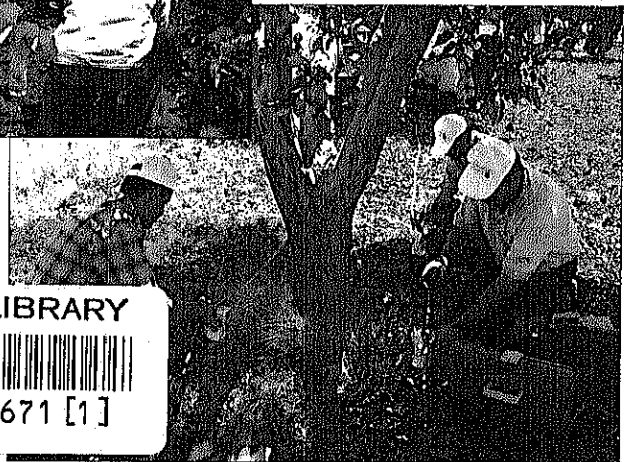
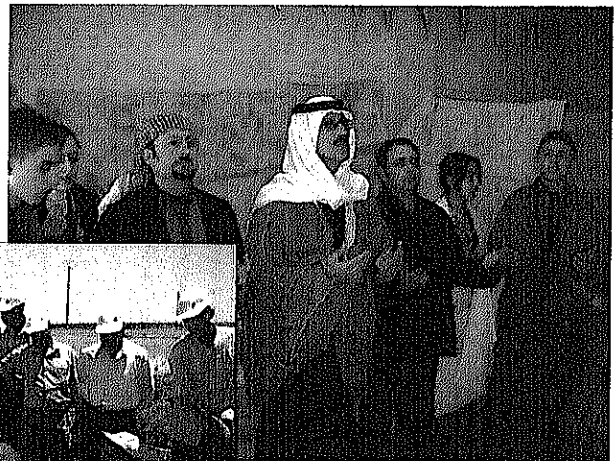
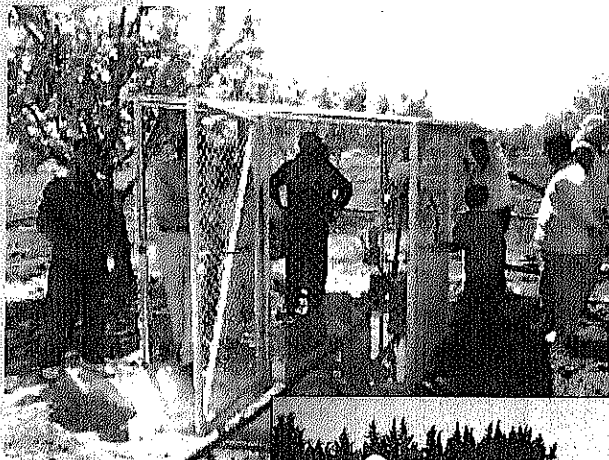


JAPAN INTERNATIONAL COOPERATION AGENCY
MINISTRY OF AGRICULTURE AND AGRARIAN REFORM, SYRIA

PROJECT
ON
DEVELOPMENT OF EFFICIENT IRRIGATION TECHNIQUES
AND EXTENSION IN SYRIA

FINAL REPORT



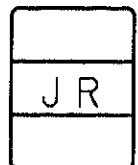
February 2008

JICA LIBRARY



1187671 [1]

NIPPON GIKEN INC.
APPROPRIATE AGRICULTURE INTERNATIONAL CO., LTD



JAPAN INTERNATIONAL COOPERATION AGENCY
MINISTRY OF AGRICULTURE AND AGRARIAN REFORM, SYRIA

PROJECT
ON
DEVELOPMENT OF EFFICIENT IRRIGATION TECHNIQUES
AND EXTENSION IN SYRIA

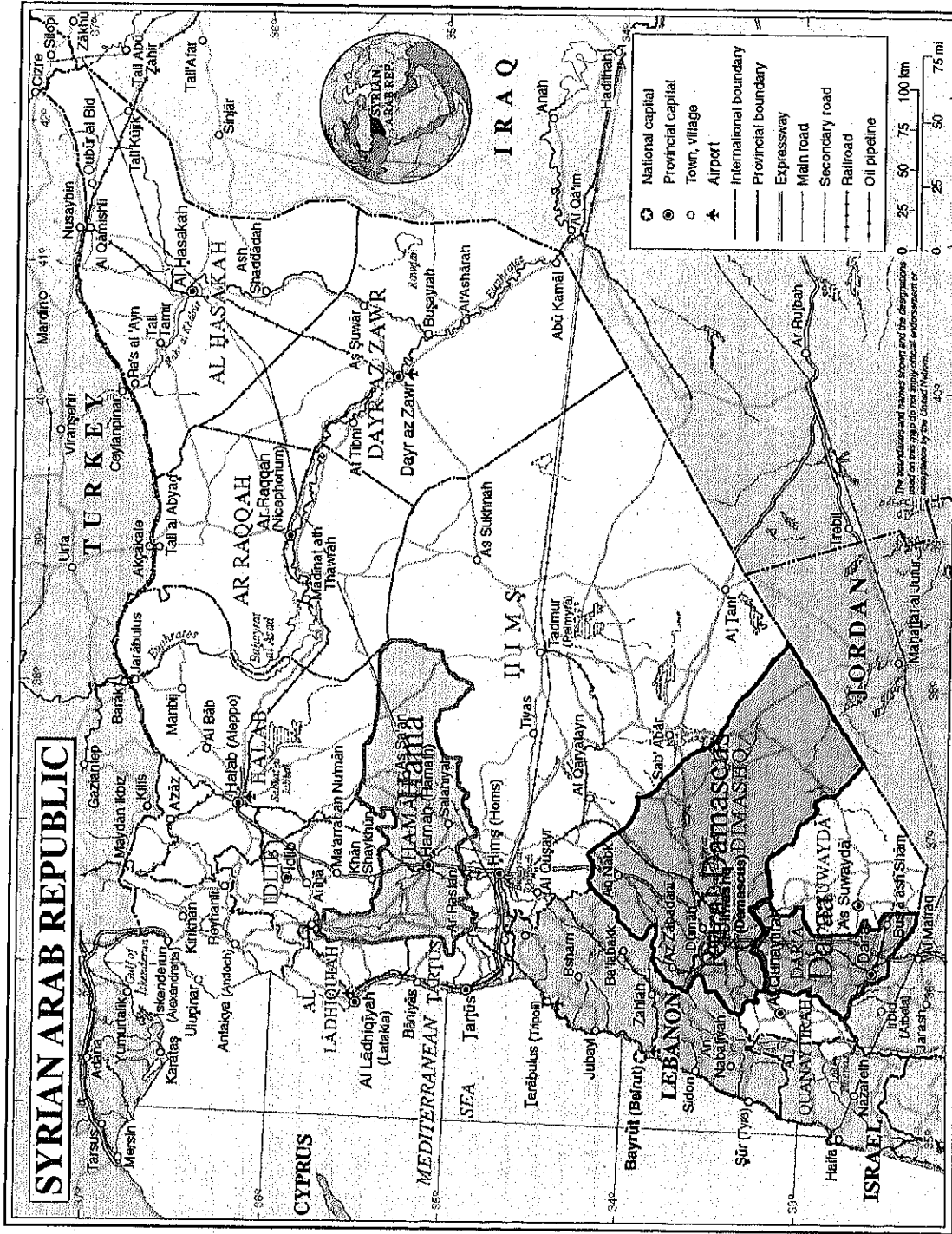
FINAL REPORT

February 2008

NIPPON GIKEN INC.
APPROPRIATE AGRICULTURE INTERNATIONAL CO., LTD



1187671 [1]



Map No. 4204 Rev. 1 UNITED NATIONS
 Department of Peacekeeping Operations
 Cartographic Section
 January 2004

Project on Development of Efficient Irrigation Techniques and Extension in Syria

Location Map of the Project

Executive Summary

1. Introduction

This is the Project on “Development of Efficient Irrigation Techniques and Extension in Syria (DEITEX)” (hereinafter “the Project”) targeting to establish an efficient irrigation in three focused governorates of Rural Damascus, Daraa, and Hama, which was started in March 2005. All field works to be taken in Syria during the project period of three years were successfully completed in January 2008. This Final Report describes details of the project implementation, achievement of the Project, and lessons learned through the execution of the Project.

2. 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 to compel them by “control or regulation”. Project implementation is outlined as follows:

Items	Substances	Remarks
Project Period	March 2005 ~ March 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.
Lineup of the Project	Japanese : Long-term and short-term experts	7 experts (irrigation, training, extension etc.)
	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 raised 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

The Project consists of 6 implementing terms of “Preparation Work in Japan”, “1st Field

Work”, “1st Work in Japan”, “2nd Field Work”, “3rd Field Work” and “4th Field Work”. Every implementing term was successfully completed on schedule and without substantial changes in its contents. No changes were given in the members of Japanese experts, and almost all counterparts who originally nominated, contributed to the project implementation until the end of the Project.

3. Results and Products of the Project

The Project obtained some results and products in line with the attainment of the project purpose. Major outcomes/outputs are as follows:

Factors in PDM	Subject of Factors	Major Process of achievement	Project Outcomes/Outputs
Overall goal	Expanding modern water-saving irrigation	(a specific action was not given)	Rate of modern irrig. e.g. Rural Damascus was upgraded 20.3%(2005)→47.5%(2007), For other two governorates, operation of the pre-introduced modern equipment was upgraded
Project purpose	Enhancing Saving water	(a specific action was not given)	Irrigation water was reduced at 21% on average in the Project sites without causing reduction of production
Output 1	Improving modern irrigation technology	<p>1) In order to improve irrigation techniques, weakness and shortcoming in the current practice of irrigation in Syria were revealed in the early stage of the Project.</p> <p>2) Baseline survey was carried out on the project areas for the purpose of; “benchmarking of indicators for project evaluation”, “analyzing the present condition from socioeconomic and agricultural economic aspects as well as others”, and “drafting a model farming system for water saving”.</p> <p>3) The Project was basically designed to develop an efficient irrigation technique by way of improving wasteful manner of irrigation. In order to put this idea into action, one demonstration farm was established in each concerned governorate of Hama, Rural Damascus, and Daraa during the 2nd Field Work, and continued its demonstration activities and monitoring until the end of the Project.</p>	Technical Manual for the efficient irrigation, like water-saving modern irrigation, was prepared during the first half of the 4th Field Work. There are two versions of the Manual in English and in Arabic. Copies of the Manual of Arabic version were delivered to the necessary posts so as to effectively utilize on their daily duties.
Output 2	Training activities	Training curriculum and training tools were carefully prepared so as to cover necessary subjects which meet the training requirement. 71 of water extensionists and 15 of irrigation SMSs (Subject Matter Specialist) were trained in total during the Project period.	The number of trained water extensionists under 58 extension units meets 46% of the ultimate requirement. On the other hand, the number of the trained SMSs under 12 extension units, is equivalent to 57% of the necessary numbers. In addition to the compulsory productions required originally, training guideline was prepared and delivered to the necessary posts.
Output 3	Extension activities	Various extension materials, like video programs including video clips, photographs, figures, and many kinds of posters and brochures were created during the project period. Based on the action plans prepared by trainees themselves, several extension activities were executed and implemented as the model extension activity of the Project.	Many extension materials were prepared, e.g. 35 types of posters, 18 times of extension events, etc. Moreover, extension manual were prepared and delivered to the necessary posts.

In addition to the compulsory results, the Project obtained some additional outcomes which meet the usage in general-purpose. Major additional outcomes are as follows:

Obtained General Outcomes (which are not specified in PDM)		Category
1)	Quantity of irrigation water consumed by governorates and by irrigation types was clarified through elaborate hydrological analysis. The same by river basins was prepared at the same time.	Subject on irrigation water use
2)	Agro-economic situation for the advantages of conversion to modern irrigation was reviewed comprehensively.	Subject on agricultural economy
3)	The advantages of modern irrigation were justified on the basis of the data obtained through demonstration activities of the Project.	Subject on irrigation technology
4)	Possible target of irrigation modernization was quantified through complex analysis. On the basis of the results, savable quantity of water by introduction of efficient irrigation was made clear.	Subject on irrigation modernization policy
5)	The Project came up with various ideas and measures to foster mind-setting for water saving in farmers, and reflected its outcomes to the extension activities. The know-how about the mind-setting is much applicable for the different projects and undertakings in future.	Subject on training/extension
6)	Participatory approach was significant in the Project. The Project showed one typical performance of participatory approach that was put into operation in terms of the extension activities.	Subject on training/extension

4. Achievement and Evaluation of the Project

Prior to the termination of the DEITEX Project, final evaluation was carried out on November 2007. Through investigation and analysis under the evaluation study, achievement of the project purpose was acceptably clarified by the prospected verifiable indicators, and the Project was satisfactory evaluated in terms of the five criteria of "Relevance", "Effectiveness", "Efficiency", "Impact" and "Sustainability". The evaluation study concluded that the Project purpose shown in the PDM would be significantly achieved by the end of the Project period.

