementation of the project activities.

(1) Harmonizing between Central and Local Officials

Officers in central offices and officials in local branches had been not always in full cooperation together with. Especially, extension unit which is the actual player of extension activities, had been far distance from the central agencies. It seems that there was an institutional gap between central and local agencies. During the period of project implementation, MAAR proclaimed emphasis on local and private sector, and restructured her organization in line with the new policy. As a restructuring in agricultural extension field, supporting unit is newly established on the higher position of existing extension units in order to act as go-between central and local. Heads of the almost all supporting units were selected from SMSs trained by the Project. Furthermore, the Project supported the operation and management of the supporting units during project period.

(2) Cooperating between Agencies of Research, Extension and Training

The most outstanding issue of GCSAR/ANRR was not to link with actual field/farmers, and not to draw on the actual problems and difficulties from farmers' level. In order to mitigate these issues, the Project encouraged mutual cooperation with GCSAR/ANRR and Extension Directorate which is the responsible organization of agricultural extension. Collaboration in several occasions has been taken between research people and extension groups on the advices of the Project.

Through reviewing of performances in public relations in GCSAR, it was unveiled that Technology Transfer Division of GCSAR plays important role of technology transfer to external organizations/farmers, and it has their own plan to fulfill their purpose. The Project tried to encourage their technical transferring activities within the sectors related to the Project like irrigation modernization or water-saving in irrigation. Some collaboration were materialized among the related organizations of Extension Directorate, DMIC, Training Directorate and Agricultural Directorates of every Governorate.

(3) Collaborating with Rural Development Scheme

As a collaboration with rural development scheme, the Project assisted local society development project implemented in Subbin under the cooperation between Hama Agricultural Directorate and Rural Woman Development Directorate.

DEITEX II organized 4-days training course for female engineers and extensionists for them to carry out the effective extension activities for rural women to save water in their home gardens through modern irrigation technology and environmental conservation mind. The training course consists of several lectures such as world water crisis, water situation in Syria, modern irrigation technology, environmental education and field practices on tank irrigation along with the preparation of action plan for extension activities. This training course was basically designed by the central C/Ps and the training materials were also prepared mainly by the central C/Ps. Based on the knowledge and skills obtained during the training course, the participants established 3 action plans and those were implemented in their project.

4.10 Capacity Building and Technical Transfer

(1) Capacity Building for Trained WEs and SMSs

One of the significant Project achievements in the capacity building was improvement of capability of WE and SMS to conduct training and/or extension activities by providing opportunities to them. Through conducting these activities, they utilized their

knowledge and skills obtained from the training courses, which was significant experiences to improve their capability. Especially during the DEITEX II period, many SMSs in each governorate worked as trainers in the WE training courses, since management of the training courses have been entrusted to the governorates. It is essential to understand training curriculum and teaching materials very well in order to teach to trainees sufficiently, which was effective to SMSs to learn more and deeper about them. In addition, it was also good opportunity to improve their communication skills through experiences as “on-the job” training.

The DEITEX I and II Project has been emphasized the difference between “training” and “education”. In both cases, the participants acquire new knowledge and skills from the process. As a post-training activity, it is very important to utilize these acquired new knowledge and skills immediately in their duty, especially in the case of “training”. So far, they have conducted various kinds of training courses in Syria, however, in many cases, the trainees have little chance to utilize acquired knowledge and skills in the post-training activity. On the other hand, DEITEX II has established training-extension system in which the trainees are obliged to conduct extension activity after completing the WE training courses. Furthermore, SMS is supposed to be a trainer of WE training after SMS/TOT courses in this system. This systematic approach was very effective to improve capacities of WEs and SMSs.

In addition, there are long steps to go before being qualified as SMS, such as completing the WE training courses successfully and achieving good results from the SMS/TOT courses. That means not all of WEs are able to be SMS, which makes qualified SMS more valuable status. Because of that, SMSs are proud of their status and confident enough in themselves, which results in conducting more effective and successful activities.

(2) C/P Training in Japan

In order to enhance the C/Ps’ capacity of managing and pursuing duties in irrigation modernization, the Project made “on-the job” and “off-the job” training for C/Ps. C/P Training in Japan is one of the characteristic project activities for capacity building and technical transfer to C/Ps.

During the project period, 4 times training in Japan were carried out with different training subjects of “Extension”, “Irrigation Technology” and “Training (including Extension)”. Major contents of the Training in Japan were lectures on agricultural

extension, training, research, and irrigation along with visiting the related organizations. The training also included lectures and practices on communication & presentation skills and curriculum development. On the other hand, the participants learned from technical workshop and study tour in the third country, including lectures and site visiting regarding irrigation development, training and extension activities as well as exchanging views and opinions with the concerned engineers.

Achievement of C/P Training in Japan conducted during the project period is mentioned in **Table C** of **ANNEX 1**, and summarized as follows:

Table 4.10.1 Outline of Implemented “C/P Training in Japan”

Name of Training		Implemented Period	No. of Participants	Purpose of the training	General activities of the training
1	1 st Training Course in Japan	From Oct. 3 to Nov.1, 2009	4 C/Ps (Central:1, Local:4)	Focusing on the training subject of “Extension”	Study on agricultural extension and training by the central government, prefectural government and local government including training on PCM workshop and Coaching Presentation methods.
2-1	2 nd Training Course in Japan	From Sep. 24 to Oct. 25, 2010	6 C/Ps (Central:2, Local:4)	Focusing on the training subject of “Irrigation Technology”	Filed visit to major irrigation schemes in Japan and manufactures of irrigation equipment. Also included methods on PCM workshop and coaching presentation.
2-2	Additional Training Course in Japan for executive C/Ps	From Oct. 2 to Oct. 10, 2010	2 C/Ps (Director of DMIC, and Director of Training Center)	Focusing on the training subject of “Project Management ”	Learn management of irrigation schemes, training, extension activities in Japan through field visit to major irrigation schemes (Kasumigaura and Toyokawa yosui) and agricultural research stations.
3	3 rd Training Course in Japan	From Oct. 01 to Oct. 30, 2011	7C/Ps (Central:3, Local:4)	Focusing on the training subject of “Training/Extension”	Study on agricultural extension and training by the central government and local government including training on PCM/CUDBAS workshop and coaching/ presentation methods.

For every case of the training, participated C/Ps prepared training report in which the fruits of the training in Japan were confirmed. After returning to their jobs for the participant C/Ps, they have utilized and verified those knowledge and experience.

(3) Third Country Training

As another “off-the job” training for capacity building and technical transfer to C/Ps, Third Country Training was planned and implemented in suitable time.

During the project period, 3 times of training were carried out for different countries for different C/Ps. Achievement of the Third Country Training is mentioned in **Table C** of **ANNEX 1**, and summarized as follows:

Table 4.10.2 Outline of Implemented “Third Country Training”

Name of Training		Implemented Period	No. of Participants	Visited Country	General activities of the training
1	1 st Third Country Training	From Jul 31 to Aug.8, 2009	7 C/Ps (Central:4, Local:3)	Tunisia	Study visit to Tunisia on modernized irrigation management and water resource management
2	2 nd Third Country Training	From Oct. 29 to Nov. 5, 2010	6 C/Ps (Central:2, Local:4)	Egypt	Study visit to Egypt on modernized irrigation under management of farmers' organization and field visit to JICA cooperated project area.
3	Additional Training (Participation in International ICID Congress)	From Oct. 15 to Oct. 24, 2011	2 C/Ps (Central:2)	Iran	Participation in The 21th ICID Congress on Irrigation and Draining & 8th International Congress on Micro-Irrigation

For every case of the training, participated C/Ps prepared training report/presentation materials summarizing the results of the training. After returning to their jobs, they held a presentation of the results of training to the associate of their offices.

(4) Implementing Training courses for Iraqi Trainees

As a remarkable “on-the job” training for capacity building and technical transfer to C/Ps, Training Courses for Iraqi Trainees were carried out by C/Ps’ initiative and management.

JICA-Jordan Office has implemented “JICA Third Country Program on Capacity Development for Agricultural and Rural Development for Iraq (CDARDI)” since 2003. The JICA-Jordan Office requested to GCSAR which is the responsible C/P organization of DEITEX II Project, to receive Iraqi trainees of the CDARDI program for the purpose of visiting the project sites and exchanging views and opinions with Syrian C/Ps of the Project. On the basis of the acceptance of the Director General of GCSAR to the request, C/Ps of DEITEX II Project received Iraqi trainees of the program in July 2010 and January 2011. After agreed on the acceptance of Iraqi trainees, C/Ps worked on planning and scheduling of the study trip of Iraqi trainees taking requirements of the participants and their convenience into consideration.

During the project period, 2 times training for Iraqi trainees were carried out by different training subjects. Achievement of the training courses is summarized as follows:

Table 4.10.3 Outline of Implemented “C/Ps Managed Training Course”

	Name of Training Course	Training period	Trainees	Main subject	Remarks
1	1 st Training Course on	From 24 to 30 July 2010	22 Iraqi engineers	- To transfer the knowledge and	This was implemented under the “Third Country Training

	JICA-CDARI Program			experience on how to formulate and manage the DEITEX II Project at the sites.	Program on Capacity Development for Agriculture and Rural Development for Iraq (CDARDI)”
2	2 nd Training Course on JICA-CDARI Program	From January 29 to February 3, 2011	17 Iraqi engineers and 5 farmers	- To transfer the outcomes achieved in DEITEXII Project. - To visit concerned organizations including ICARDA	This training course was visited many places of Damascus, Hama and Aleppo in Syria

DEITEX’s C/Ps fully attended to the trips of the Iraqi trainees, and tried to transfer the knowledge and experience on how to formulate and manage the DEITEX II Project at the sites. In addition to the C/Ps who directly engaged in the trip, many other central and local C/Ps also played a part to do with the implementation of this cooperation directly and/or indirectly. These experiences of the C/Ps were significant occasions to enhance and improve their capability of training and extension activity management.

As the conclusion of this study trip of Iraqi trainees, a wrap-up meeting was held. Evaluation and conclusion of the Iraqi’s trip discussed in the meeting are outlined as follows:

- a) The study trip was good and useful especially for the extensionist trainees, and they benefited from the field trip.
- b) They noticed that some of the DEITEX extension materials were very useful, which could be effective to convince farmers about saving water.
- c) They also learned that extension methodology developed by the DEITEX Project was very practical, especially emphasizing on the importance of good preparation to conduct efficient extension activity.
- d) They noticed that extension part is strong because scientific research is supporting them, and the relationship between the research and the extension is good.

(5) Joint-Working in Amman

Prior to termination of the Project, Japanese expert team and Syrian C/P team held an occasion of joint working in the third country in order to ensure success of the Project. During from 2 to 17 April 2012, Joint-Working of DEITEXII Project consisting following 5 sessions was held in Amman, Jordan:

Session 1: Promotion of Project Activities of DEITEX II Project in 5th Year April 02 – April 03

Session 2: Implementation of "CUDBAS Workshop" April 04 – April 07

Session 3: Discussion on Project Activities in Governorate level April 08 – April 12

Session 4: Discussion on Project Activities during Remaining Period April 13 – April 14

Session 5: Discussion on How to Sustain the Project since July 2012 April 15 – April 17

Totally 29 Syrian C/Ps and farmers related to the project activities participated in the series of sessions of the Joint-Working. The achievement of the Joint-Working is outlined as follows:

Table 4.10.4 Outline of Implemented “Joint-Working in Amman”

Part of working	Syrian participants	Japanese participants	Topics of Session	Remarks
Session 1	6 central C/Ps	3 experts	<ul style="list-style-type: none"> - to clarify the purpose and general plan of this joint-working in Amman, - to discuss and arrange about time schedule and activities of each session, - to exchange information and views about the implemented project activities until present, - to confirm the annual implementation plan of training/extension in 2012, and - to confirm the implementation of the DEITEX II Project in 2012. 	Achievement of project activities in 2011 was assessed, and plan of training/extension in 2012 was authorized.
Session 2	6 central C/Ps	3 experts 1 JICA officer	<ul style="list-style-type: none"> - to give an orientation to “training curriculum development by CUDBAS”, - to carry out CUDBAS workshop, and - to discuss how to reflect this experience into the future duties of the participants. 	Existing training curriculum was proved by the CUDBAS method.
Session 3	2 central C/Ps 18 local C/Ps (including 3 farmers)	3 experts	<ul style="list-style-type: none"> - to exchange information and views about the implemented project activities in governorate level, - to confirm the annual implementation plan of extension activities in governorate level, and - to confirm the implementation of the DEITEX II Project in governorate level. 	Project achievement by each governorate was assured.
Session 4	6 central C/Ps	3 experts 1 JICA officer	<ul style="list-style-type: none"> - to summarize the results of Final Evaluation Study, - to discuss about the preparation of final outputs of DEITEX II Project, - to discuss about the preparation work for holding "DEITEX Workshop", and - to confirm about the communication system between Japanese experts and C/Ps during the remaining period. 	Remaining work was confirmed, and contents of final outputs were finalized.
Session 5	6 central C/Ps (including D.G. of GCSAR)	3 experts 2 JICA officers	<ul style="list-style-type: none"> - to summarize the achievements and lessens of the implementation of the Project, - to hold a consultation about the new institutional structure for sustaining the Project, - to discuss about every items and measures in order to sustain the Project including how to organize “national training team” etc., and - to decide how to proceed the subjects concerning to the recommendations given in Final Evaluation. 	Reactions to the recommendations given by Final Evaluation Study were secured. Postures to the project activities after the termination of the Project were confirmed.

4.11 Systemization of Sustainable Water-saving Modern Irrigation

DEITEX II generally contributes to systemize and fix sustainable water- saving modern irrigation as well as attaining the specified project purpose. In response to the recommendation made during Mid-term evaluation study and also Final evaluation study, the Project has been encouraging to establish the national training team in order to

promote and expand training activities to other governorates in entire Syria. It is one of the achievements for the systemization of sustainable water-saving modern irrigation.

As mentioned in **Section 4.4**, The Project came up with new measures to keep existing water-extensionists active and cooperative. Systemization of holding follow-up training for the existing water-extensionists is one of the measures updating capability of the extensionists. At the same time, the Project established Water-Extensionist Assembly (WEA) in order to encourage cooperation of extensionists each other. In order to cope with difficulties for which water-extensionist cannot solve alone, the Project suggested 1) to share experiences and information in extension working with neighboring WEs, 2) to be cooperative and supporting each other with neighboring WEs, 3) to be friendly within neighboring WEs, and 4) to keep mutual relation continuously with neighboring WEs, besides their administrative roles. As a measure for achieving above requirement, the Project proposed to establish “Water-Extensionist Assembly (WEA)” which is a informal friendship society for all WEs.

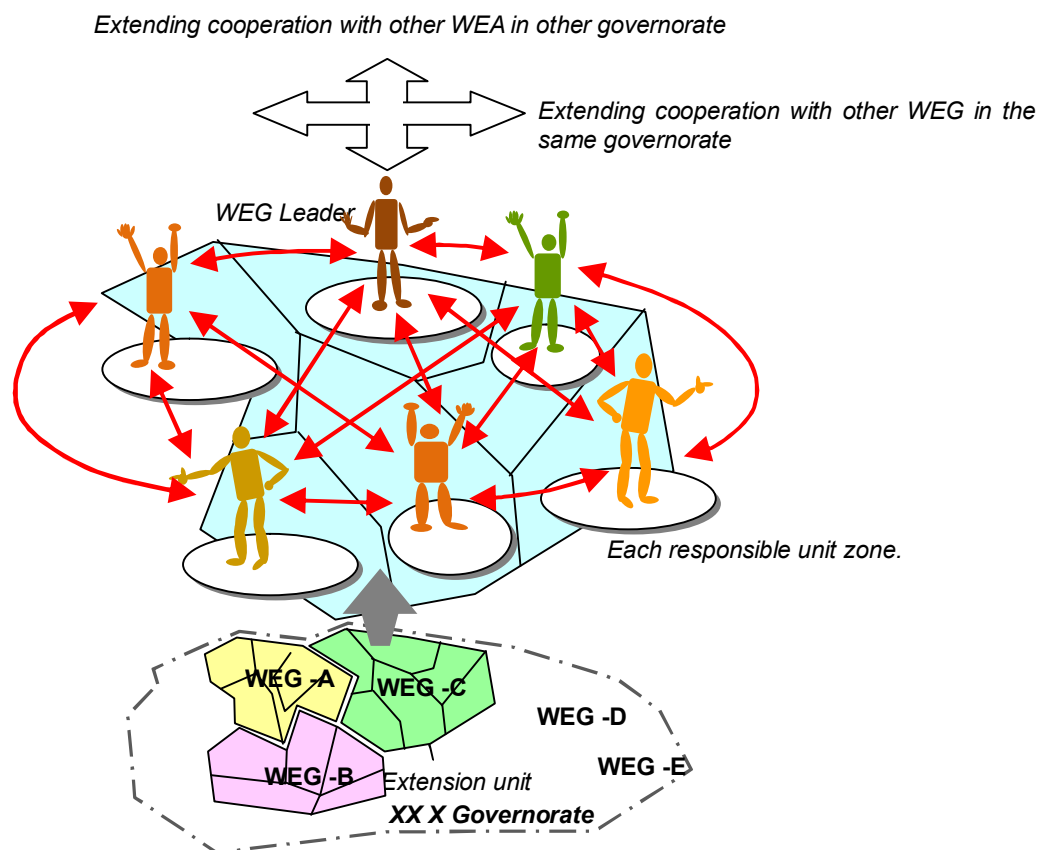


Fig.4.11.1 Conceptual Feature of Proposed WEA

WEA is to be managed by the level of governorate, and WEA of each governorate are composed of a number of Water-Extensionist Group (WEG), which consists of several WEs who are closely neighboring in their responsible extension units. Members of WEG could be cooperative and supported each other whenever needed. Each WEG will select WEG Leader who can lead the cooperation with other WEGs in the same governorate, and join the council of WEA of the governorate which will be composed of every leaders of WEGs in the same governorate. Furthermore, the council of WEA will extend cooperation with other governorate.

4.12 Public Relations

In parallel with the implementation of the substantial project activities, the Project considered and handled the public relations for modern irrigation promotion and DEITEX II Project itself. Some of extension activities of DEITEX II were implemented not only for the purpose of disseminating water-saving in irrigation within the scope of the Project, but also for covering the role of public relations. Moreover, extra activities were implemented aiming on public relations, in particular. To be brief, followings activities concerning to public relations were given on the extent of the Project:

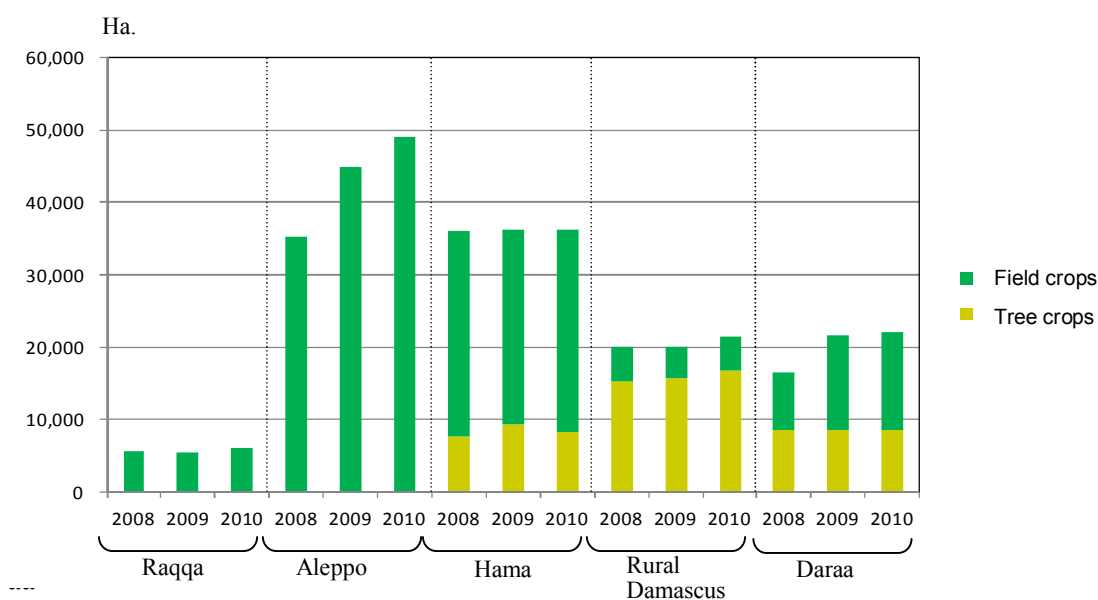
DEITEX seminar was annually held for presenting the progress of project activities and importance of the concept of water- saving, in which wide range of persons were invited for the purpose of public relations. Outstanding ceremony for opening of the demonstration farm of the Project was also performed inviting many citizens and farmers in the region for the same purpose. In addition to them, DEITEX II actively participated occasions of exhibition in agriculture and irrigation. MAAR holds agricultural fair (so called as SIATEX) at Fair Ground in Damascus in every year. DEITEX's counterparts of ANNR/GCSAR made preparation in displaying panels, projector and irrigation equipment. And they were stationed at the booth in rotation during the fair. A number of guests from the five project sites and other governorates have visited the booth and exchanged information on irrigation and project activities with the counterparts.

Furthermore, the project team of the Project was frequently interviewed by the press of newspaper and TV etc. The interviewed reports were contributed to public relations for the existence of the Project and campaign of modern irrigation promotion in Syria.

5. Achievement and Evaluation of the Project

5.1 Advancement of Modern Irrigation in the Concerned Governorates

Modern irrigation is steadily expanding in the project areas during the project period, even though degree of advancement of irrigation modernization varies by governorates due to the characteristics of irrigated agriculture and farmers' conditions in the governorates. Following figure shows changes of irrigation modernization of the concerned governorates during project period according to the data in Agricultural Statistics published by the Syrian Government:



Remarks: As of June 2012, latest Agricultural Statistics is "Agricultural Statistics 2011" which is based on the data in 2010.

Fig. 5.1.1 Advancement of Irrigation Modernization by Governorates

The situation of irrigation modernization shown above is at the whole governorate basis but not at the project sites level. As the Project focuses on the project sites where are the some parts of area selected, the achievement of irrigation modernization above does not always accord with the degree of project achievement. For instance, Raqqa has well progressed in project extension activities at the project-site basis as described in the later section of this Report, however, the advance of irrigation modernization looks slow in the above figure. This is because the effect of the Project is currently on the way of expanding from the project site to whole area of the governorate. Even though counting those situations, the overall tendency of advancement of irrigation modernization could be realized by the figure.

As advancing irrigation modernization by governorates level, the remainder area for

modernizing has steadily reduced year by year. Condition of irrigated agriculture was analyzed on the basis of the Agricultural Statistics by governorates and by years. By those results of the analysis, classified areas by irrigation types and water sources etc. were made clear as shown in **Fig.5.1.2**

According to the results of the analysis, the remainder area for irrigation modernization is clarified by the type of modernization, which is summarized in the following figure.

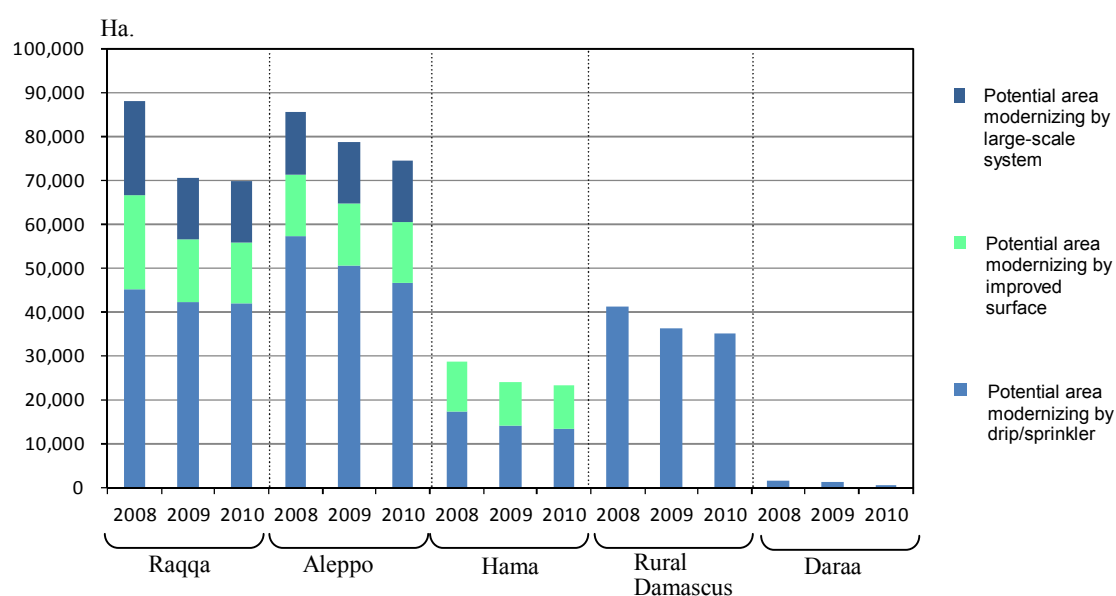


Fig. 5.1.3 Changes of Remainder Area for Irrigation Modernization

Though, there are some differences in those reducing rates, every concerned governorate has surely made a decrease in the remainder area for irrigation modernization.

5.2 Outline of the Project Evaluation

(1) Ex-ante Evaluation

After receiving the GOS's request of launching the new project which succeeds to DEITEX I, Preliminary Study was immediately conducted by JICA. Under the Study, Ex-ante Evaluation for the plan of the new project was carried out. The design of the new project was evaluated on five elements of relevance, effectiveness, efficiency, impact, and sustainability.

The relevance of the plan of the Project was considered as significant, judging from the high consistency in the Syrian Government Policy and also in the Japanese Aid Policy, and holding high beneficiaries' need for implementation under the current situation in

Syria. Effectiveness was also confirmed at the points of proper commitment of the participating agencies, and properness of the method of implementation of the Project, and high advantage in utilization of outputs generated by the Phase I Project. Efficiency was proved from the adequate relationship between proposed inputs and expected outputs.

The Project would be expected remarkable impact as achievement of Overall Goal, positive ripple effect to environment, and anticipating few negative impacts. Furthermore, sustainability of the Project was expected in political, financial and institutional aspects, as well as in technical aspect. In those respects, the plan of the new project was gone through the ex-ante evaluation, and the DEITEX II Project was set forward to the signing of R/D for the project implementation.