In addition, following recommendations were given at the same time:

Large category	Small category	Subject title	Contents
I: Subjects to be completed by the end of the Project	A: Subjects directly related to the success of the Project	a: Finalization of training and extension materials	1) Completion and delivery of technical manual and other extension & training materials
		b: Analysis of efficient irrigation techniques	1) quantitative and qualitative analysis of efficient irrigation techniques 2) fundamental analysis of cost/benefit of efficient irrigation techniques
		c: Problem identification and strategy formulation for promotion of efficient irrigation techniques	1) confirmation of the mandates of relevant organizations and their coordination 2) organizing the national task force in order to ensure sustainable execution of SMS training 3) identification of problems in using wells for irrigation

Large category	Small category	Subject title	Contents
II: Subjects to be Accomplished after the Project	A: Subjects directly related to the success of the Project	d: Promotion of further training and extension activities	1) training of SMS of irrigation 2) technical support on how to maintain the introduced modern irrigation equipment 3) collaboration work on promotion of efficient irrigation techniques 4) Formulation of an action plan by extension units and supporting units to effectively use of the project outcomes 5) Expansion of the project activities to other districts R.Damascus, Daraa and Hama governorates, furthermore, to other governorates
	B: Subjects concerned to the future circumstances of the Project	e: Promotion of further applied research	1) Formulation of action plan of applied research to promote further efficient water use nationwide 2) Establishment of wider link of information exchange and cooperation between organizations concerned
		f: Integrated approach for efficient water use	1) Promotion of efficient water use in terms of underground water resources in broader context 2) Water-saving efforts by improving surface irrigation 3) Water-saving efforts by agronomy aspects 4) Environmental issues such as salt accumulation and spillage of fertilizer and chemicals
		g: Enhancement of introducing modern irrigation equipment through the loan program	1) technical guidance of operation and maintenance of the equipment for the farmers 2) clarification of the mandates of relevant organizations concerned for promotion of modern irrigation equipment

The recommendations itemized in I.A and II.A on the above table were settled properly by the end of the Project (refer next section). As to the recommendations of II.B which are required long-term and extensive efforts, it was consented that Syrian Government including international organizations concerned shall take necessary action after this at the final Steering Committee Meeting.

5. Future Project Management

The Project is under the situation of good collaboration with counterpart organizations concerned. At the termination of the Project, necessary arrangement in training/extension was given so as to maintain and extend the training/extension activities as intended.

Several countermeasures for future success of the Project after the project termination are outlined as follows:

Category	Subject of Countermeasures	Method of Countermeasures
Improving modern irrigation technology	- delivering technical manual, and starting to make it use effectively	100 copies of Arabic version of the technical manual were delivered by January 2008, and started its utilization in accordance with guideline of manual use
	- keeping on with demonstration operation at the demonstration farms	GCSAR will continue the operation of the demonstration. Necessary spare parts of modern irrigation system was procured
Sustaining Training activities	- establishing a special coordinating organization of SMS training, and making it operation	A national team for SMS irrigation training is going to be established in collaboration with GCSAR, DoE and DMIC

Expanding extension activities	- endorsing to secure official status of the trained extensionists by the DEITEX Project	Deputy Minister of MARR committed to take necessary action
	- giving adequate supports to the extensionists to be able to engage proper extension activities	Deputy Minister of MARR committed to take necessary action
	- formulating action plan of extension activities in local level	An orientation was given to the all concerned officers of agricultural governorate offices and all chiefs of extension units, and every Directors of agricultural governorate offices decided to take necessary action
	- taking necessary regulatory arrangement in central level	Deputy Minister of MARR committed to take necessary arrangement

6. Conclusion and Recommendation

At the closing of the Project, the DEITEX Project is concluded as follows:

- 1) In order to attain saving-water in irrigation, there are two streams of “controlling and guiding by external authority/forces” and “intending saving-water and refraining wasting-water by farmers’ own initiatives”. DEITEX Project intends to attain saving-water in irrigation in accordance with the later stream. And, the Project proved that the later approach is effective, and it could be accomplished by means of training and extension activities.
- 2) The conclusion of the achievement of the Project was given through the terminal evaluation study.
- 3) Through hydrological analysis in nation-wide done within the Project, distribution of available water in Syria, and comparative situation of irrigation water use between every governorates and river basins, were remarkably clarified.
- 4) By the analysis in quantity of savable water through irrigation modernization, a concrete procedure of quantification for savable water in irrigation was clearly indicated.
- 5) The Project prepared “Technical Manual” for the convenient of technicians and extension workers when they try to improve the current water-wasting irrigation. As it is a first comprehensive guideline on modern irrigation in Syria, to utilize this in various purposes is highly expected. The technical manual is expected to be kept on among technicians and extension workers concerned.
- 6) The Project developed and extended systematic training/extension methods and system for its operation. The project team also prepared “Training Guideline” and “Extension Manual” which covered many aspects in training/extension activities and training/extension methods available regarding modern irrigation.
- 7) The Project substantially concerned about farmers’ mind in the face of promotion of modern water-saving irrigation. On the occasion of expanding an innovation, consideration to peoples’ mind should be carefully given in every developing sector, likely this project dealt with farmers’ mind.

In addition to the recommendations given by the Terminal Evaluation Study Team, the

DEITEX Project also gives following suggestions so that project cycle of the Project moves well and in sustainable.

- 1) The recommendation in terms of the achievement of the Project was given through the terminal evaluation study. Syrian Government is requested to follow the recommendation in the course of post-implementation of the DEITEX Project, and to take appropriate arrangement for the improvement of the related circumstances.
- 2) There are some effective measures to reduce quantity of water use in agricultural purpose. As the DEITEX Project dealt with the irrigation modernization of the method by handy pressurized irrigation equipment, Syrian Government (MAAR) is recommended to apply other approaches of reducing quantity of water use in agricultural purpose at the same time.
- 3) 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) Farmers always bother the aspect of restrictions of the legalization, on the other hand they do not make light of the advantage of it. Once farmers' water uses legalized, they become to deserve protection from any infringements like others disturbances and accidental failure of water use. More efforts to publicize the effectiveness of the legislation should be made more (Ministry of Irrigation).
- 5) Syrian Government (MAAR and concerned ministries) is required to work out more accurate and strategic planning of irrigation modernization in consideration with the results of hydrological analysis in nation-wide done within the Project.
- 6) Syrian organizations concerned (MAAR and concerned ministries) to modern irrigation are required to carry out deep analysis in possible quantity of water saving through modernization by governorates, in consideration with the result of analysis in quantity of savable water through modernization.
- 7) Organizations concerned to extension work in central and local level are required to effectively utilize the training/extension manual in their duties, which were prepared within the Project.

Table of Contents

Location Map

Executive Summary

Table of Contents

Acronym

1.	Introduction	1
2.	The Project	2
2.1	Project Background	2
2.2	Project Concept	3
2.3	Project Design	5
2.4	Project Implementation	11
2.5	Authority of the Project	13
3.	Project Implementation	18
3.1	General Schedule of the Project Implementation	18
3.2	Preparation Work in Japan	20
3.3	1st Field Work	22
3.4	1st Work in Japan	22
3.5	2nd Field Work	22
3.6	3rd Field Work	24
3.7	4th Field Work	26
3.8	Overviews of Implementation of the Project	27
3.9	Additional Activities taken within the Project	27
4.	Results of the Project	29
4.1	Study and Reserach	29
4.2	Baseline Survey Study	33
4.3	Demonstration Activities	45
4.4	Training Work	65
4.5	Extension Work	73
4.6	Technical Manual	86
4.7	Institutional Arrangement	89

4.8	Capacity Building and Technical Transfer	94
4.9	Systemization of Water-saving Modern Irrigation Promotion	97
4.10	International Cooperation and Publicity Work	98
5.	Achievement and Evaluation of the Project	102
5.1	General Views of Advancement of Modern Irrigation in the Project Area	102
5.2	Outline of the Project Evaluation	102
5.3	Results of the Final Evaluation	104
5.4	Conclusion and Recommendation of Final Evaluation	110
5.5	Post-hoc Activities of Final Evaluation Study	111
6.	By-products on Special Subjects	113
6.1	General View of Irrigated Agriculture in Syria	113
6.2	Agro-economic Analysis for Advantages of Modern Irrigation Conversion	118
6.3	Justification of Irrigation Modernization in Syria	125
6.4	Possible Target of Irrigation Modernization in Syria	129
6.5	Savable Quantity of Water by Introduction of Efficient Irrigation	131
6.6	Mind-setting for Water-saving	135
6.7	Participatory Approach	137
7.	Future Project Management	141
7.1	Current Status of the Post-Project	141
7.2	Management on Training Work	141
7.3	Management on Extension Work	145
7.4	Needs of Project Expansion	148
8.	Conclusion and Recommendation	149
8.1	Conclusion of the Project	149
8.2	Recommendation of the Project	150

List of FIGURES and TABLES

- Fig. 2.2.1 Schematic Views of Project Concept
- Fig. 2.2.2 Necessary Steps to Achieve Saving Water in Agriculture
- Fig. 2.4.1 General Flow of the Project
- Fig. 2.5.1 Organization of MARR as of 2005
- Fig. 2.5.2 New Organization of MARR as of 2007
- Fig. 2.5.3 Organization of GCSAR since 2002
- Fig. 2.5.4 Agencies Concerning the Project Implementation
- Fig. 2.5.5 Organization of PIU as of 2007
- Fig. 3.3.1 General flow of Baseline survey
- Fig. 4.3.1 Schematic View of Control Unit
- Fig. 4.3.2 Layout of Hama Demonstration Farm
- Fig. 4.3.3 Movable Sprinkler Irrigation Set
- Fig. 4.3.4 Drip Irrigation for Cotton field
- Fig. 4.3.5 Layout of Daraa Demonstration Farm
- Fig. 4.3.6 Drip Irrigation for Vegetable Field
- Fig. 4.3.7 Layout of Rural Damascus Demonstration Farm
- Fig. 4.3.8 Drip Irrigation for Fruit Tree Field
- Fig. 4.3.9 Irrigation Hours for Cotton in Hama Demonstration Farm
- Fig. 4.3.10 Irrigation Hours for Eggplant in Daraa Demonstration Farm
- Fig. 4.3.11 Irrigation Hours for Apple in Rural Damascus Demonstration Farm
- Fig. 4.3.12 Rate of Acknowledgement of Demonstration Farms
- Fig. 4.3.13 Farmers' Visit to the Demonstration Farms
- Fig. 4.3.14 Rates of Farmers who Learned Something from the Demonstration Farms
- Fig. 4.3.15 Specific Items Learned from the Demonstration Farms
- Fig. 4.3.16 Flow of Monitoring on Demonstration Farm
- Fig. 4.4.1 Structure of Training System under the DEITEX Project
- Fig. 4.4.2 An Example of Description of Training Guideline
- Fig. 4.4.3 Training and Extension System in the DEITEX Project
- Fig. 4.5.1 Procedures of Model Extension Activities
- Fig. 4.5.2 Extension Activities in the year 2005 and 2007 at the Extension Unit in the Project Area
- Fig. 4.9.1 Extension Structure Utilizing Every Extension Methods**
- Fig. 5.1.1 Change of Irrigated Area by Modern Irrigation Methods
- Fig. 5.1.2 Farmers' Types Categorized by Reluctancy to Irrigation Modernization**
- Fig. 6.1.2 Feature of the Area Distribution Matrix
- Fig. 6.1.3 Irrigated Area and Quantity of Irrigated Water by Governorates**