(2) Mid Term Evaluation

1) Overview of Mid-Term Evaluation Study

After 22 months since started the Project, Mid-Term Evaluation was implemented in October 2010 with the following objectives:

- a. To review the progress and achievements of project activities and to exchange opinions with the Syrian authorities concerned through visiting the project sites,
- b. To evaluate the Project from the view points of the 5 evaluation criteria,
- c. To modify PDM (Project Design Matrix) in order to properly monitor the progress and activities of the Project, if necessary,
- d. To formulate the Joint Mid-term Review Report with Syrian Evaluation Team and make necessary recommendation to both governments on the project activities in the remaining period of the Project, and
- e. To participate in the Joint Coordinating Committee in order to present and discuss the results of Mid-term Review on the Project with the Syrian authorities concerned and sign on the Minutes of Meeting.

The evaluation was fulfilled jointly by the Syrian and Japanese mid-term review teams based on materials showing the framework of the Project such as the Project Design Matrix (PDM) and the R/D. The evaluation activities included analysis on reports, field surveys, and interviews with staffs of the MAAR, staffs of Directorate of Agriculture of governorates concerned, JICA experts, irrigation farmers in the project areas and other concerned personnel in the Project. In accordance with the JICA's standard, Mid-Term

Evaluation was also preceded according to the five evaluation criteria, namely, relevance, effectiveness, efficiency, impact and sustainability. Member of the Joint Evaluation Team were selected in terms of specialty and fairness, which is shown with following table. The Japanese Evaluation Team was dispatched to Syria for the Study.

Table 5.2.1 Members of Mid-term Evaluation Team

Category	Title	Name	Occupation
Japanese team members	Leader	Mr. Masayuki TAKAHASHI	Director, Field Crop Based Farming Division 2, Rural Development Department, JICA
	Dry-land Farming	Prof. Dr. Shinobu INANAGA	Chairperson, JICA Support Committee for Dry-land Farming in Middle East
	Cooperation Planning	Ms. Yuka ASAKAWA	Program Officer, Field Crop Based Farming Division 2, Rural Development Department, JICA
	Evaluation and Analysis	Mr. Isao DOJUN	Consultant, Chuo Kaihatsu Corporation
Syrian team members	Leader	Dr. M. W. TAWIL	Director General, General Commission for Scientific Agricultural Research (GCSAR), Ministry of Agriculture and Agrarian Reform (MAAR)
	Team Member	Dr. Awadis ARSLAN	Director, Administration of Natural Resources Research (ANRR), GCSAR, MAAR
	Team Member	Dr. Bashar IBRAHIM	Assoc. Professor, Department of Rural Engineering, Faculty of Agricultural, Damascus University
	Team Member	Dr. Waeil SEIF	Professor, Water Engineering Division, Faculty of Civil Engineering, Damascus University

2) Implementing Schedule of Mid-Term Evaluation Study

Joint Evaluation Team worked for the Mid-Term Evaluation during the period from November 20 to December 3, 2010. The following meetings were held during the Mid-Term Evaluation:

- November 21st, 2010 The 1st Joint Evaluation Committee
- November 30th, 2010 The 2nd Joint Evaluation Committee
- December 2nd, 2010 Steering Committee

3) Conclusion and Recommendation based on the Results of Mid-Term Evaluation

The Mid-Term Evaluation Team was concluded that the project activities of the Project had been progressing as scheduled, most of the project's outcomes to date, such as extension of water-saving irrigation techniques and training for water extensionist, etc, had been achieved as planned. Relevance of the Project was assessed at high level and effectiveness of the Project was evaluated to be at a satisfactory level by achieving the

Project Purpose by the end of the project period. Efficiency of the Project was also judged as a satisfactory level and several positive impacts were observed such as, increased collaborative relationship among organizations concerned, dissemination of water-saving irrigation as effect of the project activities at the demonstration and neighboring farms, and farmer-to-farmer exchange of information.

The Joint Evaluation Team explained that there were some important issues in order to have better outcomes of the Project and to ensure the continued effective utilization of the outcomes of the Project after the completion of JICA cooperation. These issues were dealt with the recommendations to the project team and Syrian Government as mentioned as follows:

- a. Recommended actions to be taken by the project team in the remaining project period
 - It is necessary to strengthen training on communication skills as a subject in the curriculum of the training course for water extensionist in order that trained water extensionists can deliver knowledge and skills more effectively to farmers. In this regard, it is necessary to consider farmer's mentality which differs by regions or areas.
 - In order to deliver the outcomes of the Project to neighboring countries, it is necessary to arrange participation to the third country training courses which conducted by ICARDA commissioned by JICA, etc., and make presentation on the project activities and outputs.
 - In order to disseminate the outcomes of the Project to other governorates in Syria, it is necessary to conduct a seminar/workshop by inviting persons concerned in these areas in collaboration with regional universities and research organizations.

- b. Recommended actions to be taken by the Syrian side
 - There is very good collaborative relationship among organizations involved in the project activities at present. It is necessary to create certain coordination mechanism within the Ministry of Agriculture and Agrarian Reform and with the Ministry of Irrigation in order to keep this situation and accelerate dissemination of water-saving irrigation techniques to other governorates in Syria after the completion of the Project.
 - The project targeted areas are 5 governorates (Hama, Rural Damascus, Daraa,

Aleppo and Raqqa). In order to disseminate the outcomes of the Project to other governorates in Syria and ensure sustainability of training structure and function of the Project, it is necessary to form a national training team to prepare training plan for water extensionist, extension plan for water-saving irrigation techniques, and budgetary plan for implementing these plans.

- It is necessary to strengthen collaboration between extensionists and DMIC staffs.

c. Recommendation on revision of current Project Design Matrix (PDM version 2)

The Joint Evaluation Team noticed that some modification on PDM is necessary as a result of examination of current PDM (version 2).

As the closing of the evaluation study, Steering Committee Meeting was held on December 2, 2010 having attendance of almost all members of Steering Committee of the Project. The result of the evaluation study was agreed as explained by the evaluation team. In addition, modification of PDM was discussed in accordance with the recommendation given by the evaluation team. Finally, the PDM was revised to the version 3.0 with accepting the recommendation.

(3) Final Evaluation

1) Overview of Final Evaluation Study

Final Evaluation was conducted about 38 months after the Project inauguration. Though the original plan had intended to make the final evaluation implement within 2011, Final Evaluation Study was carried out in March 2012 being delayed by the reason of unstable conditions in Syria. Objectives of the Final Evaluation are enumerated as follows:

- a. To review the performance and achievements of the Project comparing to its plan especially accomplished after the Mid-Term Evaluation in December, 2010,
- b. To discuss on necessary actions to be taken in the remaining and after the Project periods and to exchange opinions with the Syrian authorities concerned through Video Conference,
- c. To make necessary comments and advice on the future plan of activities based on the results of the review taking the current situation in Syria into the consideration, and
- d. To formulate a Joint Evaluation Report with Syrian authorities concerned based on

the result of the items above, and participate in Joint Coordinating Committee in order to present and discuss the result of evaluation through Video Conference and to exchange the Minutes of Meeting.

The evaluation was fulfilled jointly by the Syrian and Japanese final evaluation teams based on materials showing the framework of the Project such as the Project Design Matrix (PDM) and the R/D. Despite the situation which made fields surveys impossible, effective evaluation activities included analysis on reports, questionnaire surveys for C/Ps, and interviews with JICA experts, were carried out. Members of the Joint Evaluation Team were selected in terms of specialty and fairness.

Table 5.2.2 Members of Final Evaluation Team

Category	Title	Name	Occupation
Japanese team members	Leader	Mr. Masayuki TAKAHASHI	Director, Field Crop Based Farming Division 2, Rural Development Department, JICA
	Irrigation Agriculture	Dr. Hideyuki Kanamori	Senior Advisor (Operation and Management of Irrigation Systems), JICA
	Cooperation Planning	Ms. Yuka ASAKAWA	Program Officer, Field Crop Based Farming Division 2, Rural Development Department, JICA
	Evaluation and Analysis	Dr. Yoshihito Kashiwazaki	Consultant, A & M Consultant Co., Ltd.
Syrian team members	Leader	Dr. Mohammad Naif Al Salty	Director General, General Commission for Scientific Agricultural Research (GCSAR), Ministry of Agriculture and Agrarian Reform (MAAR)
	Team Member	Dr. Awadis ARSLAN	Deputy Director General, GCSAR, MAAR
	Team Member	Mr. Haitham Al-Ashkar	Deputy Director, National Agricultural Policy Center (NAPC), MAAR
	Team Member	Dr. Bachar Ibrahim	Head of Rural Engineering Division, Damascus University

2) Reviewing Activities of Final Evaluation Study

Japanese Evaluation Team was not dispatched to Syria but worked in Japan. Joint Evaluation Team started working for the Terminal Evaluation during the last week of February and the Terminal Evaluation was concluded at the Steering Committee held on the 19th of March, 2012. Meetings held during the Terminal Evaluation were as follows:

- February 29th, 2012 The pre-1st meeting (a video conference)
- March 6th, 2012 The 1st Joint Evaluation Committee (a video conference)
- March 14th, 2012 The 2nd Joint Evaluation Committee (a video conference)
- March 19th, 2012 Steering Committee (a video conference)

3) Results of Final Evaluation

The conversion of irrigation system from the traditional water-consuming irrigation to modern water-saving irrigation system is regarded as one of the most important issues in the development plan of Syria. One of the important fields of the assistance policy of the Government of Japan for Syria is the water resource management and its effective use. As a result, the **relevance** of the Project is considered high in terms of needs of beneficiaries, policies of the Government of Syria, and assistance policy of Japan.

A small part of the indicators for the Project Purpose has not been achieved yet but is expected to accomplish by the end of the Project. The personnel concerned in the Project have established excellent relationships not only within the Project but also with the farmers and other institutions, which positively affected on the effectiveness of the Project functions. In addition, the Government of Syria established DMIC and has been providing a grant and loan to the farmers in order to activate the introduction of irrigation equipment. As a result, the **efficiency** of the Project is at an excellent level.

The outputs of the Project have been produced satisfactorily in terms most of the related indicators as shown in the following section. Both Syrian and Japanese sides have appropriately provided the inputs for the project activities. The products of the Phase I Project have been utilized effectively during the Project. In conclusion, the **effectiveness** of the Project is at a satisfactory level in terms of outputs based on the input conditions.

The outcomes of the Project as of the present strongly indicate positive prospects for achievement of the Overall Goal as 5 extra years are still given to the responsible organizations. In addition, following other impacts could be expected:

- Increased collaborative relationship between the organizations concerned
- Competitive mind in farmers
- Newly introduced irrigation approach; the group-irrigation program
- Comprehensive training course
- Positive impacts observed in demonstration farms (saving working time, diesel and fertilizer)
- The high management ability and strong ownership of the Syrian C/Ps.

As a result, the **impact** of the Project was confirmed at an excellent level in terms of Overall Goal, and other positive or negative impacts by the Project.

Furthermore, sustainability of the Project was examined in several important aspects.

From the viewpoint of Political aspect, the Government of Syria has placed great importance on the modernization of irrigation and the policy sustainability will be secured regardless of the deterioration of the security situation. From the viewpoint of organizational aspect, the modernization of irrigation by the extension of water-saving irrigation techniques to the farmers will be continued in a sustainable manner. From the viewpoint of financial aspect, it is needless to mention that the Government of Syria should allocate a sufficient amount of the budget. From the viewpoint of technical aspect, the capacity of the Syrian C/Ps and staff concerned with the Project has developed not only the techniques on modern irrigation but also the management skills through the implementation of the project activities. From the viewpoint of Social, cultural and environmental aspects, the following aspects have been considered by the Project for the environment:

- Depletion in groundwater level in particular
- Rationalization of fertilizer application
- Rationalization of water use by the farmers in some project areas

In conclusion, the **sustainability** of the Project was affirmed is in terms of concerned aspects from a very wide perspective. Nevertheless, counter measures against the following negative effects would be considered.

- Environmental influence from farm equipment waste
- Social influence of job opportunities for irrigation-agriculture workers

4) Conclusion and Recommendation of Final Evaluation

Taking the results of evaluation analyzed above as well as the achievements of the Project mentioned in the following **Section 5.3** into consideration, It was confirmed that the project activities have been continued with producing its outputs at a satisfactory level even under the current difficult situation in Syria, although a part of the activities has been postponed. Some of the main activities such as extension of water-saving irrigation techniques and training for water extensionists have been conducted in the form of improved style in accordance with recommendations proposed at Mid-term Review. These facts enable to conclude that the Project is expected to complete its period by achieving the Project Purpose by the end of the Project.

Having said that, since the dispatch of Japanese experts was partially restricted due to Japan's security instructions, some activities have been postponed because of the security issues, and this Terminal Evaluation was carried out without conducting surveys on the

spot, the Joint Evaluation Team has found out some issues to be addressed for overcoming these restrictions. The issues are mentioned as recommendations.

Following recommendations were given:

- a. Since the Joint Evaluation Team for this Terminal Evaluation could not conduct any surveys in the field and some updated information was missing regarding the indicators of each output and the Project Purpose, a field survey is recommended to be jointly carried out by Syria and Japan to collect those missing information and to find out the real achievement once the situation in Syria is settled down. It is also possible to have discussion in that occasion on necessary and possible future cooperation between Syria and Japan in case some specific needs and feasible activities are clarified.
- b. As recommended at Mid-term Review, in order to disseminate the outcomes of the Project to other governorates in Syria and ensure the sustainability of training structure and the function of the Project, it is strongly recommended once again that the idea of forming a National Training Team within the MAAR is realized so that a training plan for water extensionist, an extension plan for water-saving irrigation techniques and budgetary plan for implementing these plans are prepared.
- c. In order to further enhance the communication between the extensionists and farmers, it is recommended for the project team to add a training item on “attitude” to the curriculum in the remaining period.
- d. In order to conduct further water saving, research on other measures than pressurized irrigation should be sustained on managerial, institutional and agronomical approaches for maximizing water productivity.

5.3 Achievement Clarified by the Final Evaluation

Through conducting Final Evaluation Study, achievements of the Project were clarified in terms of indicators described in the PDM as shown in **Table 5.3.1**. On the basis of the achievement confirmed as shown in the following table, the Project was evaluated and concluded as mentioned in **Chapter 5.2**.

Table 5.3.1 Achievements of the Project clarified by Final Evaluation

Indicators		Concerned information and data	Achievement
Op. (1)-1	Amount of irrigation water used for each crop in the Demonstration	The reduction rates of observed irrigated water in 2010 and 2011 against the baseline of irrigation water amount obtained in 2009.	It could be analyzed that farmers' positive engagement in the activities on the demonstration farms might result in those high

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	Farms in Aleppo and Raqqa Governorates are reduced by 10 – 15%	<table border="1"> <thead> <tr> <th rowspan="2">Demonstration farm (Gov.)</th> <th colspan="2">Reduction rate</th> </tr> <tr> <th>2010</th> <th>2011</th> </tr> </thead> <tbody> <tr> <td>Jine (Aleppo)</td> <td>41.1%</td> <td>43.7%</td> </tr> <tr> <td>Sukkarie (Raqqa)</td> <td>42.1%</td> <td>28.6%</td> </tr> </tbody> </table> <p>Note: The reduction rates above are the average of the values by crops.</p>	Demonstration farm (Gov.)	Reduction rate		2010	2011	Jine (Aleppo)	41.1%	43.7%	Sukkarie (Raqqa)	42.1%	28.6%	reduction rates as showing much above the indicator. The reduction of irrigated water don't spoil crop production because the yields of crops on the demonstration farms were much higher than the average yield of the neighboring farmers.							
Demonstration farm (Gov.)	Reduction rate																				
	2010	2011																			
Jine (Aleppo)	41.1%	43.7%																			
Sukkarie (Raqqa)	42.1%	28.6%																			
Op. (1)-2	The number of farmers adopting water-saving irrigation technique in the Project Sites in Aleppo and Raqqa Governorates increases by 80 – 100%	<p>The ratio of modernized farmers was estimated by changes in the irrigated areas with water-saving irrigation systems “before” and “after” the project implementation as follows:</p> <table border="1"> <thead> <tr> <th rowspan="2">Project Site (Gov.)</th> <th colspan="2">Ratio of modernized farmers</th> <th rowspan="2">Increased ratio</th> </tr> <tr> <th>Before (2008)</th> <th>After (2010)</th> </tr> </thead> <tbody> <tr> <td>Jine (Aleppo)</td> <td>16.9%</td> <td>36.9%</td> <td>217%</td> </tr> <tr> <td>Sukkarie (Raqqa)</td> <td>0.8%</td> <td>13.8%</td> <td>1,725%</td> </tr> </tbody> </table>	Project Site (Gov.)	Ratio of modernized farmers		Increased ratio	Before (2008)	After (2010)	Jine (Aleppo)	16.9%	36.9%	217%	Sukkarie (Raqqa)	0.8%	13.8%	1,725%	Though the data for “after” are available until 2010, the increased ratio is quite high resulting from the fact that the area with water-saving irrigation before the project commencement was small.				
Project Site (Gov.)	Ratio of modernized farmers			Increased ratio																	
	Before (2008)	After (2010)																			
Jine (Aleppo)	16.9%	36.9%	217%																		
Sukkarie (Raqqa)	0.8%	13.8%	1,725%																		
Op. (1)-3	The frequency of regular extension activities implemented by the trained extensionists in Aleppo and Raqqa Governorates is more than 10 times a year.	<p>As to Aleppo and Raqqa, training activities for water-extensionists were initiated in 2009. The trained water-extensionists have entered into operation since 2010.</p> <table border="1"> <thead> <tr> <th rowspan="2">Project Site (Gov.)</th> <th colspan="3">Number of extension activities</th> </tr> <tr> <th>before</th> <th>2010</th> <th>2011</th> </tr> </thead> <tbody> <tr> <td>Jine (Aleppo)</td> <td>0/0</td> <td>65/8</td> <td>26/17</td> </tr> <tr> <td>Sukkarie (Raqqa)</td> <td>0/0</td> <td>5/9</td> <td>14/17</td> </tr> </tbody> </table> <p>Note: Numerators of the figures above are numbers of extension activities, on the other hand, denominators of those are number of water-extensionists.</p>	Project Site (Gov.)	Number of extension activities			before	2010	2011	Jine (Aleppo)	0/0	65/8	26/17	Sukkarie (Raqqa)	0/0	5/9	14/17	Aleppo shows well over the indicator. Though Raqqa runs its operation at lower pace than Aleppo, the number of extension activities became over the indicator in 2011.			
Project Site (Gov.)	Number of extension activities																				
	before	2010	2011																		
Jine (Aleppo)	0/0	65/8	26/17																		
Sukkarie (Raqqa)	0/0	5/9	14/17																		
Op. (1)-4	Quality of extension activities by the trained extensionists is at a suitable level.	The Project proposed an “implementation cycle for extension activities”, which includes the preparation of an implementation plan and a post fact meeting for evaluation etc. And, the cycle has been well-established.	The fixed implementation cycle has promoted its establishment in order to improve the quality of extension activities.																		
Op. (2)-1	The difficulties after the Phase I Project are clarified and the countermeasures are established (more than 5 cases)	At the beginning of the Project, difficulties or issues raised after the completion of Phase I Project were surveyed, and 11 issues identified of which five(5) issues were on training and six(6) issues were on extension. At the time of March 2012, eight(8) issues were assessed as “improved” and remaining three (3) were evaluated as “slightly better” by Syrian C/Ps.	The conditions on this output have mostly been improved, which clearly satisfies the indicator.																		
Op. (2)-2	Number of irrigation farmers in the Project Sites adopting modern irrigation technique increases by 30 –40 %	<p>Numbers of modernized farmers in irrigation by project sites were estimated by the sample survey.</p> <table border="1"> <thead> <tr> <th rowspan="2">Project site (Gov.)</th> <th colspan="2">Ratio of modernized farmers</th> <th rowspan="2">Increased ratio</th> </tr> <tr> <th>Before (2009)</th> <th>After (2010)</th> </tr> </thead> <tbody> <tr> <td>Nawa (Daraa)</td> <td>53.4%</td> <td>86.4%</td> <td>61.2%</td> </tr> <tr> <td>Halfaya (Hama)</td> <td>55.3%</td> <td>66.7%</td> <td>20.6%</td> </tr> <tr> <td>B.Saber (R.Damascus)</td> <td>45.1%</td> <td>64.5%</td> <td>43.0%</td> </tr> </tbody> </table> <p>Note: Other project sites out of above were excluded for evaluation because the original proportions of irrigated farmers with modern irrigation were</p>	Project site (Gov.)	Ratio of modernized farmers		Increased ratio	Before (2009)	After (2010)	Nawa (Daraa)	53.4%	86.4%	61.2%	Halfaya (Hama)	55.3%	66.7%	20.6%	B.Saber (R.Damascus)	45.1%	64.5%	43.0%	The increase rates of Daraa and Rural Damascus are more than the indicator but not in Halfaya in Hama. Although the data in 2011 were not available, C/Ps in Hama reported through a questionnaire survey so that the conditions have certainly been improved since 2010 when the Mid-Term evaluation was conducted.
Project site (Gov.)	Ratio of modernized farmers			Increased ratio																	
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Nawa (Daraa)	53.4%	86.4%	61.2%																		
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<p>Op. (2)-3</p>	<p>The frequency of regular extension activities implemented by the concerned organizations in Rural Damascus, Hama and Daraa Governorates increases by 25 %</p>	<p>more than 80%.</p> <p>As to Daraa, Hama and Rural Damascus, extension activities related with water-saving irrigation had been implemented at an advanced level due to the implementation of Phase I Project. Since started this Phase II Project, the extension activities have been accelerated more.</p> <table border="1" data-bbox="555 405 1023 577"> <thead> <tr> <th rowspan="2">Governorate</th> <th colspan="3">Number of extension activities</th> </tr> <tr> <th>2008</th> <th>2009</th> <th>2010</th> </tr> </thead> <tbody> <tr> <td>Daraa</td> <td>16/ -</td> <td>36/125%</td> <td>36/125%</td> </tr> <tr> <td>Hama</td> <td>25/ -</td> <td>107/328%</td> <td>133/432%</td> </tr> <tr> <td>Rural Damascus</td> <td>28/ -</td> <td>29/3.6%</td> <td>39/39.3%</td> </tr> </tbody> </table> <p>Note: Numerators of the figures above are numbers of extension activities, on the other hand, denominators of those are increase rates to the original frequencies in 2008.</p>	Governorate	Number of extension activities			2008	2009	2010	Daraa	16/ -	36/125%	36/125%	Hama	25/ -	107/328%	133/432%	Rural Damascus	28/ -	29/3.6%	39/39.3%	<p>The increase rates of extension activities in the 3 governorates are more than the indicator and considered to be at satisfactory levels.</p>																																																								
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<p>Op. (3)-1</p>	<p>Cooperated activities on dissemination of measures to improve and operate water-saving irrigation techniques are increased</p>	<p>The following cooperation activities on improvement and utilization of water- saving irrigation techniques have been under operation in collaboration with the universities and international research organizations.</p> <ol style="list-style-type: none"> 1) Promoting cooperation activities through the experimental and research activities of the Project, 2) Obtaining suggestions and advices on development and extension of the extension tools for water-saving irrigation, 3) Supporting and co-hosting the training course implemented by ICARDA, 4) Establishing the bases of cooperation with the neighboring countries by participating in the 21st International Congress of ICID held on October 2011 at Teheran and presenting the outcomes of the Project. 	<p>The attempt by the Project for cooperation has been conducted through a variety of means, which also contributes to establish good relationship between the persons concerned.</p> <p>The positive effects and the outcomes are expected to come up in due course.</p>																																																																											
<p>P.P. 1)</p>	<p>The usage of irrigated water for crops in the Project Sites is reduced by the Project (10 -20 %)</p>	<p>The following table shows the amount of irrigation water used per ha by crop in the respective governorates. The data were obtained through the Baseline Survey (February 2009) and the Impact Survey (October 2010).</p> <table border="1" data-bbox="555 1301 1366 1742"> <thead> <tr> <th rowspan="3">Governorate</th> <th rowspan="3">Crop</th> <th colspan="2">Amount of irrigation water (Baseline Survey: 2009)</th> <th colspan="2">Amount of irrigation water (Impact Survey: 2010)</th> <th rowspan="3">Reduction rate</th> </tr> <tr> <th>m3/ha</th> <th>Irrigation method</th> <th>m3/ha</th> <th>Irrigation method</th> </tr> </thead> <tbody> <tr> <td>Aleppo</td> <td>Cotton</td> <td>15,625</td> <td>Tr.</td> <td>7,530</td> <td>Dr.</td> <td>50.9%</td> </tr> <tr> <td rowspan="3">Daraa</td> <td>Tomato</td> <td>10,094</td> <td>Dr.</td> <td>5,027</td> <td>Dr.</td> <td>50.2%</td> </tr> <tr> <td>Watermelon</td> <td>7,500</td> <td>Dr.</td> <td>4,553</td> <td>Dr.</td> <td>39.3%</td> </tr> <tr> <td>Grape</td> <td>11,446</td> <td>Mix.</td> <td>7,921</td> <td>Dr.</td> <td>30.8%</td> </tr> <tr> <td rowspan="2">Hama</td> <td>Potato</td> <td>12,600</td> <td>Mix.</td> <td>8,247</td> <td>Dr.</td> <td>34.5%</td> </tr> <tr> <td>Cucumber</td> <td>8,725</td> <td>Sp.</td> <td>8,952</td> <td>Sp.</td> <td>-2.6%</td> </tr> <tr> <td>Raqqa</td> <td>Cotton</td> <td>15,625</td> <td>Tr.</td> <td>7,817</td> <td>Dr.</td> <td>50.0%</td> </tr> <tr> <td rowspan="3">Rural Damascus</td> <td>Apple</td> <td>6,206</td> <td>Dr.</td> <td>4,051</td> <td>Dr.</td> <td>34.7%</td> </tr> <tr> <td>Peach</td> <td>6,842</td> <td>Dr.</td> <td>3,943</td> <td>Dr.</td> <td>42.4%</td> </tr> <tr> <td>Pear</td> <td>6,053</td> <td>Dr.</td> <td>5,180</td> <td>Dr.</td> <td>14.4%</td> </tr> </tbody> </table> <p>Note: Mix.: using both method (traditional and modern irrigation), Sp.: Sprinkler irrigation, Dr.: Drip irrigation, Tr.: Traditional irrigation</p> <p>Although no reduction was observed for cucumber in Hama, the reduction rates for all of other crops were recorded between 30% and 50% in the five governorates. These reduction rates were quite better than the target rate (10 -20%). Therefore, it was presumed that the Project Purpose was achieved in terms of Indicator 1.</p>	Governorate	Crop	Amount of irrigation water (Baseline Survey: 2009)		Amount of irrigation water (Impact Survey: 2010)		Reduction rate	m3/ha	Irrigation method	m3/ha	Irrigation method	Aleppo	Cotton	15,625	Tr.	7,530	Dr.	50.9%	Daraa	Tomato	10,094	Dr.	5,027	Dr.	50.2%	Watermelon	7,500	Dr.	4,553	Dr.	39.3%	Grape	11,446	Mix.	7,921	Dr.	30.8%	Hama	Potato	12,600	Mix.	8,247	Dr.	34.5%	Cucumber	8,725	Sp.	8,952	Sp.	-2.6%	Raqqa	Cotton	15,625	Tr.	7,817	Dr.	50.0%	Rural Damascus	Apple	6,206	Dr.	4,051	Dr.	34.7%	Peach	6,842	Dr.	3,943	Dr.	42.4%	Pear	6,053	Dr.	5,180	Dr.	14.4%
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<p>P.P. 2)</p>	<p>The capability of extensionists and</p>	<p>The following table shows the numbers of the extension units that requires qualified Water-Extensionists (WE) and the numbers of the units with qualified WEs.</p>																																																																												

staff of related agencies on extension of water-saving irrigation is improved (number of certified extensionists become more than 40 % to the required number of water extensionists)	Governorate		Situation in 2010		Situation in 2011		Insufficiency WE
	Number of extension units that requires qualified WE	Number of extension unit with qualified WE	Allocation sufficiency ratio	Number of extension unit with qualified WE	Allocation sufficiency ratio		
	Hama	72	32	44.4%	33	45.8%	-
	R.Damascus	52	24	46.2%	28	53.8%	-
	Daraa	38	37	97.4%	30	78.9%	-
	Aleppo	80	17	21.3%	27	33.8%	5
	Raqqa	40	14	35.0%	20	50.0%	-
	Total	282	124	44.0%	138	48.9%	-