Fig. 6.1.4	Irrigated Area and Quantity of Irrigated Water by Basins
Fig. 6.2.1	Farmers' Income by Irrigation Methods
Fig. 6.2.2	Investigated Production Costs and Returns
Fig. 8.1.1	Transition of the Number of Licensed Wells
Table 2.3.1	List of Japanese Experts
Table 2.4.1	List of Project Stages
Table 2.4.2	Tentative Schedule of the Project
Table 3.1.1	Proposed Project Implementation Schedule
Table 3.1.2	Actual Time Schedule Finally Implemented
Table 3.2.1	Salient Feature of Implementation of "Preparation Work in Japan"
Table 3.3.1	Salient Feature of Implementation of "1st Field Work"
Table 3.3.2	Outline of the Baseline Survey
Table 3.4.1	Salient Feature of Implementation of "1st Work in Japan"
Table 3.5.1	Salient Feature of Implementation of "2nd Field Work"
Table 3.5.2	Salient Feature of Selected Demonstration Farms
Table 3.5.3	Dimensions of Modern Irrigation System of Demonstration Farms
Table 3.6.1	Salient Feature of Implementation of "3rd Field Work"
Table 3.7.1	Salient Feature of Implementation of "4 th Field Work"
Table 3.9.1	Additional Activities taken within the Project
Table 4.1.1	Problems and Inadequacies in Current Irrigation Practice
Table 4.1.2	Researched Subjects in Irrigation done by DIWU/ANRR
Table 4.1.3	Major Target Crops of Irrigation Researches
Table 4.1.4	Details of Target Crops of Irrigation Researches (Field crops and Vegetables)
Table 4.1.5	Details of Target Crops of Irrigation Researches (Fruit trees)
Table 4.1.6	Research Subjects in Irrigation Research Stations for the Year 2005
Table 4.1.7	Target Crops of the Irrigation Research Stations (Field Crop & Vegetables)
Table 4.1.8	Target Crops of Irrigation Research Stations (Fruit trees)
Table 4.2.1	Referential Villages Selected in Baseline Survey
Table 4.3.1	Problems to be Improved in Demonstration Farms
Table 4.3.2	Outline of Demonstration Farms
Table 4.3.3	Cropping Pattern of Demonstration Farm in Kafr Zeita, Hama
Table 4.3.4	Cropping Pattern of Demonstration Farm in Kafr Four, Rural Damascus
Table 4.3.5	Cropping Pattern of Demonstration Farm in Tafas, Daraa
Table 4.3.6	Provisional Proposed Irrigation Hour in Demonstration Farms
Table 4.3.7	General Roles of Concerned Parties in Operation and management of Demonstration
Table 4.3.8	Monitoring Method by Item and Responsible Party

Table 4.3.9	Sample of Monitoring Sheet
Table 4.3.10	Summary of Results in Demonstration Activities
Table 4.4.1	Necessary Training Subjects for Water Extensionists
Table 4.4.2	Subjects and objectives of the training courses for Water Extensionists
Table 4.4.3	Necessary Training Subjects for the Irrigation SMS
Table 4.4.4	Objectives of the Evaluation in Training Courses
Table 4.5.1	Model Extension Activities Implemented
Table 4.5.2	Relation among Extension Types, Incentive Factors and Model Extension Activities
Table 4.5.3	Outline of Extension Manual
Table 4.5.4	Extension Activities Carried Out by Trained Water Extensionists
Table 4.6.1	Contents of Technical Manual
Table 4.6.2	Selected Posts for Delivering Copy of Technical Manual
Table 4.7.1	Role of each Organization in different Activities
Table 4.8.1	Number of the Trained Water Extensionists in the Target Governorates
Table 4.8.2	Number of the Trained Irrigation SMS in the Target Governorates
Table 4.8.3	Technical Transfer Performed during the Project Period
Table 4.8.4	List of Counterpart Training in Japan and Study Tour to the Third Country
Table 4.9.1	Categorization of Farmers for Irrigation Modernization
Table 4.10.1	Outline of the Training Course for Iraq Engineers
Table 5.2.1	Members of the JICA Evaluation Team
Table 5.2.2	Members of the Syrian Evaluation Team
Table 5.2.3	Time Schedule of Final Evaluation Study
Table 5.3.1	Clarified Achievement of Project Purpose
Table 5.3.3	Summary of Project Evaluation in terms of Five Criteria
Table 5.4.1	Recommendation Given by the Final Evaluation Study Team
Table 6.1.1	Salient Features of River Basins in Syria
Table 6.1.2	General Features of Available Data in Used Water Volume and Irrigated Area
Table 6.1.3	Available Data/Information for Identification of Area Distribution Matrix
Table 6.1.4	Basin-wised and Governorate-wised Area Distribution
Table 6.1.5	Available Data in Used Water Volume and Irrigated Area by the Irrigation Types
Table 6.1.6	Estimated Feature of Irrigation in Governorate-wise
Table 6.1.7	Estimated Feature of Irrigation in Basin-wise
Table 6.2.1	Annual Cost of Irrigation by Method
Table 6.2.2	Crop Productivity by Type of Fertilization
Table 6.2.3	Financial Unit Cost of Irrigation Water by Water Source and Irrigation Method
Table 6.2.4	Economic Effects of Modern Irrigation Method Compared with Traditional Irrigation on Major Crops

Table 6.2.5	Crop Budget Analysis of Major Crops
Table 6.3.1	Summary of Water Use and Productivity of Potato (Autumn) in Kafr Zeita, Hama
Table 6.3.2	Comparison of Cultivation Details in HDF and HMF2
Table 6.3.3	Comparison of Cost and Benefit in HDF and HMF2
Table 6.3.4	Selected Data of Water Use and Productivity of Vegetables in Tafas, Daraa
Table 6.4.1	Possible Target of Irrigation Modernization in Syria
Table 6.5.1	Irrigation Areas by Different Irrigation Types in the Project Area
Table 6.5.2	Modernizable Irrigation Areas by crops in the Project Area
Table 6.5.3	Level of Irrigation Modernization by Crops
Table 6.5.4	Savable Quantity of Water by Introduction of Efficient Irrigation in the Project Area
Table 6.6.1	Farmers Characteristics in Three Governorates
Table 6.6.2	Evaluation of Five Incentive Factors in Each Governorate
Table 7.3.1	Distribution of Water Extensionist and SMS in the Project Area

Figures and Tables in **bold** type are attached in the section of “Figures and Tables”.

ANNEXES

- Annex 1 Inputs of the Project
- Annex 2 Revised Versions of PDM
- Annex 3 Record of Meetings
- Annex 4 Details of the Training Course Program
- Annex 5 List of the trained SMS and WE
- Annex 6 Distributed Extension Materials

ACRONYM

ANRR:	Administration of Natural Resource Research
ACSAD:	Arab Center for the Studies of Arid zones and Dry lands
ED (or EoD):	Extension Directorate
DEITEX:	Project on Development of Efficient Irrigation Techniques and Extension in Syria
DIWM:	Directorate of Irrigation and Water Management, MAAR
DMIC:	Directorate of Modern Irrigation Conversion, MAAR
DoS:	Directorate of Soil, MAAR
FAO:	Food and Agriculture Organization of the United Nations
GCSAR:	General Commission for Scientific Agricultural Research
GDP:	Gross Domestic Product
GNP:	Gross National Product
GOS:	Government of Syria
HDI:	Human Development Index
ICARDA:	International Center for Agricultural Research in Dry Areas
IFAD:	International Fund for Agricultural Development
JICA:	Japan International Cooperation Agency
MAAR:	Ministry of Agriculture and Agrarian Reform
MOI:	Ministry of Irrigation
MOD:	Ministry of Defense
ODA:	Official Development Assistance
OECD:	Organization for Economic Cooperation and Development
OJT:	On the Job Training
PCM:	Project Cycle Management
PDM:	Project Design Matrix
PIU:	Project Implementation Unit
R/D:	Record of Discussions
SC:	Steering Committee
SMS:	Subject Matter Specialist
SP:	Syrian Pound
SPC:	State Planning Committee
TQD:	Training and Quality Directorate
UNDP:	United Nations Development Programme
WE:	Water Extensionist
WUA:	Water Users Association
Project Area:	Three governorates of Rural Damascus, Daraa and Hama
Project Site:	Selected farmlands within the project areas for focusing project activities
Pilot Demonstration Farm:	Farmlands within the project sites being equipped modern irrigation equipment/facilities under the project

1. Introduction

The Government of Syria (GOS) requested technical cooperation to the Government of Japan (GOJ) in order to accelerate the shift from the present conventional water-consuming irrigation to the modern water-saving irrigation immediately, in which Ministry of Agriculture and Agrarian Reform (MAAR) was designated as the implementation organization. The Japan International Cooperation Agency (JICA) conducted the pre-evaluation study in order to examine the request during February to October 2004. Based on the result of the study, both Syrian and Japanese sides agreed and signed the record of discussions (R/D) on the implementation of the "Project on Development of Efficient Irrigation Techniques and Extension in Syria (DEITEX)" (hereinafter, "the Project") targeting to attain the project purpose in three governorates of Rural Damascus, Daraa and Hama, in November 2004.

The Project has been being implemented since March 2005 with the project period of three years. Presently, the project period consisting of 6 implementing terms of "Preparation Work in Japan", "1st Field Work", "1st Work in Japan", "2nd Field Work", "3rd Field Work" and "4th Field Work", were successfully completed in February 2008. This Final Report describes details and conclusion of the DEITEX Project.

2. The Project

2.1 Project Background

Hereinafter, it is described at a 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 19,930 thousand in 2004, 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 1,361 thousand ha in 2004 (it becomes at 1,505 thousand ha as of 2007). Irrigated agriculture consumes water more than 80% of the total water use in Syria, hindering to provide water resource to other sectors such as industry and domestic water use.

Consequently, efficient water use in agriculture is one of the most important issues in Syria, in order to increase crop production and improve agricultural productivity. The Syrian Government issued a decree declaring to change all the traditional irrigation system to modern irrigation by 2004, however, the target did not achieved as required. One of the major constraints which hampers the Syrian Government's challenge, is lack of effective extension activities in order to transfer irrigation research results to farmers, including technical assistance for designing, installing and maintenance of the modern system as well as dissemination of proper information on the system. In addition, most of farmers are reluctant to introduce the modern irrigation due to high cost of the irrigation system. Tangled bureaucratic procedures for accessing agricultural loan makes issues more complicated.

Under these circumstances, the Syrian government requested technical cooperation to the Japanese government in order to improve the situation. Then, the Project was started complying with the request. According to the R/D of the Project, the target of the Project is to achieve proper amount of irrigation water use for each crop in project sites, through providing adequate supports by strengthened training/extension activities. The project activities include a) conducting baseline survey in order to clarify the present

conditions of farmer's irrigation, b) studying and reviewing existing irrigation technologies and extension activities which meet farmers' requirements, and c) implementing extension and training activities for saving water targeting irrigation engineers, extension workers and core farmers in project sites.

(After commencing the Project, strategy of the Project and details of the project implementation were worked out at the beginning of the project period. It was worked up into Project Document.)

2.2 Project Concept

While development in irrigated agriculture could enhance future food security more in Syria, there are contradictory phenomena of "soaring demand of irrigated area expansion" in one side, and "shortage and/or depletion of water resources" in the other side. In this respect, saving water in irrigated agriculture is one of the top priority issues of the country, because measure of saving water can ease both phenomena at the same time.

There are two streams of promoting saving water in irrigation, namely by administrative control and by farmers' own accord. Taking current depression in promoting water-saving by means of administrative controlling in Syria into consideration, the Project ambitiously focuses its attention on the later. The project concept was set "to make farmers to go for water saving irrigation by their own choose" through adequate extension activities.