The sufficiency ratios in Hama, R.Damascus and Daraa Governorates exceeded the target ratio (40%) in both 2010 and 2011, which resulted from the advantage that the training for WE started during Phase I Project and continues under the Project as well. On the other hand, the ratios of Aleppo and Raqqa where the training started under the Project from 2009, were considerably low in 2010, but fairly improved in 2011. Despite the low ration in Aleppo, the overall allocation sufficiency ratio (48.9%) has satisfied the indicator (40%). Therefore, it was proved that the Project Purpose was achieved in terms of Indicator 2.

Op.: Output, P.P.: Project Purpose

5.4 Post-hoc Activities after the Final Evaluation Study

After the termination of the final evaluation study, the Project Team accomplished remaining duties securing planned project activities, which are to be completed by the end of the Project. In addition to those, most important subjects concerned to the recommendations were arranged by the end of the Project, at the occasion of Joint-Working in Amman to hold thorough discussion between Japanese experts and C/Ps.

Recommendations given in the Final Evaluation have been worked on by the project team. The direction and method of reacting to the recommendations were argued in the series of discussion under the Joint-Working in Amman. Following reactions were concluded to be held:

Table 5.4.1 Reactions for Recommendations of the Final Evaluation

Summary of Recommendation	Reactions to be held
a. A field survey is recommended to be jointly carried out by Syria/Japan, and <u>to find out the real achievement</u> once the situation in Syria is settled down. It is also possible to have <u>discussion on necessary and possible future cooperation</u> between Syria and Japan.	This recommendation is concerned with implementation of a fact finding study and future cooperation after the phasing out of the Project on the basis of the request from Syrian side. At the occasion of Joint-Working in Amman, Syrian side mentioned to implement an international workshop for DEITEX Project and launching a new phase of the Project. Deputy Resident Representative of JICA Syria office replied that Japanese Government has frozen new cooperation at the time being at April 2012.
b. In order to disseminate the outcomes of the Project to other governorates and ensure the sustainability of training structure and the function of the Project, <u>it is strongly recommended once again to form a National Training Team</u> within the MAAR.	Formation of National Training Team (NTT) was discussed and decided as follows at the same occasion above: 1) Mission of NTT: to expand and upgrade the training activities of DEITEX Project to other governorates 2) Staff of NTT: to assign more than 10 full-time staffs who are the central C/Ps of DEITEXII 3) Technical resources of NTT: to utilize whole developed and

Final Report of the DEITEX II Project

	<p>employed tools/contents in the DEITEX Project, and every useful materials under the command of the concerned organizations.</p> <p>4) Authority of NTT: to be positioned under to direct control of G.D. of GCSAR in association with other concered organizations.</p> <p>5) Facilities of NTT: to be arranged in line with the decision of NTT committee that will be established in near future.</p>
<p>c. In order to further enhance the communication between WEs and farmers, <u>it is recommended for the project team to add a training item on “attitude” to the curriculum in the remaining period.</u></p>	<p>The importance of attitude was recognized in the CUDBAS workshop held within Joint-Working in Amman. Attention to the “Attitude” in the training subject shall be additionally paid by the way of implementing follow-up training courses under the cooperation of Extension Directorate.</p>
<p>d. <u>Research on other measures than pressurized irrigation should be sustained on managerial, institutional and agronomical approaches for maximizing water productivity.</u></p>	<p>Syrian side agreed to promote a research with managerial, institutional and agronomical approaches on other modern irrigation methods as well as pressurized irrigation. It will be dealt with an outlook for long term.</p>

6. By-products on Special Subjects

6.1 Contribution in Irrigation Modernization on National Level

Modern water-saving irrigation is steadily expanding in Syria, though the pace of the expansion is not with a sensitive response but with a consistent increasing trend. Following figure shows changes in the ratio of irrigation modernization which is the proportion of the modernized irrigation area to the total irrigated area by concerned governorates. Those curves of modernization ratio seem to be accelerated after the year of 2008 in prospective views, at which the Project entered into implementation.

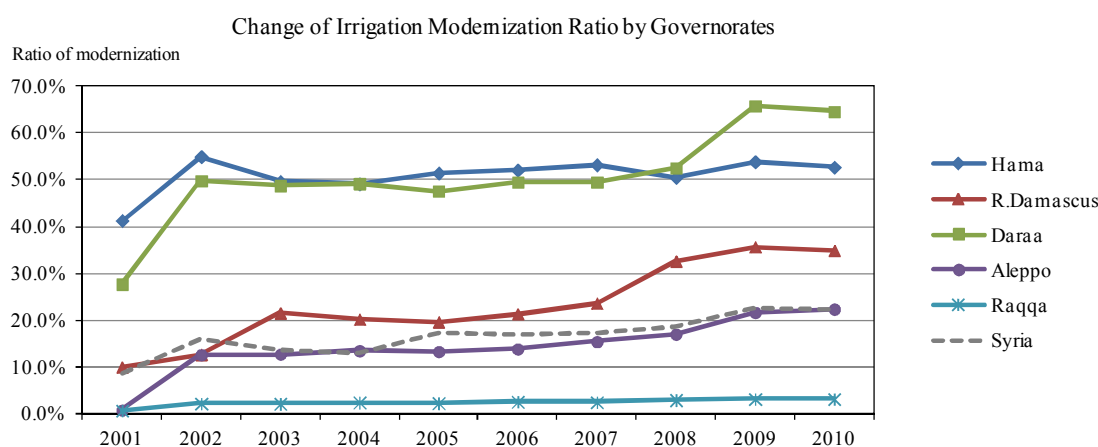


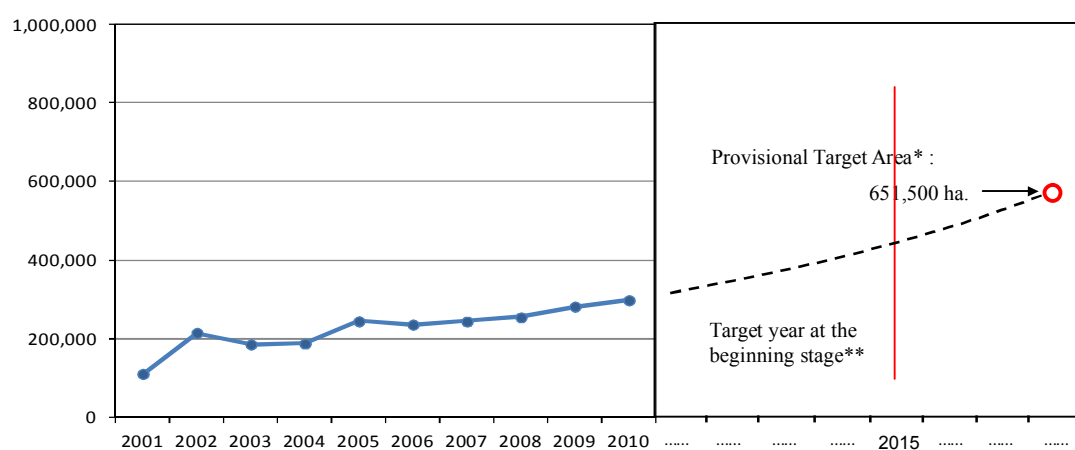
Fig.6.1.1 Change in the Irrigation Modernization Ratio by Governorates

The advancement of modern water-saving irrigation has been achieved not only by the contribution of the Project but also by the collaborative support from the counterpart organizations of GCSAR and DoE, which is clarified by the evaluation study as mentioned in **Chapter 5.2**. At the same time, the contribution of DMIC's operation is even significant than the achievement of the DEITEX II Project in terms of irrigation modernization. However, the cause of the expansion of irrigation modernization/rationalization is not single but complex with several efforts of various personnel and organizations concerned. The Project contributes the modernization in the aspect of software such as dissemination on operation and management of modern irrigation, meanwhile DMIC plays a part in the aspect of hardware. Both of the DEITEX II and DMIC are effective counterparts complementing each other, each adding something the other lack. The real advancement of irrigation modernization is a synergistic effect of the two players.

Furthermore, it can be presumed that the irrigation modernization will accelerate year

by year if the circumstance of the mission for irrigation modernization is not drastically changed. The Project has completed establishment of several project sites and operating systems in training/extension that is a bridgehead to expand its achievements to other areas widely. Therefore, it is very hopeful that the rate of the expansion in irrigation modernization will increase in geometric progression.

Taking current advancement of irrigation modernization into consideration, its future progress could be prospected as follows: Having a margin of a few years in setting the goal, it is not difficult to achieve the target of irrigation modernization in Syria at all, if current disturbance situations will be not last long.



*: The DEITEX I suggested that appropriate target area of irrigation modernization was at 816,500 ha for the entire area of Syria. This provisional target is the figure subtracted 165,000ha of the governmental system from the same.

Fig.6.1.2 Future Prospect of Irrigation Modernization in Syria

6.2 Training Guidelines

Similar to the training guideline for water extensionist training which was prepared in the DEITEX I, guidelines for SMS/TOT courses have been produced in the DEITEX II period. The expected target people of the guidelines are trainers and supervisors of the SMS/TOT courses. The guidelines will be useful for them when they conduct these training courses as trainers and/or supervisors. In addition, the guidelines also include necessary and useful information for the expected target people, such as follow-up training, evaluation of trainer & training course, and database for water extensionists.

(1) Training Guidelines for SMS Training Course

The objective of the SMS training course is to provide advanced knowledge and skills

to water extensionists in the field of design and installation of modern irrigation system. The guidelines describe structure and objective of the training course, typical training program, and explanation of each slide of Power Point presentations for lectures. The guidelines also explain procedures of field practices such as measuring discharge and pressure of pump, conducting topographic survey by using GPS, installing modern irrigation network, etc. The following figures show some examples of the guidelines.

[Summary Sheet]	
Subject	
Crop Water Requirement for Irrigation Planning	
Outline of the Lecture	
The lecture introduces the procedure of estimating crop water requirement (CWR).	
Outputs	
By the end of this lecture and practice:	
The trainees understand the procedure of estimating crop water requirement by three methods, 1) Blaney-Criddle, 2) Pan evaporation and 3) Penman-Monteith methods.	
Teaching Materials	
Power Point Presentation: Crop Water Requirement for Irrigation Planning	
Teaching Process	
1) Lecture (30 minutes)	
2) Explanation of Practice Procedure (10 minutes)	
3) Practice 1 (30 minutes)	
4) Discussing the result of Practice 1 (20 minutes)	
5) Practice 2 (30 minutes)	
6) Discussing the result of Practice 2 (20 minutes)	
Time Allocation	
2 hours	

Fig. 6.2.1 Summary sheet of the presentation

Item	Time	Description	Teaching Material
1) Title of the presentation	-	In this lecture, the procedure of estimating crop water requirement is introduced.	Slide No 1
2) Evapo – Transpiration (ET)	3 min	This is a schematic diagram showing water balance over the crop. Evapo-transpiration (ET) is the sum of water amount which is consumed for crop growth by both evaporation from wet soil surface and transpiration from crop leaves. The proportion of evaporation and transpiration varies according to growing stage of the crop and circumstance of the farmland. At sowing stage, 100% of evapo-transpiration comes out from evaporation because farmland surface is not covered by the crop. When the farmland surface is fully covered by the crop in the growing stage, transpiration is dominant over evaporation. In this stage, roughly speaking, evapo-transpiration is caused 90 % by transpiration and 10 % by evaporation.	Slide No 2
3) Crop Water Requirement (CWR)	10 min	This is a flowchart showing the procedure of calculating CWR. CWR is defined as water amount necessary for steady crop growth without stress of water shortage. It is equivalent to the water amount consumed by evapo-transpiration under the circumstance of appropriate water supply. Each factor, ETo, ETcrop, CWR and IWA shown in the flowchart, can be calculated step by step according to the following process. 1. Reference evapo-transpiration (ETo) is defined as standard value of evapo-transpiration, which presents the rate of evapo-transpiration under the large scale farmland surface covered by 8 to 15 cm tall green grass. ETo is calculated with meteorological data by correlation equation such as Blaney-Criddle, Pan evaporation or Penman-Monteith method. 2. Variety of the target crop and growing stage must be considered for the estimation of crop evapo-transpiration (ETcrop) . Differences in evapo-transpiration between the target crops and the reference grass are integrated into crop coefficient (Kc) . Crop evapo-transpiration (ETcrop) is therefore calculated by multiplying ETo by crop coefficient (Kc). In the next slide, Kc will be explained in detail. 3. A certain amount of water is lost by evaporation, seepage, deep percolation from irrigation network and farmland during irrigation practice.	Slide No 3

Fig. 6.2.2 Explanation of each presentation slide

(2) Training Guidelines for TOT Course

TOT course developed by the DEITEX is aiming to conduct specialized training course which is particularly oriented to support successful implementation of the WE training courses. The DEITEX TOT course is divided into two parts; the first half is mainly managed by the Training Directorate with making use of their rich experiences in conducting general TOT. Major contents of the training are lectures and practices related to communication skills and various kinds of teaching methods such as lecture, group discussion, role play, brain storming, and case study. The subjects of the practices were determined carefully based on extension activities concerning saving water and modern irrigation.

The second half of the program is more closely related to conduct the WE training

courses, which includes explanation of the DEITEX training-extension system, how to use the WE training guideline and teaching materials, practice of delivering lecture, and preparation of action plan of extension activity. The format of the TOT guidelines is similar to the SMS guidelines, describing structure and objective of the training course, typical training program, and explanation of each slide of Power Point presentations for lectures.

(3) Follow-up Training

It is already mentioned the necessity of the follow-up training in the **Section 4.4.3**, to improve abilities of water extensionists so as to conduct more effective extension activities. The guidelines explain examples of the follow-up training including improved surface irrigation and editing extension movie. The guidelines also describe a method of curriculum development based on training needs.

(4) Evaluation of Trainer and Training Course

Evaluation methods for trainer and training course have been established by the DEITEX II Project as well as DEITEX I. The guidelines explain analysis methods of evaluation results with practical examples including radar chart analysis. The guidelines also introduce an idea of evaluation method for WE abilities to conduct extension activity successfully.

(5) Database for Water Extensionists

In order to compile information on water extensionists, a database for WE has been established. The guidelines explain structure of the database and how to use it. The guidelines also provide some idea about connecting information on water extensionists and GIS mapping. The WE database and GIS mapping will be useful to know current status of WEs and progress of their extension activities. The database will be also applicable to make future plan of training and extension activities. It is necessary to add more information and/or update the existing data to make the database more meaningful.

6.3 Extension Structure on Modern Irrigation Promotion

In 2007, MAAR made a substantial institutional restructure in extension sector along the new policy of “delegating from central to local”. In line with the restructuring, governorates were strengthened to hold the right to charge of extension units. On the other hand, Extension Directorate became to manage supporting units which were newly

established as a upper structure of the conventional extension units. The role of the supporting unit is to supervise and support the extension activities done by extension units. Among 103 supporting units in total which were established in all over the country, 45 supporting units are concerned with the project area.

Good partnership has been sometimes seen among the related organizations of the Project. A “sense of unity” cultured by DEITEX II seems to be the motive source for their partnership. Since the WEs allocated to extension units and SMSs posted to supporting units are under the same umbrella of DEITEX II as well as DEITEX I Project, the smooth cooperation and mutual aid was observed between those two units. Moreover, DEITEX II accepted 24 (WE:18, SMS:6) trainees from DMIC in WE and SMS training courses. Mutual collaboration was also observed among the trained staffs of DMIC, WEs and SMSs in conducting extension activities because of the same reason.

The Project contributes to strengthen the institutional framework of MAAR through the keen connection between the officers and staff allocated in various organizations which were cultivated through the involvement to the DEITEX Project.

6.4 Extension Contents

In order to pursuit the project purpose, the Project has predominantly implemented extension activities as well as other mainstream activities. Four (4) types of extension tools have been developed in order to largely support and accelerate the extension activities related with the aspects of irrigation in software and mind-set. The developed extension tools were namely Discharge measurement kit, Irrigation calendar, Irrigation notebook, and Digital irrigation note (DIN). Those irrigation tools have been devised so that irrigation farmers, who are supposed to use them, can get enough knowledge for saving irrigation water and be motivated to water-saving more.

(1) Discharge measurement kit

In Syria, non-uniform discharge from drip emitters on the field was one of major problems with the farmers who utilized modern irrigation. It caused over irrigation and reduction in yield and quality of crop production. However, most farmers didn't care the uniformity of emitters because they didn't have enough knowledge about irrigation net. Therefore, discharge measurement kit which farmer can check the uniformity of emitters in his field was prepared.

Discharge measurement kit was a tool kit for measuring discharge from drip emitters and consisted of a beaker, pressure gauge, some connectors and sockets. Pressure gauge

was utilized for measuring water pressure at the end of tubes and emitters. It was useful to investigate the uniformity of the emitter regardless of the tube length and land slope. Beaker was set under the emitter for collecting water drop for 3-5 minutes in order to estimate discharge of the emitter (liter/hr).

In the extension activity on introducing discharge measurement kit, WE (water extensionist) firstly explained the importance of the uniformity of emitters to the farmers. Then all the participants went out to the field in order to measure the discharge by themselves as a practical training.

It was a good opportunity for understanding suitable irrigation management and increasing farmers' realization. Therefore, awareness of saving water in farmers also increased.



A scene of measuring discharge by the "discharge measurement kit"



Discharge measurement kit

(2) Irrigation Calendar

Crop water requirement was essential information for suitable irrigation management. Agricultural research station was established every governorate and conducted a lot of experiments for estimating suitable CWR in crop by crop and area by area. However, there was only few opportunities to transfer these achievements to the farmer and the farmer could not understand well because suitable materials were not prepared. The materials prepared by researcher were basically too complicated and scientific to understand for the farmer. Therefore, irrigation calendar was invented to transfer the information of CWR to the farmers easily. Irrigation calendar only showed suitable irrigation hour that the farmers wanted to know.



Front side



Back side

Irrigation Calendar for Vegetables

الوقت	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	1	2	3	4	5	6	7	8	9	10	11	12
3	1	2	3	4	5	6	7	8	9	10	11	12
4	1	2	3	4	5	6	7	8	9	10	11	12
5	1	2	3	4	5	6	7	8	9	10	11	12
6	1	2	3	4	5	6	7	8	9	10	11	12
7	1	2	3	4	5	6	7	8	9	10	11	12
8	1	2	3	4	5	6	7	8	9	10	11	12
9	1	2	3	4	5	6	7	8	9	10	11	12
10	1	2	3	4	5	6	7	8	9	10	11	12
11	1	2	3	4	5	6	7	8	9	10	11	12
12	1	2	3	4	5	6	7	8	9	10	11	12

Irrigation Calendar for Fruits Tree

Two (2) types of irrigation calendar were prepared, one was for vegetables and the other was for fruits trees. Irrigation calendar for vegetables consisted of 2 disks. 3

cases of recommended irrigation hour (everyday irrigation, every other day irrigation, and every 4 days irrigation) were shown by sliding cover disk to the proper place; the windows of the cover disk were fitted in the transplanted/sown month and current month mentioned on the other disk. Irrigation calendar for fruits trees was rectangle shaped. One fruits tree was generally irrigated by a number of emitters, so irrigation calendar for trees was considered total amount of irrigation by some emitters as one irrigation for one tree. Recommended irrigation hour was estimated by using crop coefficient (Kc) from GCSAR and Penman-Monteith method, and considered suitable irrigation method and design for the region for calculating irrigation intensity.

Table 6.4.1 List of distributed Irrigation Calendar

Governorate	Crop	Irrigation method	Remarks
Aleppo	Cotton	Drip	Some farmers requested to provide IC for olive tree.
Raqqa	Cotton	Drip	Farmers requested to provide IC for sugar beet.
Hama	Potato	Sprinkler	Farmers preferred IC because of simple display.
	Cucumber	Drip	
Rural Damascus	Potato	Mini sprinkler	WE introduced IC in farmer's school for cherry which was not the activity under control of DEITEX project.
	Apple	Drip	
Daraa	Tomato	Drip	Most farmers satisfied the recommended irrigation hour mentioned on IC.

In the extension activity on introducing irrigation calendar, water extensionist explained how to use irrigation calendar together with the idea of irrigation amount and irrigation hour before distributing irrigation calendar to the farmer. The farmer was able to irrigate properly by utilizing both discharge measurement kit and irrigation calendar.

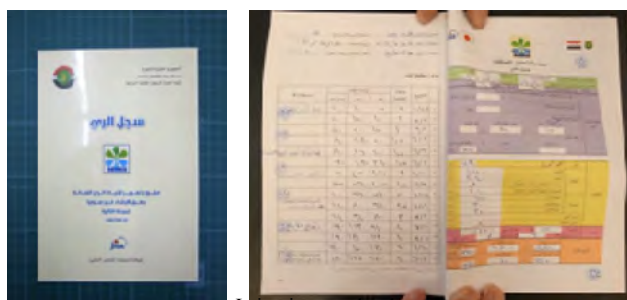
(3) Irrigation notebook

Increasing awareness of saving water among the farmer was essential to achieve saving water in agricultural sector in Syria. Irrigation notebook was produced in order to contribute for the increasing famers' awareness. According to the survey, most farmers in Syria did not made a note of their work on the field, only few farmers made a note on a piece of paper, no farmer recorded his cultivation on a notebook nor reviewed his record. Farmers generally cultivated crops depend on their experience and intuition. It is better farmers record their cultivation manner on irrigation notebook and review their record after the cultivation for successful farm management. Farmers are able to learn and realize something by reviewing their record.

Irrigation notebook is consisting of 2 parts, recording sheet and analyzing sheet. Recording sheet is recorded everything related with the work in the field like irrigation

amount, cost of fertilizer, yield, kind of work, and so on.

Analyzing sheet is utilized for analysis of cultivation based on recording sheet after the cultivation. Balance of payments for the cultivation is calculated by filling into the blank on analyzing sheet.



Irrigation notebook

Irrigation notebook was distributed to the farmer after water extensionist explained the importance of recording. Following figures show the sample of analyzing sheets which were recorded by two cotton farmers. The farmer A (left side) irrigated by traditional surface irrigation and farmer B (right side) irrigated by drip irrigation. Fuel cost of farmers A and B were 110,810 SYP/ha and 45,000 SYP/ha, respectively, which was estimated by irrigation hour and pump efficiency. Cost of production including fertilizer, agrochemical, other materials, labor, packing material, and transportation was estimated as 176,620 SYP/ha for the farmer A and 96,530 SYP/ha for the farmer B. Production of the farmer A was 5,000 kg/ha and the farmer B was 4,230 kg/ha. Sales of the farmer A was 182,220 SYP/ha and farmer B was 163,380 SYP/ha.

Traditional surface irrigation (cotton)

Analyzing sheet							
Cultivation Information							
Crop	Cotton		Area	27 donum			
Cultivation period	(from 2012/5/1	to 2012/12/1					
Pump	Water Discharge:	65 m ³ /hr	Inch	In			
Irrigation	1. How many liters of diesel does your pump need to operation for 1 hour?						
		a	11	L diesel / hour			
	2. How many hours did you irrigate the crop?						
		b	1360	hours			
Irrigation	3. Amount of diesel						
	L diesel / hr	x	Irrigation hour	= Litter of diesel			
	a	11	x	b	1360	= c	14960
Irrigation	4. Cost of diesel						
	L diesel	x	SYP	= Cost of diesel (SYP)			
	c	14960	x	20	= d	299200	SYP
Expenditure	Irrigation	Fuel	d	299,200	SYP		
	Cultivation	Fertilizer		17,820	SYP		
		Agro-Chemical			SYP		
		Other materials		4,000	SYP		
		Labor (Land preparation / Weeding)		39,860	SYP		
	Harvesting	Labor (Harvesting)		81,000	SYP		
		Packing Materials		20,000	SYP		
		Transportation		10,000	SYP		
	Other		5,000	SYP			
	Total Cost				e	476,880	SYP
Income	Products	13,500	kg	Sales f	492,000	SYP	
	Unit Price (Max)	37	(Min)	34	SYP / kg		
Balance of payment	Sales (f)	-	Total Cost (e)	-	Net Profit (SYP) (g)		
	13,500	-	476,880	-	15,120	SYP	
Balance of payment	Net Profit (g)	+	donum	-	Net Profit (SYP / d)		
	15,120	+	27	-	560	SYP / d	

Drip irrigation (cotton)

Analyzing sheet							
Cultivation Information							
Crop	Cotton		Area	13 donum			
Cultivation period	(from 4/14	to 4/25					
Pump	Water Discharge:	m ³ /hr	Inch	In			
Irrigation	1. How many liters of diesel does your pump need to operation for 1 hour?						
		a	10	L diesel / hour			
	2. How many hours did you irrigate the crop?						
		b	390	hours			
Irrigation	3. Amount of diesel						
	L diesel / hr	x	Irrigation hour	= Litter of diesel			
	a	10	x	b	390	= c	3900
Irrigation	4. Cost of diesel						
	L diesel	x	SYP	= Cost of diesel (SYP)			
	c	3900	x	15	= d	58500	SYP
Expenditure	Irrigation	Fuel	d	58,500	SYP		
	Cultivation	Fertilizer		8,500	SYP		
		Agro-Chemical		2,000	SYP		
		Other materials		2,500	SYP		
		Labor (Land preparation / Weeding)		9,500	SYP		
	Harvesting	Labor (Harvesting)		33,000	SYP		
		Packing Materials		6,500	SYP		
		Transportation		3,000	SYP		
	Other		2,000	SYP			
	Total Cost				e	125,500	SYP
Income	Products	5,500	kg	Sales f	212,400	SYP	
	Unit Price (Max)	39	(Min)	36	SYP / kg		
Balance of payment	Sales (f)	-	Total Cost (e)	-	Net Profit (SYP) (g)		
	212,400	-	125,500	-	86,900	SYP	
Balance of payment	Net Profit (g)	+	donum	-	Net Profit (SYP / d)		
	86,900	+	13	-	6,684	SYP / d	

Sample of analyzing sheet

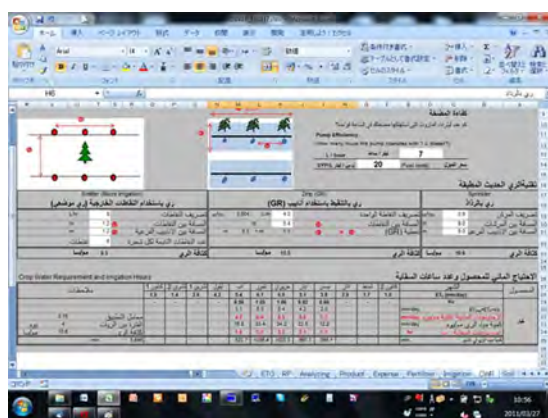
The farmer A got bigger amount of sales than the farmer B, however, focusing on the

benefits, net profit of these two farmers were 5,600 SYP/ha and 66,840 SYP/ha, respectively, which shows the benefit of the farmers B is 10 times bigger than the farmer A. In this way analyzing sheet gives farmers instruction for improving their farm management. Water-extensionists (WEs) were also able to give some advices by using specific numbers according to irrigation notebook.