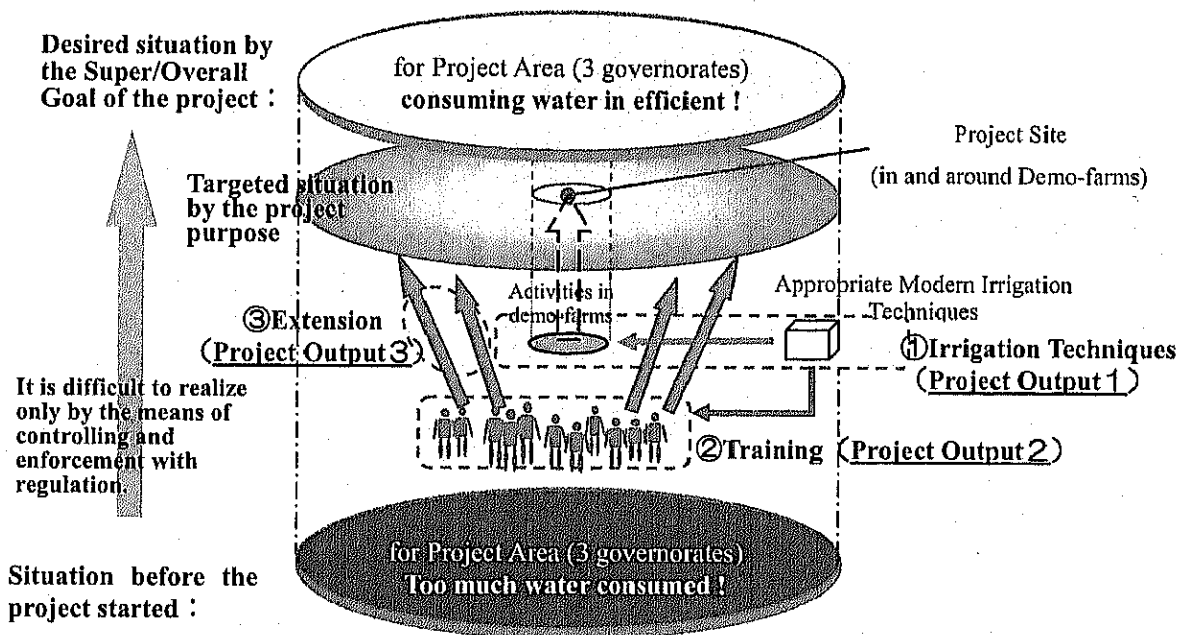


Fig.2.2.1 Schematic Views of Project Concept

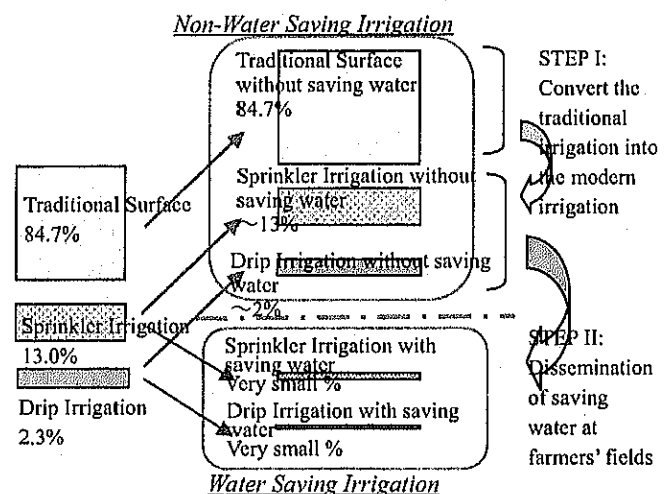
Since “extension activities” requires skilled extension workers, “training” must be an important component in the Project. Furthermore, “training/extension” have need of appropriate irrigation techniques. In those connections, project concept is visually shown in Fig.2.2.1.

Furthermore, farmers are generally reluctant to proceed to save water under the existing irrigation condition as it is, because they feel few incentives. Modern irrigation methods utilizing “handy pressurized irrigation equipment like drip or sprinkler” which are counted upon to give water saving effects more, are advantageous to farmers in several views. As those advantages are right 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 project “to realize saving water in irrigation effectively by means of introducing modern irrigation method appealing those advantages in several fields”. For the farmers who have already applied modern irrigation, the project also tries to bring out possible advantages like water saving effects that modern irrigation method can give.

The most common irrigation method in Syria is traditional surface irrigation (basin and furrow), which covers nearly 85% of the total irrigated area in 2004. Modern irrigation such as drip and sprinkler irrigation is very effective in terms of saving water, and thus the government is encouraging farmers to replace the traditional system by the modern system. However, modern irrigated area is still as small as 185,000ha, only 15% of the total irrigated land. (in 2004)

According to the previous field survey by Japanese experts, most of farmers irrigate more amount of water than crop water requirement, even if they introduce the modern irrigation system.

As mentioned previously as the “advantages in several fields”, the modern irrigation saves not only irrigation water but also labor works in terms of water delivery and fertilizers



Note: The percentage shows the ratio against the total irrigated area of 1.3 Million ha as of 2005

Fig.2.2.2 Necessary Steps to Achieve Saving Water in Agriculture

application, which results in improvement of productivity. As mentioned above, these advantages of the modern irrigation methods are very attractive to farmers who can afford it, and some of them introduce drip/sprinkler irrigation not for saving water.

The Syrian government is aiming to achieve the target of “converting all traditional irrigation system into the modern irrigation by 2004”, with various measures and policies including encouraging of agricultural loan to introduce the modern irrigation, promoting domestic production system of irrigation equipment, and restriction of drilling new wells. Despite of these varieties of procedures and efforts, there is still a long way to go before achieving the target. In order to realize sustainable and rational water use in the country, it is needless to repeat the importance and the necessity of promoting the modern irrigation. In addition, further effort is also required so that farmers adopt and operate the modern irrigation system properly to save water.

It is obvious that saving water in agricultural sector is the urgent subject in Syria. It is also pointed out that most of farmers are negative to introduce the modern irrigation system so far. The pre-evaluation team of the project indicated the major reasons of the slow expansion of the modern system to farmer’s level as follows; a) insufficient outcomes despite of various kinds of administration measures related to the issue, b) lack of appropriate techniques on saving water which farmers can adopt easily, and c) inadequate training and extension services/activities regarding the subject to farmers. On the other hand, even if farmers introduce the modern system, many of them do not save water, because they don’t have a good command of their “hardware” (modern irrigation system). In other words, establishment of “the software” is also necessary to utilize the hardware as it can be. In addition to those, “mind of farmers” that is an understanding of proper use of irrigation system and awareness of utilizing precious water resource in a deep manner, is essential to realize saving-water.

Considering the importance of each factor of the hardware, the software and the mind of farmers and harmonization between them, the project strategy is prepared. 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

The Project was designed so as to ultimately ease high pressure on water resources in

Syria. A project design that was set at the beginning, then it was revised at several times as required to meet the demands of the times. Project design in final version is described hereunder. Progress of revising of PDM which is a standard expression of the project design is described in the next chapter.

(1) Overall Goal

Overall Goal is the development effect expected as a result of the achievement of Project Purpose. The overall goal of this project can be represented by “water use efficiency is improved, and water loss is reduced in the farmers’ fields of project areas”.

The indicator to measure the success of overall goal is a decrease of total amount of irrigated water in the project areas by the year 2010, under the condition that crop production in the project areas is sustained (and/or improved) after the commencement of the project. The year 2010 indicates the 2 years later on the project completion.

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.

Then, as the next stage of the overall goal, a super goal of this project could be set that “sustainable irrigation water use is achieved in the whole possible regions in Syria”. Once the project areas are improved in water use efficiency, consequently it will extend to other areas or concerned basins in which efficient irrigation is required urgently. Such development also strongly support and contribute to the economic growth in Syria.

(2) Project Purpose

Project Purpose is the objective that is expected to be achieved by the end of the project implementation. Referring to the result of the Preparatory Study for the project conducted in March 2004, the project purpose is decided as “proper amount of irrigation water is used for each crop in the project sites, through providing adequate supports by strengthened training/extension activities”. Furthermore, additional phrase of “*under the condition that* capability for promoting water saving modern irrigation is raised in the organizations/staffs concerning the project areas” was added during the project period, because a comment was given so that how strengthen training/extension activities have to be referred clearly.

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 “total amount of irrigated water in the project sites decreased 10 – 20 % by the completion of the Project”, and “crop production in the project sites remains at the same level as before the commencement of the Project”. In addition to those, “New responsible organization for modern irrigation is established” and “Responsible governmental organizations become capable of promoting water saving modern irrigation” were put in the indicators. 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 will evaluate whether the training and extension service in the project sites have met the needs from water scarcity in Syria. An increased rate of farmers applying manner of modern efficient irrigation will be the evidence that farmers have favorably judged the quality of training and extension service.

(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. Satisfactory water saving efficient irrigation techniques are established according to the local conditions in the project sites.
2. Irrigation engineers, extension workers concerning the project, are able to transfer knowledge to farmers in terms of on-farm water saving modern irrigation method.
3. Farmers in the project areas are guided so as to adopt efficient irrigation for each crop individually through providing extension services.

(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. Subject of irrigation techniques and research
 - 1-1 Review past and present research activities of ANRR
 - 1-2 Conduct a baseline survey of the project areas in which project sites are located
 - 1-3 Conduct a preliminary study on the selection of the project sites

- 1-4 Prepare the detailed plan of operation of the project
- 1-5 Organize farmers' group(s) for introducing group water management, if necessary
- 1-6 Establish the (pilot) demonstration farms in the project sites
- 1-7 Investigate suitable modern water-saving irrigation method for the project areas
- 1-8 Prepare manuals and/or guidelines on the efficient irrigation techniques

2. Subject of training

- 2-1 Review past and present training activities
- 2-2 Identify needs and confronted problems in terms of training activities
- 2-3 Improve the training curriculum and teaching materials
- 2-4 Carry out the training courses to the irrigation engineers and extension workers concerned

3. Subject of extension activity

- 3-1 Review past and present extension activities
- 3-2 Identify needs and confronted problems in terms of extension activities.
- 3-3 Improve the extension materials
- 3-4 Provide extension services to the farmers in and surrounding the project sites

(5) Inputs from Japanese Side

1) Japanese experts

The Japanese experts of which terms of reference are described in ANNEX 2, 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
	Agricultural extension	Hiroyasu OHNUMA	M. of agriculture
Dispatch of Japanese short-term experts	Agro-economy/ Agronomy	Mitsuo NISHIYA	M. of agriculture
	Irrigation system designing	Tomoki HOTTA	M. of agriculture
	Socio-economy	Naoki KOGA	M. of agriculture
	Irrigation water management	Eiichi TAKIGAWA	M. of agriculture
Team-coordinator	-	Eiichi TAKIGAWA	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
- 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

On the R/D of the Project, both governments agreed to provide machinery, equipment and materials necessary for the implementation of the Project as listed below.

- Cars to be used in the project
- Office equipment to be used in the project
- Audiovisual aids for training activities
- Equipment for extension activities
- Equipment and instrument for establishment of the demonstration farms

Taking the necessity and importance into consideration, Japanese side finalized the items of equipment for this purpose, and procured those at the beginning of the project implementation. Procured equipment by the Japanese side are shown in ANNEX 3.

Furthermore, the Syrian side 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 side arranged 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 allocated for technical cooperation as designed in the R/D. 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 1.

4) Training in third countries

During the project period, Syrian counterpart personnel visited third countries for the purpose of study tour learning 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 Jordan in 2005 and to Greece in 2007, 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 was 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. Once satisfied the overall goal, “the efficient irrigation techniques are spread widely within the basins concerned” and “farmers within the basins can purchase modern irrigation equipment easily as required in terms of quality and quantity” were considered to be

indispensable for attaining the super goal.

After the project purpose would be successfully attained, the necessary condition to achieve the overall goal were directed to two provisions of “the outcomes obtained in the project spread and are utilized properly within the project areas” and “farmers in the project areas can purchase modern irrigation equipment easily as required in terms of quality and quantity”.

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. Three provisions of “Farmers in the project sites can purchase modern irrigation equipment easily as required in terms of quality and quantity”, “Trained irrigation engineers and extension workers do not leave from their duty” and “Marketing condition in the project sites do not aggravate drastically” were finally decided as the important assumption for the attainment of the project purpose.

Furthermore, “the proper operation in on-going training and extension system will be performed” was set as the risk 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 “responsible irrigation engineers and extension workers join the project as required” was set as the precondition in the Project.

2.4 Project Implementation

2.4.1 Project Implementation Stages

Period of cooperation of the project is planned at 3 years from March 2005 to March 2008. The project period consists of 6 stages, namely, Preparatory Work in Japan, 1st Field Work, 1st Work in Japan, 2nd Field Work, 3rd Field Work and 4th Field Work. 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
Preparatory Work in Japan	March 2005	Year of 2004
1 st Field Work (in Syria)	May 2005 to October 2005	Year of 2005
1 st Work in Japan	October 2005 to November 2005	Year of 2005
2 nd Field Work (in Syria)	November 2005 to March 2006	Year of 2005
3 rd Field Work (in Syria)	April 2006 to March 2007	Year of 2006
4 th Field Work (in Syria)	April 2007 to March 2008	Year of 2007

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.

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

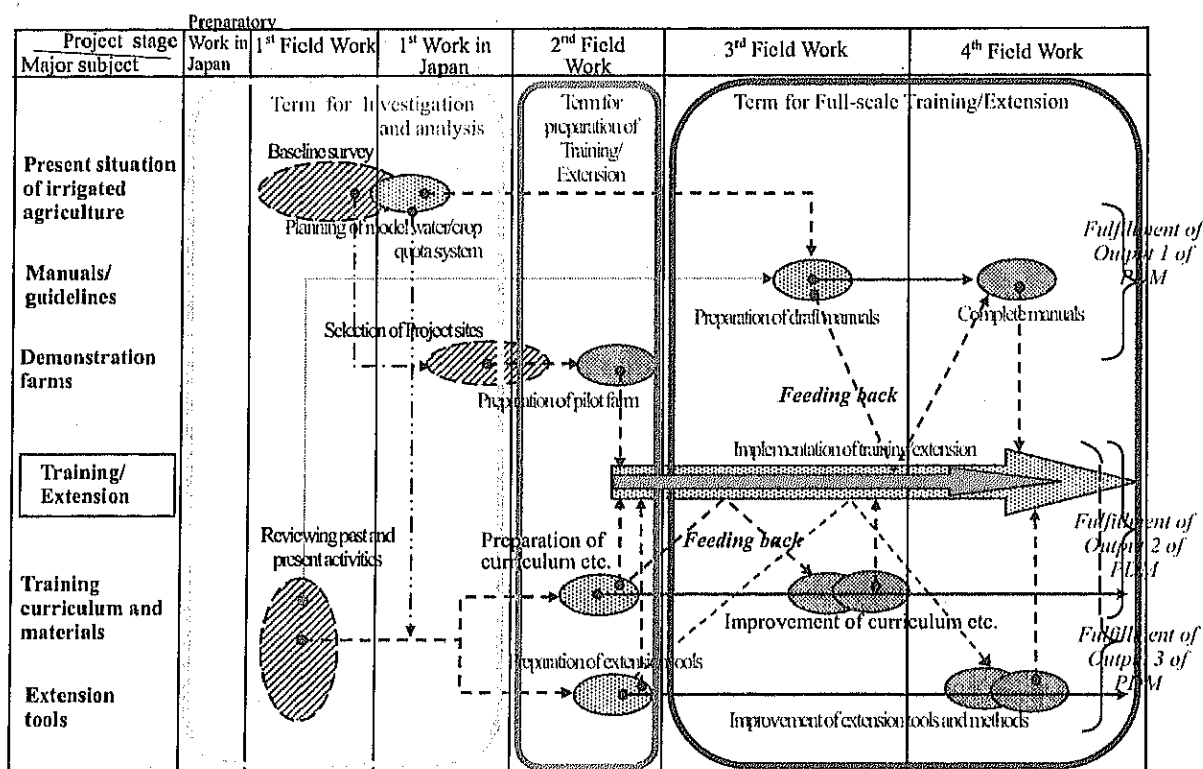


Fig.2.4.1 General Flow of the Project

2.4.3 Plan of Operation

The Table 2.4.2 gives the tentative 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 Resource Research (ANRR) of GCSAR, MAAR, has been chosen as the competent counterpart organization of the project. Extension Directorate of MAAR is counterpart agency in the field of extension services of the project. Fig.2.5.1 shows general structure of MAAR as of the time when project started in 2005.

MAAR was given drastic reform in its organization in order to meet recent administrative needs. New organization of MAAR restructured since 2007 was shown in Fig.2.5.2.

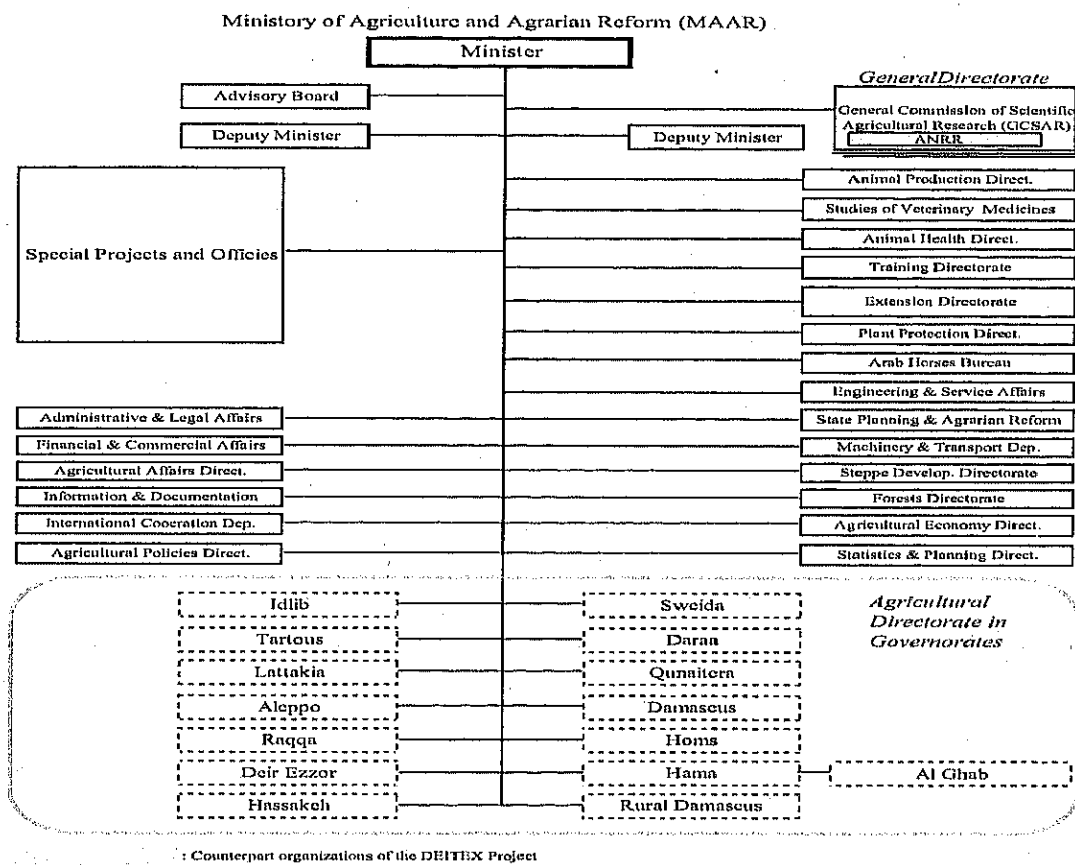


Fig.2.5.1 Organization of MARR as of 2005

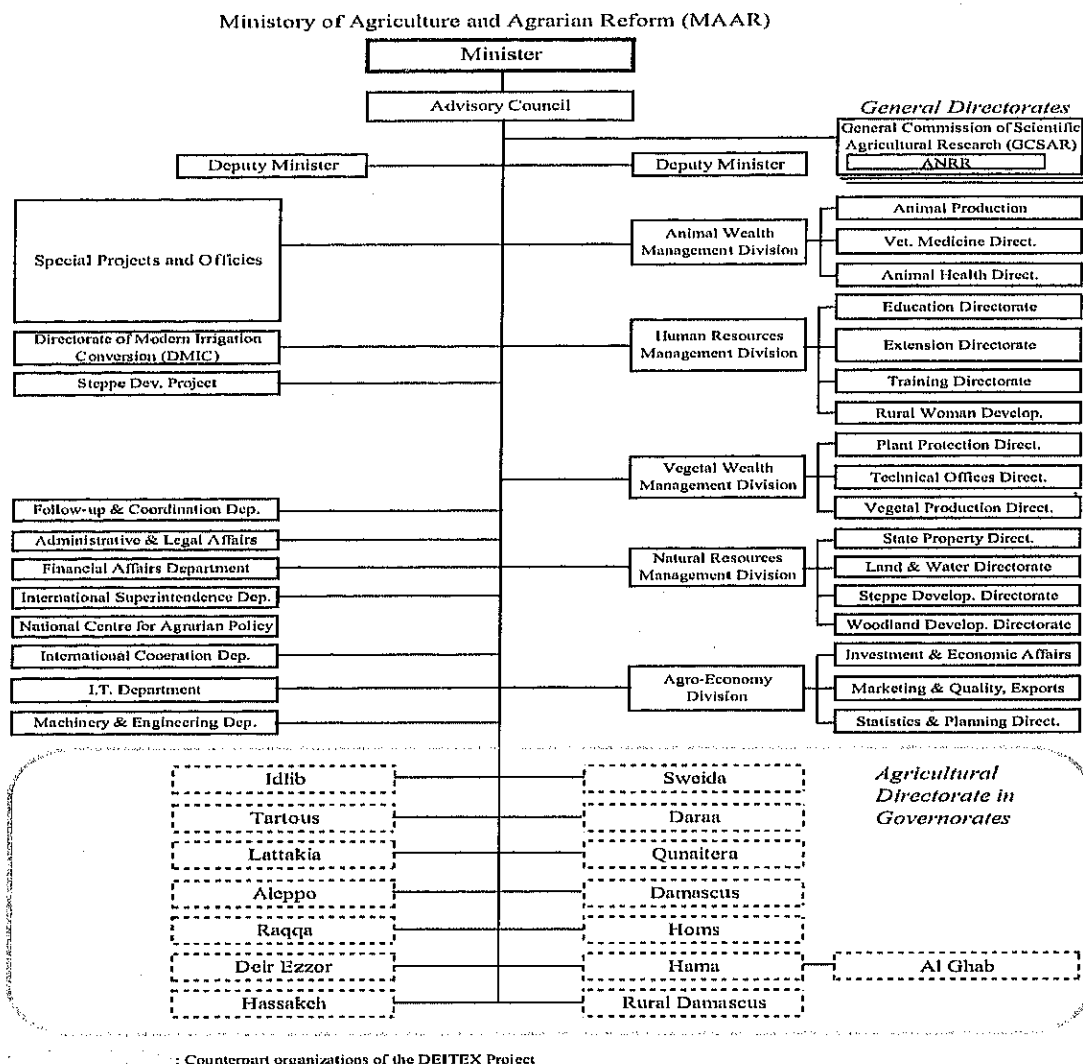


Fig.2.5.2 New Organization of MARR as of 2007

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), organization of GCSAR has been retained as it was. Fig.2.5.3 shows general structure of GCSAR as of 2007. Administration of Agricultural Natural Resources Research (ANRR) which is an acting counterpart agency of the Project is a vital unit of GCSAR.

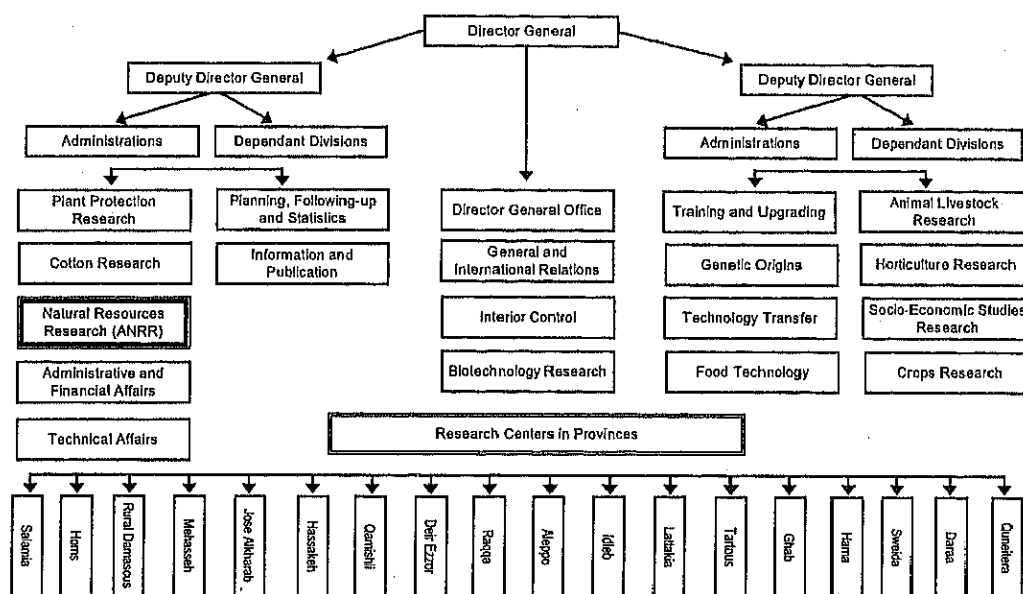


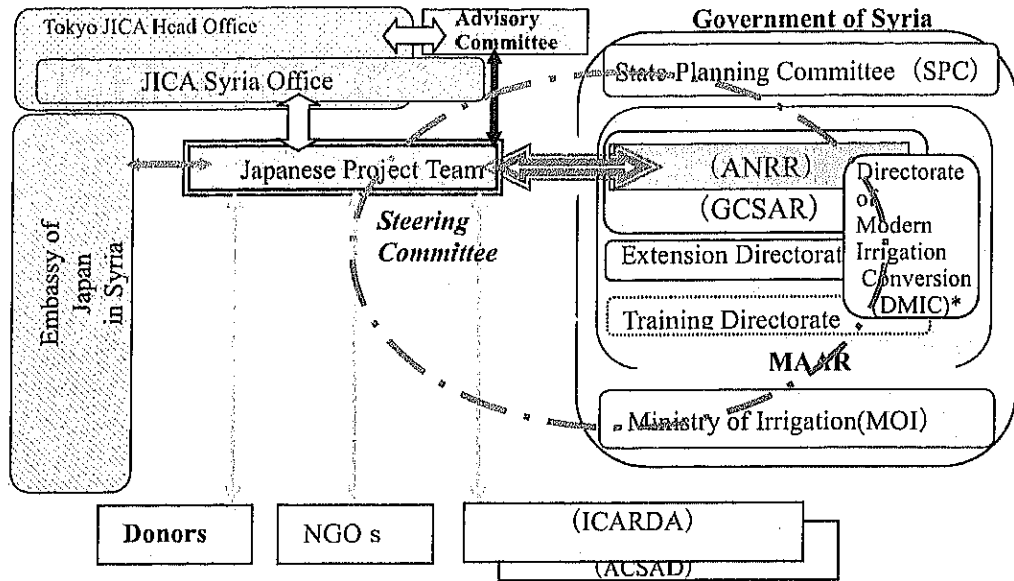
Fig.2.5.3 Organization of GCSAR since 2002

2.5.2 Structure of Project Implementation

The Project was implanted by ANRR and DoE 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 of the project. A series of SC meetings were held during each field survey term to evaluate and approve the achievement of the project, and to exchange view on issues arising including modification of PDM and so on. Directorate of Modern Irrigation Conversion (DMIC) which was a newly established organization being responsible for irrigation modernization in Syria, joined the counterpart alliance on January 2007 on the basis of the agreement given in the steering committee.