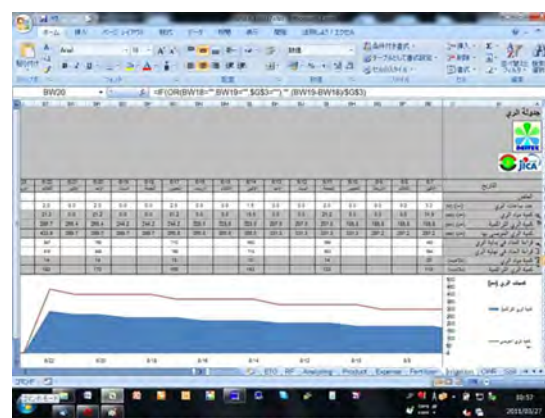
(4) Digital irrigation note (DIN)

Digital irrigation note (DIN) is a computer program for water extensionists. DIN has been created based on the same idea as the irrigation notebook. By inputting data which is recorded by farmers on the irrigation notebook, DIN automatically analyze amounts of irrigation water and applied fertilizer with plotting graphs.

DIN is also able to calculate crop water requirement, suitable fertilizer amount for N, P, and K, based on the local meteorological data and soil analysis. Water extensionist were able to give sound advice to the farmers by using DIN.



Auto-calculation of CWR



Record of Irrigation

Digital Irrigation Note (DIN)

6.5 Promotion of Group Modern Irrigation

(1) Group Modern Irrigation

“Group Modern Irrigation” is defined as modern irrigation being managed by a group of irrigation farmers, which has been attracted and long-awaited for the realization in Syria. The reason that group modern irrigation has been getting attention is the high overall effect of water-saving as enumerated below.

- 1) It can save large amount of water by a group of farmers, not an individual farmer.
- 2) Details of operation and management will be recorded so as to acquire transpiration and fairness of group irrigation activities, which will be useful to identify achievement of saving-water.

- 3) By making a collective action as the farmers group, cooperation together and mutual inhibition against over-irrigation comes to realize.
- 4) Irrigation water sources of the irrigation group become to unify in general. The simplification in water source makes it easy for the administrator of water resources/water use to control and regulate.

Moreover, the promotion of group modern irrigation has to proceed in following two fields:

- a) Irrigation system should be modernized as a whole, not only in the on-farm facilities but also in the main facilities so as to enable to operate modern irrigation.
- b) Water Uses Association (WUA) has to be established associating members of the irrigation farmers. And, it should become to function a rational group modern irrigation.

So far, in Syria, implementation of the group modern irrigation was not realized for the reason that the preparation in those two subjects was not easy. Nevertheless, Syrian Government has developed implementing environment of the group modern irrigation. One is the establishment of regulations concerning to WUA of group modern irrigation, and the other is the expansion of the applicants for DMIC loan not only to individual farmers but also to WUA.

(2) Group Modern Irrigation in Arne under the DEITEX II

Considering with the situation that realization of the group modern irrigation is anticipated strongly, the scheme of Arne Satellite Plot of the Project has challenged to realize modernization for group irrigation as described in the **Section 4.3.1**.

1) General condition of Arne site for the group modern irrigation

Arne district is the mountainous area locates in the southern foot of *Jabal Shaikh* mountain, northern part of Rural Damascus. In the Arne area, more than 50 farmers are used to irrigate tree crops by a traditional group irrigation providing water from an unlicensed source of spring. The farmers in Arne have performed group water use and cooperative management of water source through the traditional group irrigation called “*Adern*”, however, there are some difficulties in its traditional system and operation. Though the spring is perennial, its seasonal fluctuation of discharge is conspicuous. The farmers are used to suffer water scarcity.

In recent years, water scarcity become critical so that it suffers the yield of crops, and

water conflicts between water users break out. DEITEX II Project decided to implement group modern irrigation as a scope of Satellite Plot in Arne, taking high needs of promotion of modernization and high replicability to other areas into consideration.

2) Plan of Arne Group Modern Irrigation

Through a fact finding survey and interviewing to farmers concerned in the Arne area, it was confirmed that the constraints in irrigation such as water shortage could be resolved by means of irrigation modernization at the group unit. On the basis of the future prospect in group modern irrigation, the Project made the plan of group irrigation scheme as follows:

- a) Method of watering on the on-farm level should completely convert from current traditional surface irrigation to drip irrigation.
- b) Main conveyance and distribution facilities of the irrigation system which takes form of open channel should be remodeled to a pipe line so as to reduce conveyance water losses and to provide necessary water pressure.
- c) Current farmers group should be reorganized to a modern WUA to meet with the modernization in irrigation system. In line with the reorganization plan of the farmers group, new WUA should be officially registered with certain water-right under the full consent of the concerned farmers.
- d) The fresh modality of new WUA consisting of procedures in group water management and rules of administration of WUA etc. should be worked out, and be familiarized to the concerned parties through several training and extension activities.

The Project established the general plan of Arne group irrigation scheme covering the above-mentioned 4 subjects under the cooperation of DMIC. The Project took charge in the subject b) above on the scope of Arne Satellite Plot establishment, on the other hand, the subject a), which was on-farm work, was dealt with farmers themselves. As to the subject c) above, new Arne WUA was approved by the Ministry of Irrigation with the consents of almost all farmers (55 farmers). Furthermore, the Project has conducted a series of extension activities to disseminate and to give orientation on the operation and management of group modern irrigation to the farmers concerned.

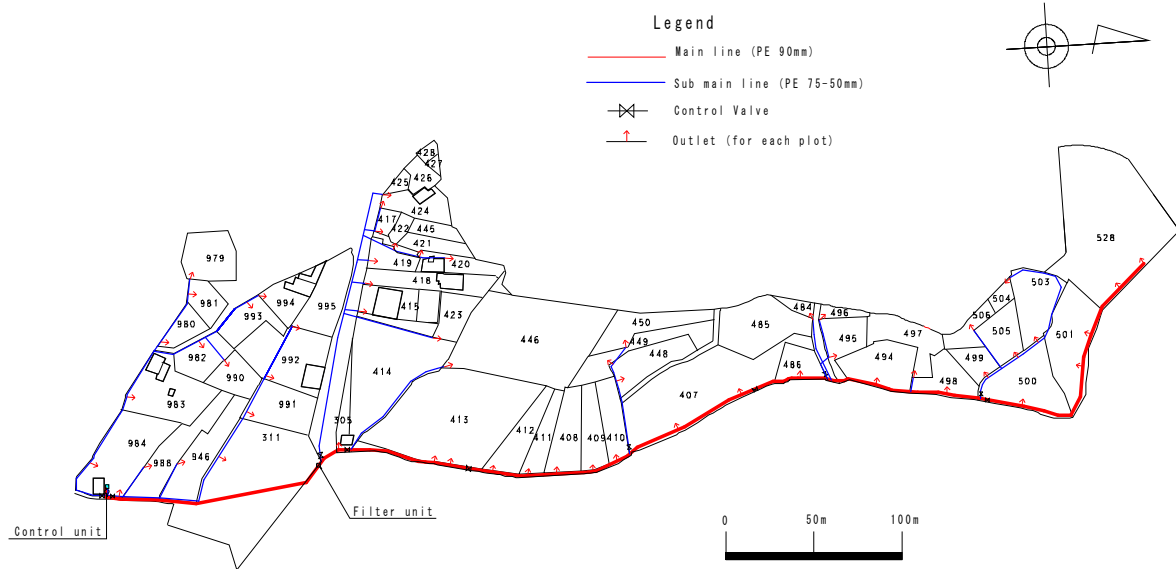


Fig.6.5.1 General Layout of Arne Group Modern irrigation System

Fig.6.5.1 shows general layout of irrigation system of Arne Group Modern Irrigation. And, **Fig.6.5.2** illustrates the comparison of water balance between with and without modernization in Arne. It shows that the shortage of water during summer season is dissolved by the modernization.

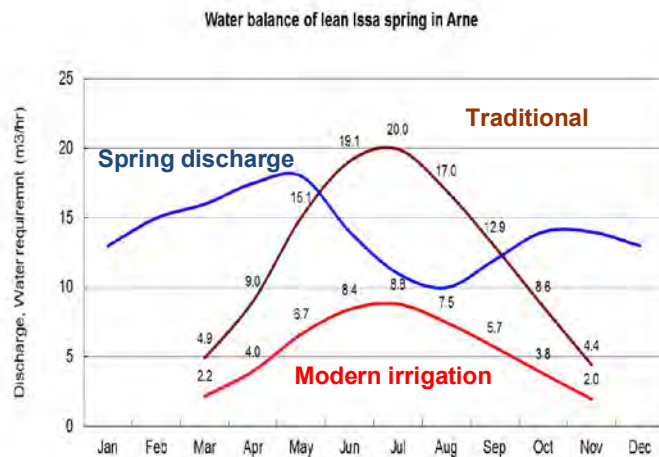


Fig.6.5.2 Water Balances comparing with and without modernization in Arne

3) Current operation of Arne Group Modern Irrigation

Through the procedures above, the scheme of Arne Group Modern Irrigation has been completed and entered into its operation stage. New system of operation and management in Arne WUA has been fixed. According to the chairman of the board of Arne WUA interviewed in Amman on April 2012, water management has been correctly pursued delivering water to every member farmers at the 13 days rotation as the original plan indicates, and irrigation fee has been collected from the almost all member farmers. The Chairman said that the board of WUA voted to increase the rate of irrigation fee from 50 SYP/don. to 150 SYP/don. in order to prepare for future repairment cost of the

irrigation system etc.

At the time being, Arne Group Modern Irrigation has been managed under the well organized operation and management of the new WUA. The chairmen said that the production of apple has increased and the water shortage problem has been dissolved since the establishment of Arne Group Modern Irrigation.

(3) Expansion of Group Modern Irrigation for Other Areas

As mentioned above, Group Modern Irrigation has been in success in Arne. Around the area of Arne, there are some similar sites to Arne in the topographic features and type of irrigation. Those sites seem to be hopeful candidate sites for group modern irrigation. An extensionist in Arne reported that many visitors who are interesting in the group modern irrigation came to Arne to observe the success of Arne Group Modern Irrigation. It is highly expected to expand this Arne's model of group modern irrigation to other areas widely.

However, it is suggested to pay attention to the approach for group irrigation. So far, some agencies in Syria challenged to open "group irrigation under a common well" for which existing private wells should be disused and integrated to a newly established common well. This is an ideal plan from the viewpoint of water sources control, nevertheless, it may take long way for the settlement of negotiations with beneficiaries.

The major factor of the success of Arne Group Modern Irrigation might be the point that the plan didn't touch the existing water source as it is. It is suggested that social and physical conditions should be considered deeply when group irrigation will be initiated.

7. Future Project Management

7.1 Current Status of the Post-Project

The Project was implemented with good collaboration between Syrian counterpart organizations concerned, consisting of GCSAR, Directorate of Extension, Directorate of Training and DMIC. GCSAR is reliable to pursue research activities for the subjects of irrigated agriculture that is one mainstream of the project purpose. Extension Directorate is also dependable to continue and expand extension activities in line with the project implementation. DMIC is much motivated to extend irrigation modernization by means of providing technical and financial services. DMIC's work is much reciprocal with the project implementation for the attainment of overall target of the Project. Training activities on the irrigation modernization are being promoted by the counterpart organizations under the administrative support of Training Directorate.

In addition to those, Agricultural Departments in Governorates play an important role for the promotion of irrigation modernization in local level. As described in **Chapter 4.9**, the Project completed necessary arrangement in local level having full cooperation with the local counterparts and trained extensionists. In this respect, necessary measures of training/extension activities were already arranged to meet the project strategy.