Furthermore, the Project Implementing Unit (PIU) was established in order to fulfill the project purpose in mutual cooperation with Japanese team and Syrian counterpart team.

Organizations on the SC and PIU which were operated during the project period are shown in Fig.2.5.4 and Fig.2.5.5, respectively.



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

Fig.2.5.4 Agencies Concerning the Project Implementation

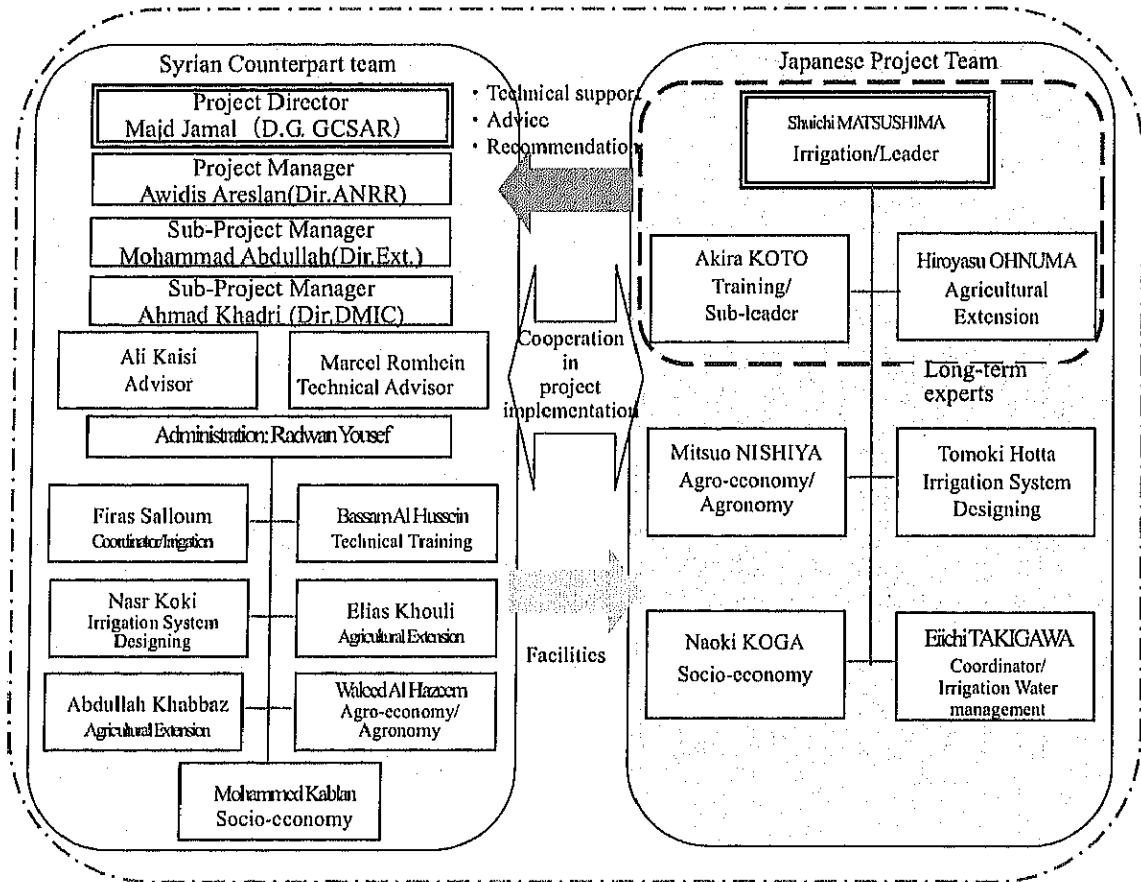


Fig.2.5.5 Organization of PIU as of 2007

On the project R/D concluded on November 2004, 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 **Chapter 3**.

3. Project Implementation

3.1 General Schedule of the Project Implementation

The project implementation schedule was designed at the time when the Project started as shown in Table 3.1.1.

Table 3.1.1 Proposed Project Implementation Schedule

Date: March 2005

Planned Tasks	Activity in PDM	Project Period																																			
		CY 2005									CY 2006									CY 2007									CY2008								
		Japanese FY. 2005									Japanese FY. 2006									Japanese FY. 2007																	
		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
<i>Year 1</i>																																					
Preparatory Work in Japan																																					
[1] Prepare the draft implementation plan of the Project.	<input type="checkbox"/>																																				
[2] Prepare the Project Document.	<input type="checkbox"/>																																				
<i>Year 2</i>																																					
1st Field Work																																					
[3] Explain and discuss for the Project Document.																																					
[4] Confirm the project implementation plan.	1-4																																				
[5] Collect and analyze general data and information.	1-2 2-2 3-2																																				
[6] Review the past and present activities of MAAR.	1-1 2-1 3-1																																				
[7] Execute Baseline Survey.	1-2																																				
[8] Prepare the Progress Report 1.																																					
1st Work in Japan																																					
[9] Prepare the Baseline Survey report.	1-2																																				
[10] Examine the nominated sites for the project sites.	1-3																																				
[11] Report to the supporting agencies in Japan.																																					
2nd Field Work																																					
[12] Explain and discuss the Baseline Survey Report.																																					
[13] Select the project sites.	1-3																																				
[14] Establish the pilot demonstration farms in the project sites.	1-5 1-6																																				
[15] Prepare training curriculum and materials.	2-3																																				
[16] Implement training and extension services.	2-3 3-3																																				
[17] Prepare the Progress Report 2.																																					
<i>Year 3</i>																																					
3rd Field Work																																					
[18] Implement training and extension services.	2-3 3-3																																				
[19] Recommend research method on efficient irrigation to ANRR.	1-7																																				
[20] Prepare draft design standard and on-farm irrigation manuals.	1-8																																				
[21] Support to the JICA Mid-term Evaluation Mission.																																					
[22] Prepare the Progress Report 3 and 4.																																					
<i>Year 4</i>																																					
4th Field Work																																					
[23] Implement training and extension services.	2-3 3-3																																				
[24] Prepare design standard and on-farm irrigation manuals.	1-8																																				
[25] Support to the JICA Terminal Evaluation Mission.																																					
[26] Prepare the Progress Report 5.																																					
[27] Prepare the Project Completion Report.																																					

During the project period, the Project was timely and successfully implemented on schedule without a marked change. However, minor changes were given in the

implementation schedule as needs arose. Actual time schedule finally implemented is shown in Table 3.1.2 at the back of this report.

Actual conditions of project implementation are outlined hereinafter by project terms.

Preparation Work in Japan

Project Document which is a fundamental text defining project and indicating method of project implementation was to be completed prior to starting field work in Syria. At the beginning of the Project, an initial work term of "Preparation Work in Japan" was arranged in order to complete the Project Document.

The Preparation Work in Japan was successfully finished as summarized as follows:

Table 3.2.1 Salient Feature of Implementation of "Preparation Work in Japan"

Items	Proposed	Operated	Remarks
Implementing term	From March 2005 to March 2005 (0.5 months)	From March 2005 to March 2005 (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 Project Document	Preparation of the Project Document	
Inputs	Assignment Project Leader: 0.5M/M Training: 0.5M/M <u>Extension: 0.5M/M</u> Total 1.5M/M Others No procurement	Assignment Project Leader: 0.5M/M Training: 0.5M/M <u>Extension: 0.5M/M</u> Total 1.5M/M Others No procurement	No change
Outputs	Project Document (Prepared implementation plan is to be referred within the Project Document)	Project Document (Prepared implementation plan was referred within the Project Document)	No change
Achievement	-	-	Rate of project achievement (Achievement/required results)
Progress	-	1.6 %	Rate of progress (finished assignment/total assignment)

Necessary numbers of copies of the Project Document were made and delivered as indicated by JICA.

3.3 1st Field Work

The 1st Field Work was commenced on April 2005, and it was implemented as planned in the implementation plan. 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 April 2005 to September 2005 (5.0 months)	From April 2005 to September 2005 (5.0 months)	No change
Implementing tasks	Explanation and discussion for the Project Document	Explanation and discussion for the Project Document at the Kickoff Meeting	No change
	Confirmation of the project implementation plan	Confirmation of the project implementation plan	
	Collection and analysis for the general data and information	Collection and analysis for the general data and information	
	Review for the past and present activities of MAAR	Review for the past and present activities of MAAR	
	Conducting of Baseline Survey	Conducting of Baseline Survey	
Inputs	Assignment Project Leader: 4.0M/M Training: 5.0M/M Extension 3.0M/M Agro-economy 2.6M/M Socio-economy 1.5M/M Total 14.1M/M Others Equipment listed within the Project Document	Assignment Project Leader: 4.0M/M Training: 5.0M/M Extension 3.0M/M Agro-economy 2.6M/M Socio-economy 1.5M/M Total 14.1M/M Others Equipment listed in ANNEX 1	No change
Outputs	- Project implementation plan - Referential data and information to the project - Baseline survey report prepared by local consultant	- Confirmed project implementation plan - Referential data and information to the project - Baseline survey report prepared by the International Business Links	No change
Achievement	-	16.2 %	Rate of project attainment (Achievement/required results)
Progress	-	16.7 %	Rate of progress (finished assignment/total assignment)

After arriving in Syria for Japanese Team, firstly Kick-off Meeting was held on May 10, 2005. In the meeting, Project Document was submitted and explained its contents. And counterparts of the project were nominated in the response of the request of Japanese team.

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

- Confirming the implementation plan on the basis of the tentative idea presented in Project Document.
- Collecting and analyzing data and information related to the project
- Reviewing the past and present activities of MAAR concerning to irrigated agriculture and water saving in irrigation under the cooperation of organizations concerned.

A baseline survey was carried out on the project areas for the purpose of; (1) benchmarking of indicators for project evaluation, (2) analyzing the present condition from socioeconomic and agricultural economic aspects as well as others, and (3) drafting a model farming system for water saving. Though routinized part of the baseline survey was completed applying a local contractor, the project team managed the completing of the baseline survey.

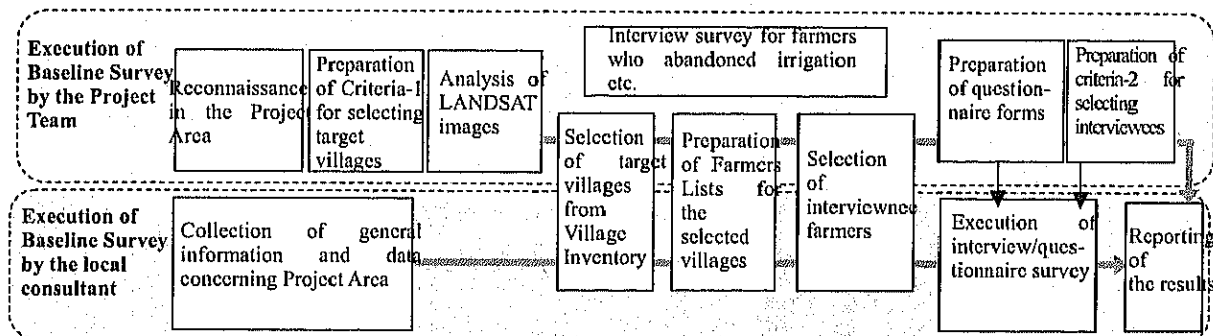


Fig. 3.3.1 General flow of Baseline survey

Baseline survey of the Project done during this project term is outlined below.

Table 3.3.2 Outline of the Baseline Survey

Items	Details	Remarks
Implementation period of baseline survey	During 100 days after the contract date of 12 th June, 2005.	
Name of hired local consultant	International Business Links (Hamra Street, Nahhas Building P.O.Box 12652, Damascus)	
Selected target villages	3 villages in Rural Damascus (Mughr Al Meer, Hineh, Zabadani) 3 villages in Daraa (Tafas, Dael, Ebtaa) 3 villages in Hama (Kafr Zeita, Latamunch, Zalaquiat)	These were selected from the village inventory.
Selected interviewees	90 farmers (10 farmers in each selected target village)	They were chosen from the farmers list of the selected target villages.

In addition to the activities mentioned above, Progress Report 1 was prepared on

August 2005 compiling results and information about the progress of the project.

3.4 1st Work in Japan

The 1st Work in Japan was commenced on October 2005, and it was implemented as planned in the implementation plan. Salient feature of the 1st Work in Japan is shown below.

Table 3.4.1 Salient Feature of Implementation of "1st Work in Japan"

Items	Proposed	Operated	Remarks
Implementing term	during October 2005 (1.0 months)	During October 2005 (1.0 months)	No change
Implementing tasks	Preparation of Baseline Survey report	Preparation of Baseline Survey report	No change
	Examination of nominates sites for the project sites	Examination of nominates sites for the project sites	
	Reporting to the supporting agencies in Japan	Participation to the advisory committee meeting	
Inputs	Assignment Project Leader: 1.0M/M Total 1.0M/M	Assignment Project Leader: 1.0M/M Total 1.0M/M	No change
	Others Not applicable	Others Not applicable	
Outputs	- Baseline Survey report	- Baseline Survey report	No change
Achievement	-	16.8 %	Rate of project attainment (Achievement/required results)
Progress	-	19.9 %	Rate of progress (finished assignment/total assignment)

During the 1st Work in Japan, the Baseline Survey Report was prepared. The contents of the report are as follows:

- 1. Introduction
- 2. Object and Method of the Baseline Survey
- 3. Results of the Questionnaire Survey
- 4. Specific Outcomes of the Baseline Survey
- 5. Further Activities during 2nd Field Work in the Project (including Selection of Demonstration Farm Sites)

3.5 2nd Field Work

The 2nd Field Work was implemented from November 2005 to March 2006, and it was

completed as planned in the implementation plan. Salient feature of the 2nd Field Work is shown below.

Table 3.5.1 Salient Feature of Implementation of "2nd Field Work"

Items	Proposed	Operated	Remarks
Implementing term	From November 2005 to March 2006 (4.0 months)	From November 2005 to March 2006 (4.0 months)	No change
Implementing tasks	Explanation and discussion for the Baseline Survey report	Explanation and discussion for the Baseline Survey report	No change
	Selection of the project sites	Selection of the project sites and candidate sites of demonstration farms	
	Establishment of the demonstration farms in the project sites	Establishment of modern irrigation system of the demonstration farms in the project sites	
	Preparation of training curriculum and materials	Preparation of training curriculum and materials	
	Implementation of training and extension services	Implementation of training course for Water-Extensionist and extension services	
	Preparation of Progress Report 2	Preparation of Progress Report 2	
Inputs	Assignment Project Leader: 3.7M/M Training: 3.7M/M Extension 3.7M/M Agro-economy 1.6M/M Irrigation system 2.3M/M Socio-economy 1.0M/M Total 16.0M/M Others Irrigation equipment of the demonstration farms	Assignment Project Leader: 3.7M/M Training: 3.7M/M Extension 3.9M/M Agro-economy 1.6M/M Irrigation system 2.5M/M Socio-economy 1.0M/M Total 16.4M/M Others Irrigation equipment of the demonstration farms	Increased as required
Outputs	- Completed Baseline Survey report - Modern irrigation systems of the demonstration farms - Training curriculum and materials - Progress report 2	- Completed Baseline Survey report - Modern irrigation systems of the demonstration farms - Training curriculum and materials, and extension tools - Progress report 2 - Counterpart training in Japan	No change
Achievement	-	29.5 %	Rate of project attainment (Achievement/required results)
Progress	-	37.0 %	Rate of progress (finished assignment/total assignment)

As shown below, demonstration farms were selected in consideration with the result of pre-survey of the site selection which was done during 1st Work in Japan.

Table 3.5.2 Salient Feature of Selected Demonstration Farms

Governorate	Information about Demonstration Farm		Remarks
	Maslaha, (Village)	Name of concerned farmers	
Hama	Kafr Zeita (Kafr Zeita)	Mr. Faris Al Abden	
Rural Damascus	Haramoun (Kafr Hour)	Mr. Isam Yehia (DF-1) Mr. Adal Fatmeh (DF-2) Mr. Ahmad Fallsh (DF-3, 5) Mr. Gazi Gazi (DF-4) Mr. Ali Fallah (DF-6)	
Daraa	Tafas (Tafas)	Mr. Mhd Al Natour	While one demonstration site had been once chosen in Tafas (Daiel), it was replaced to the present site due to personal reason.

After selecting demonstration sites in every governorates, appropriate modern irrigation systems were established by the end of March 2006, of which outlines are shown below.

Table 3.5.3 Dimensions of Modern Irrigation System of Demonstration Farms

Items	Hama Demonstration Farm	Rural Damascus Demonstration Farm	Daraa Demonstration Farm			
Irrigation Area	3.7 ha	3.4 ha	6.0 ha			
Target Crop	Field Crop	Fruit Trees	Vegetables			
Type of Modern Irrigation	Movable Sprinkler	Eemitter, Micro-sprinkler	Drip tube			
Dimension of Irrigation System	Sprinkler set	64 nos.	Emitter	3,672 nos.	Drip tube	42,000 m.
	Lateral PVC	744 m.	Micro-sprinkler	408 nos.	Lateral PE	1,050 m.
	Sub-main PVC	96 m.	Lateral PE	10,270 m.	Sub-main PE	380 m.
	Main pipe PE	385 m.	Sub-main PE	277 m.	Main pipe PE	310 m.
	Outlet	2 nos.	Main pipe PE	495 m.	Outlet	8 nos.
	Control unit	1 set	Control unit	6 sets	Control unit	1 set
Water meter	5 nos.	Water meter	5 nos.	Water meter	5 nos.	

Training tools for the training courses for water-extensionists were prepared during the 2nd Field Work. Prepared training tools are listed in the ANNEX 4.

Training course for water-extensionist is programmed consisting of four training sessions. Every sessions of the training course were opened in the appropriate spaces in each governorate. Details of the training are explained in Chapter 4.

3.6 3rd Field Work

The 3rd Field Work was commenced on April 2006, and it was implemented as planned in the implementation plan. Salient feature of the 3rd Field Work is shown below,

Table 3.6.1 Salient Feature of Implementation of "3rd Field Work"

Items	Proposed	Operated	Remarks
Implementing term	From April 2006 to February 2007 (11.0 months)	From March 2006 to February 2007 (11.5 months)	No change
Implementing tasks	Implementation of training and extension services	Implementation of training and extension services	JICA mid-term evaluation mission was not dispatched at the planned time.
	Preparation of recommendation of the research method of efficient irrigation to ANRR	Preparation of recommendation of the research method of efficient irrigation to ANRR (within the progress reports)	
	Preparation of draft design standard and on-farm irrigation manuals	Preparation of draft technical manuals of modern irrigation	
	Supporting to the JICA mid-term evaluation mission	Mid-term evaluation was not held	
	Preparation of Progress report 3, and 4	Preparation of Progress report 3, and 4	
Inputs	Assignment Project Leader: 6.5M/M Training: 9.0M/M Extension 8.0M/M Agro-economy 2.0M/M Irrigation system 2.5M/M Socio-economy 2.0M/M <u>Water manag. 0.0M/M</u> Total 30.0M/M Others Irrigation equipment for the demonstration farms	Assignment Project Leader: 5.0M/M Training: 7.5M/M Extension 5.0M/M Agro-economy 3.0M/M Irrigation system 3.5M/M Socio-economy 3.0M/M <u>Water manag. 1.2M/M</u> Total 28.2M/M Others Irrigation equipment for the demonstration farms	Modified as required.
Outputs	- Results of training and extension activities - Draft technical manuals - Progress report 3, and 4	- Results of training and extension activities - Draft technical manuals - Progress report 3, and 4 - counterpart training in Japan	No change
Achievement	-	65.0 %	Rate of project attainment (Achievement/required results)
Progress	-	66.6 %	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. Remaining three sessions of the training course for water-extensionist were carried out in each governorate, and a closing ceremony was held on January 2007. Details of the training are explained in Chapter 4.

Extension activities were also conducted with much related with training activities.

3.7 4th Field Work

The 4th Field Work was commenced on April 2007, and it was implemented as planned in the implementation plan. Salient feature of the 4th Field Work is shown below.

Table 3.7.1 Salient Feature of Implementation of "4th Field Work"

Items	Proposed	Operated	Remarks
Implementing term	From April 2007 to January 2008 (10.0 months)	From April 2007 to January 2008 (10.0 months)	No change
Implementing tasks	Implementation of training and extension services	Implementation of training and extension services	No change
	Preparation of final design standard and on-farm irrigation manuals	Preparation of final design standard and on-farm irrigation manuals	
	Supporting to the JICA final evaluation mission	Supporting to the JICA final evaluation mission	
	Preparation of progress report 5	Preparation of progress report 5	
	Preparation of completion report	Preparation of completion report	
Inputs	Assignment Project Leader: 6.0M/M Training: 9.0M/M Extension 8.0M/M Agro-economy 0.0M/M Irrigation system 0.0M/M Socio-economy 2.0 M/M <u>Water manag. 0.0M/M</u> Total 25.0M/M Others Not applicable	Assignment Project Leader: 5.2M/M Training: 8.0M/M Extension 7.0M/M Agro-economy 1.5M/M Irrigation system 4.5M/M Socio-economy 3.0 M/M <u>Water manag. 2.0M/M</u> Total 31.2M/M Others Not applicable	No change
Outputs	<ul style="list-style-type: none"> - Results of training and extension activities - Final technical manuals - Progress report 5 - Completion report 	<ul style="list-style-type: none"> - Results of training and extension activities - Final technical manuals, Training Guideline, Extension Manual - Progress report 5 - Completion report - Final seminar - Counterpart training in Japan - Study tour of the third country (in Greece) 	Besides preparation of the technical Manual, training guideline and extension manual also prepared
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 fields were completed by the end of the project

period. Terminal evaluation study was successfully carried out on November 2007. Furthermore, Final Seminar and Final Steering Committee Meeting were held on January 2008.

3.8 Overviews of Implementation of the Project

In accordance with the actual schedule of project implementation, the Project was managed in proper 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, and conditions of assignment of counterparts consisting of central and local counterparts are shown in Table B, C, and D (each tables 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 1.0 and Version 2.0 are given in ANNEX 2.

Moreover, records of Steering Committee Meeting were attached in ANNEX 3.