Taking the current situation for the circumstances of the Project into consideration, preparation for post-project seems to be ready in general.

7.2 Management on Training Work

As one of remarkable outputs of the DEITEX II Project, the training system for water extensionists has been entrusted to the governorates including evaluation of trainer and training course. In addition, follow-up training system has been newly established to improve abilities of the trained extensionists. These training systems shall be duly sustained in the post-Project period as well, so that continuous training activities will be conducted in order to achieve the ultimate goal of saving water in agriculture. The following actions are required to ensure continual and successful training implementation during the post-Project stage.

(1) Establishment of a National Team for Continuous Training Activities

In order to conduct future training activities in efficient and sustainable way, and to disseminate the Project outputs to other governorates, formation of a National Training

Team is needed. The National Team will consist of engineers of GCSAR, DMIC, Extension Directorate, and Training Directorate in order to make use of their experiences obtained through the training activities during the DEITEX Project period. Tasks of the National Team will be planning and implementation of SMS training course, and supporting WE training courses in governorates.

As mentioned in **Chapter 5.4**, the necessity and the importance of establishment of the National Team have been already realized among the concerned organizations, and it was agreed at the Amman meeting in April 2012 to take necessary actions to formulate the National Team, such as forming a committee for the Team, selection of Team members, and issuing a letter to the Minister of Agriculture.

(2) Improvement of Training Courses based on the Requirements

Follow-up training activities have been newly conducted in order to improve abilities of extensionists by providing additional knowledge and skills. In the course of progress of training and extension activities, additional training needs will be clarified, which are directly related to farmer's problems to be solved through extension activities. Accordingly, new training courses shall be necessary to establish to meet these requirements. It will be one of the most important tasks in the future training management to deal with these newly emerged training needs.

CUDBAS will be one of the useful methods to identify abilities which target people should acquire, and to prepare new training curriculum to train them. Conducting necessary follow-up training courses will be effective to improve quality of extensionists, which will be resulted in conducting better quality of extension activities to be more useful for farmers.

(3) Self-Sustaining Training Activities in the Governorates

One of the most significant Project outputs is entrusting management of WE training activities to the governorates during the DEITEX II period. Not only teaching materials and training curriculum, but also evaluation systems for trainer and training course shall be fully utilized in order to implement the WE training courses more successfully. Results of the evaluation of trainers and training courses shall be analyzed properly and be utilized to improve the future training courses, which will be done by self-sustaining activities of governorates with the assistance of central counterparts. The support from the central will be also necessary to conduct a follow-up training course when it is needed.

Good collaboration and role sharing between central and governorate organizations will be essential to conduct successful training activities.

(4) Establishment of a Regional Training Center

The DEITEX Project conducted training courses for Iraqi engineers who engage agricultural and rural area development projects in Iraq, as a part of regional cooperation in human resource development. These training courses were effective to disseminate project outcomes to other areas, and also to provide good opportunity to the Syrian counterparts to improve their abilities in training course management. Based on the experience, it will be possible to establish a regional training center in order to contribute in saving water and its extension in the area. The regional training center will be useful to disseminate the Project outputs to the area, and also be a source of some financial revenue.

7.3 Management on Extension Work

7.3.1 Proper Allocation and Effective Utilization of WEs and SMSs

Especially at the model extension units, the great efforts have been conducted to perform advanced, well-organized and functioned extension activities by the combination of WEs and SMSs under the good understanding of decision makers such as chiefs of unit, department and directorate. The necessary step for the time being is to establish the unit that can perform ideal extension activities to be suitable as a model unit by continuing the efforts so far tackled. In the next step, the model should be expanded for all the units to be able to carry out ideal extension activities. In order to manage extension organizations under the flow mentioned above, the proper allocation and the effective utilization of WEs and SMSs should actively be enhanced based on the following concepts.

(1) Extension Activity by Water Extensionist

Chief of Extension Unit should give chances for the trained and experienced WEs to perform their extension activities to promote water saving agriculture in the area. Once such extension activities were proved effective, chief of Extension Unit should plan as many such activities as possible and list them in the annual activity plan. In order to design the effective extension activities, various suggestions from SMS and researchers of irrigation station should be invited if such personnel are available in the area. In this

way, WEs can effectively perform their duties toward water saving.

(2) Supporting and Training Activities by SMS

SMS should properly be distributed in the support unit in order for SMS to support WE in the ordinary units not only technically but also mentally. Team work of WEs should be promoted under the assistance of SMS in order to perform the effective capacity building of WEs through sharing their experiences and lessons learned in the implementation of extension activities. SMS should also be utilized as trainers in the WE training activity and SMS can always be familiar with up to date information through such training activity.

(3) Irrigation Modernization by DMIC

The trained staff of DMIC in Governorate level should also be utilized effectively in the implementation of irrigation modernization. They are expected to perform various activities such as farm survey, diagnosis of existing irrigation system and also design, installation, maintenance and operation of irrigation system. Those activities can be performed in the extension unit in most cases in collaboration with WE under the support of SMS.

(4) Staff Database Management

The number of trained WE, SMS and DMIC staff will be increased year by year through the promotion of training activities in each governorate. The database of such extension staff will be necessary in order to properly distribute them and to effectively utilize their capability. Proper distribution and effective utilization of the trained extension staff can be performed through appropriate management of such staff database including year of training, other experiences and extension activities carried out for each staff.

7.3.2 Establishment of Extension Cycle

Through the evaluation of extension activities, the collaborative works among WEs, SMSs and administrative staff are being enhanced. The capacity development of the extension organization is consequently enhanced and the procedure to improve the future extension activities is also established. The extension cycle in which the extension activity is planned, implemented and improved through the lessons learned obtained from

the evaluation of performed activity should be established to be operated only by the extension staff even without assistance from the project. It is therefore recommended from now to effectively utilize the extension manual prepared based on the experiences obtained through DEITEX activities. The active promotion of the extension activities to be implemented according to the extension manual definitely leads to the future establishment of the extension cycle.

7.3.3 Activation of Water Extensionists Assembly (WEA)

There is a movement that some WEAs are organized by the WEs working in the adjacent area and they are trying to promote information sharing and transmission of useful information and experiences. For this activity, as already mentioned, it is important to promote the activity through compiling the group profile and also suggesting the promising groups to produce their own newsletter. The member of WEA will thus accumulate their useful information and experiences, which will definitely leads to the quality improvement of extension activities and also the establishment of extension cycle. Furthermore, the capacity building of whole extension organization can be developed through the activation of information exchange among WEAs.

7.4 Confidence in the Success of Water-saving

Water scarcity will become severe as water demand increases year by year. Water issue must be very essential and everlasting task in Syria. Since almost all available water resources have been developed in Syria, effective water use has to be highlighted especially in agricultural sector.

Project period of DEITEX II has been completed. After the completion of the Project, Syrian side already declared to continue and accelerate the project activities. Taking the determination of Syrian side on the future project management into consideration, it could be expected that the Project will be maintained and managed with appropriate project cycle. Necessary materials and management plan of the future project management were already prepared, and owned in common together with. What required from now on, is to pursue by own efforts of Syrian side.

The project activities have been conducted focusing on the selected five governorates. The expansion of the modern water-saving irrigation is necessary not only within the five governorates but also in other governorates in Syria. More endeavors to expand the outcomes of the Project to other regions are highly expected.

During the later period of the Project, Japanese experts could not join the real project activities at the sites in Syria but they continued cooperation from Japan. Even under such irregular situation, C/Ps took an active role in the project activities by their own efforts, which has proved that Syrian C/Ps are capable enough for the project management. The achievement of Syrian C/Ps during that later period of the DEITEX II promises the success of future project management.

8. Conclusions and Suggestions

8.1 Conclusions

At the completion of the Project, achievements through the implementation of the DEITEX II Project are concluded as follows:

- (1) As for attaining saving-water in irrigation, there are two streams, namely “controlling and guiding by external authority/forces” and “intending saving-water and refraining wasting-water by farmers’ own initiatives”. Everyone prefers the latter manner because it is straight and sound way. The DEITEX I had taken the approach to focus on the latter way under the administrative background of regulations of water resources conservation and overuse of irrigation water. The DEITEX II has succeeded the policy and strategy of the DEITEX I.

Through project activities on training and extension, the DEITEX II Project proved that the later approach is effective, and it could be progressed more and more by the further training and extension activities.

- (2) Project Concept of DEITEX II declares to ensure a keen coordination and collaboration between the activities of “Research”, “Training” and “Extension”, which are the essential components to achieve the Project purpose. The Final Evaluation also pointed out synergy effects among these components to realize successful implementation of the Project. The integrated approach employed in the DEITEX II Project as well as DEITEX I will be applicable to other projects which aim to promote multi-sectoral public issues.

- (3) Counterpart organizations of the DEITEX II Project include four different bodies, which worked closely together in order to achieve the Project purpose. It was rather difficult to realize good collaboration works among different organizations in Syria, however, the counterpart organizations of the Project have been cooperating in good manner to conduct the Project activities successfully. There are three reasons behind the successful realization of the cooperation as follows:

- (a) The objective of the Project as a common goal is very clear and crucial, which was saving water in irrigated agriculture,

- (b) The Project activities included cross-sectional subjects, which are rather easy to be involved by the counterpart organizations even though they had own duties as existing individual organizations, and
- (c) The role of each organization is carefully considered based on its mandate, so as to realize efficient collaboration works under the Project.

The collaboration works and the coordination system which have been achieved in the DEITEX Project will provide good suggestions to conduct other project activities with coordinating several different organizations in Syria in future.

- (4) The conclusion of the achievement of the Project was given through the Final Evaluation Study so that the Project kept producing its outputs with a satisfactory level, and the Project completed its period by achieving the Project Purpose by the end of the Project. It could be referred in the **Chapter 5**.
- (5) According to the observation of current trend of modern water-saving irrigation in Syria as described in **Chapter 6.1**, expansion of modern water-saving irrigation to entire Syria is hopeful. Modality of DEITEX Project should be taken over next generations in Syria.
- (6) By the analysis on the breakdown of irrigation modernized areas by types of farming shown in **Chapter 5.1**, the structure of irrigation modernization was clarified. In future promotion of irrigation modernization, the potentialities for irrigation modernization by the types of farming should be considered.
- (7) The DEITEX II Project prepared “Technical Manual” for the convenient of technicians and extension workers when they try to improve the current water-wasting irrigation. This is the revised version based on the manual prepared during the DEITEX I Phase. The technical manual is expected to be utilized by technicians and extension workers concerned.
- (8) The DEITEX II Project developed and extended systematic training/extension methods and system for its operation. The project team also established “Training

Guidelines” and “Extension Manual” which covered every aspect in training/extension activities and training/extension methods available.

- (9) Through the implementation of DEITEX II as well as DEITEX I, the Project cultivated a partnership between the organizations concerned and a friendship between the colleagues engaged in the Project such as C/Ps, WEs, trainers, researchers and farmers. Such close and wide-ranging human relationship is precious. The cultivated relationship by the DEITEX Project should serve in any situation of future development in Syria.

8.2 Suggestions

In addition to the recommendations given by the Final Evaluation Study Team, the DEITEX II Project also provides following suggestions so that project cycle of the Project will be managed in good and sustainable manner:

- (1) The reaction against the recommendation which was given through the Final Evaluation study is directed as described in the **Chapter 5.4**. Syrian Government is requested to follow the recommendation in the course of post-implementation of the DEITEX II Project, and to pursue the plan for the reaction as it was directed.
- (2) As it is related with the recommendation (4) given in the Final Evaluation study, there are some effective measures to reduce quantity of water use in agricultural purpose as enumerated as follows:
 - (a) Introducing draught-tolerant crops (including improving draught-tolerance of crops by means of breeding research)
 - (b) Physical and chemical treatments reducing water consumption of crops
 - (c) Reducing area of irrigation
 - (d) Optimizing cultivation period and selecting less water consuming crops
 - (e) Minimizing waste water and leakage by means of improving water management
 - (f) Minimizing conveyance and delivery losses of water by means of improving irrigation facilities
 - (g) Introducing modern irrigation method (method by handy pressurized irrigation equipment, method by large-scale pressurized irrigation devices, Improved

surface irrigation method)

The DEITEX II Project dealt with several methods of modern irrigation which are categorized into (g) mentioned above. Irrigation farmers are recommended to apply the most suitable irrigation methods to meet the actual conditions of their farming and managing skills.

- (3) It is undeniable that groundwater use is subject to be dominated by its physical and hydro-geological characteristics. As far as lifting much groundwater above its capacity, irrigation water supply could not be sustainable, even though applying modern irrigation methods. Modern irrigation is certainly manageable to realize saving water, however, it is beyond its management when some basic conditions and circumstances are not allowable.
- (4) The Syrian Government is required to work out more accurate and strategic planning of irrigation modernization on the basis of the latest hydrological and hydro-geological data, and to update it time by time.
- (5) Organizations concerned to extension work in central and local level are required to effectively utilize the training/extension manuals in their duties, which were prepared within the Project.
- (6) During the project period, DEITEX II held DEITEX Seminar/Workshop in every year for the purpose of publicizing the project outcomes and enhancing mutual friendship among project partners. C/Ps sometime mentioned their intension to hold DEITEX Workshop even after the termination of the Project. It is suggested that DEITEX Workshop will be given periodically in future by the effort of Syrian side.
- (7) In order to dissolve the water issue, it is necessary to secure national stable conditions so that concerned personnel can concentrate on their duties. Social and administrative stability is a great desire for Syria.