3.9 Additional Activities taken within the Project

In addition to 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 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 4.10.	Opening web-page of the Project	The web-page was established and maintained at the JICA web-site	http://project.jica.go.jp/syria/4425006E0/
	Preparation of "DEITEX Project News"	Seven numbers of the news were prepared.	
	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	

Final Report of the DEITEX Project

Technology development	Preparation of a series of "DEITEX Technical Report"	Six volumes of the report were prepared.	
	Introduction of Japanese irrigation equipment of "spray tube"	Japanese irrigation equipment of spray tube was brought and examined its applicability in Syria	The irrigation equipment was tested at the Hama Irrigation Station
	Experiment of underground irrigation	Several methods of underground irrigation were investigated in Rural Damascus	Farmers innovation about underground irrigation were reviewed around Kafr Four Demonstration Farms
Inter-cooperation between sectoral organizations and donors	Participation of 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	
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	
	Providing special assist from Japanese expert	The project team some times requested Japanese experts to participate in project implementation	One expert of crop disease and harmful insects was involved to inspect farming condition of the demonstration farms

Note: Some of the subjects mentioned above are described the details in Section 4.10

4. Results of the Project

4.1 Study and Research

4.1.1 Investigation for Irrigation Practice

In order to improve irrigation techniques, weakness and shortcoming in the current practice of irrigation in Syria was revealed in the early stage of the Project. Through reconnaissance and getting information out of farmers in the Project Area, problems on introduction of modern irrigation are clarified. The problems are classified into seven categories, namely 1) On the use and management of water sources, 2) On the selection and installation of irrigation equipment, 3) On the usage and maintenance of irrigation equipment, 4) On the water management, 5) On the farmers awareness and understanding, 6) On the unsolved technical issues, and 7) On the issues of extension and training. Followings are identified remarkable problems by the categories during the 1st Field Work:

Table 4.1.1 Problems and Inadequacies in Current Irrigation Practice

Categories of issues	Contents	Identified village (directorate)
On the usage/management of water sources	Only some farmers register their wells for water use	Everywhere visited
	Few farmers install water-meter at their wells	Everywhere visited
	Some farmers steal irrigation water from rivers	Maghr Al-Meir (Rural D.)
	Yielding capacity of well is not correctly evaluated	Everywhere visited
On the selection and installation of irrigation equipment	Filters are not functional due to poor quality	Everywhere visited
	Emitters with too big capacity are used to be applied	Many places (Rural D.)
	Various type of drip emitters are installed on the same lateral line	Manyplaces (Rural D.)
	Drip irrigation is adopted regardless of profitability	Al-Bahhar (Rural D.)
	Problematic Spaghetti-type drip equipment is dominant for grapes	Everywhere visited
	Removable lateral pipe of sprinkler is too long to move	Kafar Zeita (Hama)
	Lateral pipe of sprinkler is too long to keep regular pressure along the same lateral pipe	Kafar Zeita (Hama)
	Inadequate type of sprinkler to the adopted crops is installed	Everywhere in Hama
	Terminal treatment of lateral pipe of sprinkler is not adequate	Everywhere in Hama
	Micro-sprinkler is adopted in inadequate manner of installation	Hinah (Rural D.)
On the usage and maintenance of irrigation equipment	Vague purposed water tank is installed	Al-Bahhar (Daraa.)
	Pump having too big yielding capacity is installed	Everywhere visited
	Farmers use drip tube over its durability	Everywhere visited
	Filters are not functional due to poor maintenance	Everywhere visited
On the water management	Leaking water occurs due to poor installation	Everywhere visited
	Pipeline is easy to degrade because of putting on the ground	Everywhere visited
	Interval days of irrigation is decided depending on the farmers experiences without scientific evidences	Everywhere visited
	Farmers ignore about actual quantity of irrigating water	Everywhere visited
On the farmers awareness and understanding	Farmers ignore about crop water requirement	Everywhere visited
	Farmers ignore about real availability of their water sources	Everywhere visited
	Farmers lack the sense of saving water	Everywhere visited
On the farmers awareness and understanding	Modern irrigation is adopted for the purpose of reducing laborload and increasing products	Everywhere visited
	Existing well is used by individuals only	Everywhere visited

On the unsolved technical issues	Attributes of fruit tree crops drastically change after applying modern irrigation method	Zabadani (Rural D.)
	Feasibility of applying modern irrigation is vague.	Everywhere visited
On the issues of extension and training	Farmers are unfamiliar with extension services	Everywhere visited
	Farmers are ignore about extension system	Everywhere visited

After giving inspection for current irrigation practice during the 1st Field Work, project team continuously tried to find out problems and inadequacies in irrigation when visited irrigated fields. Identified problems were considered to devise its solution, and those were reflected into technical manual preparation, demonstration activities, training works, and extension activities of the Project.

4.1.2 Review of Research Activities on Irrigation Techniques

Research activities previously done by the GCSAR was reviewed as follows:

(1) Past irrigation research activities during 1990 – 2005

Since ANRR was established in 2002, the administration consists of these distinct research divisions, i.e. irrigation and soil. Irrigation is a major issue of research in ANRR.

Following table summarizes research subjects which were conducted in fifteen years during 1990 – 2005 at eleven irrigation research stations of the country. The table reveals that comparison of irrigation methods and crop water requirement are the dominant research subjects, consisting 49.8% and 40.1% of the total, respectively. Other important subjects, such as salinity research was only conducted in Deir Zor and Hassake. Use of non-conventional water (treated / drainage water) was studied in R. Damascus and Deir Zor.

Table 4.1.2 Researched Subjects in Irrigation done by DIWU/ANRR

Stage	Year	Research Subjects					
		Irrigation Methods	Water Requirement	Salinity	Treated/ Drainage Water	Irrigation accessories	Trial field
Early	1990-95	30	37	0	1	0	0
Middle	1996-00	144	202	9	9	0	4
Recent	2001-05	242	96	26	18	5	12
Total		416	335	35	28	5	16
%		49.8%	40.1%	4.2%	3.4%	0.6%	1.9%

Source: Annual Work Plan Reports of DIWU/ANRR published in different years.

As far as the target crops of these irrigation researches concerns during the same period, following table shows that field crops such as wheat and cotton have been the most dominant followed by fruit trees, consisting 44.9% and 41.1 % of the total, respectively. Irrigation researches for vegetables were very less, composing only 5.9%.

Table 4.1.3 Major Target Crops of Irrigation Researches

Year	Field Crops	Vegetables	Fruit trees	Others
1990-95	48	2	22	0
1996-00	173	15	164	21
2001-05	169	34	171	50
Total	390	51	357	71
%	44.9%	5.9%	41.1%	8.2%

Source: Annual Work Plan Reports of DIWU/ANRR published in different years.

Among the field crops, wheat has most frequently been used as research crop, followed by cotton, maize and sugar beet. And, grape and olive have been principal fruit trees used in the irrigation researches. (see following tables).

Table 4.1.4 Details of Target Crops of Irrigation Researches (Field crops and Vegetables)

Year	Field Crops					Vegetables				
	Wheat	Maize	Cotton	Sugar beet	Tomato	Potato	Eggplant	Pepper	Squash	Okra
1990-95	34	6	3	0	0	0	1	0		0
1996-00	83	18	59	5	0	5	9	1		0
2001-05	70	32	44	18	2	12	14	6		4
Total	187	56	106	23	2	17	20	7	3	4
%	24.8%	7.4%	14.1%	3.1%	0.3%	2.3%	2.7%	0.9%	0.4%	0.5%

Table 4.1.5 Details of Target Crops of Irrigation Researches (Fruit trees)

Year	Fruit Trees									
	Olive	Apple	Apricot	Grape	Cherry	Peach	Pear	Pistachio	Citrus	Date Palm
1990-95	2	3	2	5	0	5	0	2	0	0
1996-00	38	4	17	51	5	14	3	9	5	0
2001-05	38	10	7	51	4	10	19	7	6	4
Total	78	17	26	107	9	29	22	18	9	4
%	10.4%	2.3%	3.5%	14.2%	1.2%	3.9%	2.9%	2.4%	1.2%	0.5%

Source: Annual Work Plan Reports of DIWU/ANRR published in different years.

(2) On-going irrigation research activities

Currently on-going irrigation researches at ANRR were studied based on "ANRR's Annual Research Plan 2004 - 2005", and the result is summarized in the following table showing that the research on different irrigation methods and crop water requirement are still main subjects, consisting 45.5% and 33.8% of the total, respectively. Salinity research is only conducted in Deir Zor and Hassake stations, and Nashabie carries out use of non-conventional water for irrigation. One of the new research subjects is testing the spread of horizontal and vertical humidity in the agricultural soil by using different water discharge of the drippers, which is conducting in Homs, Aleppo, Hassake, Tartous and Lattakia. Establishment of trial fields in farmer's land is also pointed out as an attempt which is worth to be noted.

Table 4.1.6 Research Subjects in Irrigation Research Stations for the Year 2005

Governorate	Station	Water Requirement	Irrigation Method	Salinity	Waste / Drainage Water	Irrigation accessories	Trial Field	Target Crop		
								Field Crop	Vegetable	Fruit tree
RDamascus	Nashabie	4	4		2			1	0	5
Quneitra	K. Arnabah	2	4					1	1	5
Daraa	Jillien	4	2					1	1	2
Homs	Mukhtarieh	5	5			1		2	3	4
Hama	Tizin		6					2	1	2
Idleb	Kitian		2					0	1	1
Aleppo	Serbaya	4	2			1		3	0	5
Deir Zor	Marieh	4	2	4			2	3	1	2
Hassake	Maqqasem	1	5	1		1	2	7	0	3
Tartous	Sahl Akkar	1	2			1		1	1	4
Lattakia	Sit Kheiras	1	1			1		0	1	2
Total		26	35	5	2	5	4	21	10	35
Ratio (%)		33.8%	45.5%	6.5%	2.6%	6.5%	5.2%	31.8%	15.2%	53.0%

Source: Annual Research Plan 2004-2005, ANRR.

Concerning target crops of the research, the table also reveals that fruit trees are dominant (53.0%), followed by field crops (31.8%). Among the fruit trees, grape and olive are the major crops, while wheat and cotton are prominent as field crops. Although vegetables are not very often used, potato, eggplant, okra, and tomato are examined.

Table 4.1.7 Target Crops of the Irrigation Research Stations (Field Crop & Vegetables)

Governorate	Station	Field Crops				Vegetables				
		Wheat	Maize	Cotton	Sugar beet	Tomato	Potato	Eggplant	Pepper	Okra
RDamascus	Nashabie									
Quneitra	K. Arnabah	1						1		
Daraa	Jillien		1			1				
Homs	Mukhtarieh	1				1		1	1	
Hama	Tizin	2		1		1		2		
Idleb	Kitian							1		
Aleppo	Serbaya	2	1	1						
Deir Zor	Marieh	3	2	2	3					2
Hassake	Maqqasem	2	1	4						
Tartous	Sahl Akkar		1						1	
Lattakia	Sit Kheiras								1	
Total		11	6	8	5	1	4	4	1	2
Ratio (%)		14.5%	7.9%	10.5%	6.6%	1.3%	5.3%	5.3%	1.3%	2.6%

Source: Annual Research Plan 2004-2005, ANRR.

Table 4.1.8 Target Crops of Irrigation Research Stations (Fruit trees)

Governorate	Station	Fruit Trees									
		Olive	Apple	Apricot	Grape	Cherry	Peach	Pear	Pistachio	Citrus	Date Palm
RDamascus	Nashabie	1	1	1	2		1	1			
Quneitra	K. Arnabah	1	1		1	1		1			
Daraa	Jillien	1			1						

Homs	Mukhtarieh	2			2			1			
Hama	Tizin	1					1				
Idleb	Kitian				1						
Aleppo	Serbaya	1			1				1		1
Deir Zor	Marieh				1						1
Hassake	Maqqasem	1			1			1			
Tartous	Sahl Akkar										1
Lattakia	Sit Kheiras										1
Total		8	2	1	10	1	2	4	1	2	2
Ratio		10.5%	2.6%	1.3%	13.2%	1.3%	2.6%	5.3%	1.3%	2.6%	2.6%

Source: Annual Research Plan 2004-2005, ANRR.

4.2 Baseline Survey Study

4.2.1 Introduction

Baseline survey was carried out during the period from May 2005 to September 2005. The baseline survey was implemented on the project areas for the purpose of; (1) benchmarking of indicators for project evaluation, (2) analyzing the present condition from socioeconomic and agricultural economic aspects as well as others, and (3) drafting a model water/crop quota system for water saving. Applying local contractor in the part of collecting data/information, execution of interview survey, and data processing of the interview survey, the project team managed whole procedure of the survey, analyzed interview results, and brought the Baseline Survey to a conclusion. The Project Team was prepared Baseline Survey Report compiling every results and conclusion, and submitted the report on October 2005.

4.2.2 Procedure of Baseline Survey

Execution of the baseline survey aims to provide instruction and guidance for improving of current water-wasteful irrigation, besides giving necessary information for the selection of demonstration farm sites. Moreover, benchmarks are important in terms of assessing the progress and effects of the Project implementation. Some benchmarks are also to be identified within the baseline survey.

As the first step of the baseline survey, reconnaissance in the Project Area and collecting activities of general information/data concerning the Project Area were taken in order to clarify the actual condition. For the following second step, village inventories of each directorate of the Project Area were prepared to contrast characteristics of villages concerned easily. LANDSAT satellite images during different seasons were also utilized for clarifying actual situation of irrigated agriculture. On the basis of the information, following three

referential villages were selected in each directorate of the Project Area from a perspective of representativeness of the area:

Table 4.2.1 Referential Villages Selected in Baseline Survey

Governorate	Name of Selected Referential Villages		
Hama	Kafir Zeita	Latamneh	Zalaqiat
Rural Damascus	Hinah	Maghr Al Meer	Zabadani
Daraa	Tafas	Daiei	Ebtaa

As the next step, Farmers' List concerning to the referential villages in which individual farmers are outlined quantitatively was prepared taking several procedures. Candidates of interviewees were selected on the basis of the Farmers' List so that the interviewees were average farmers in scale and could provide useful information meeting to the project purpose.

By the middle of September, 2005, the interview survey was completed at every referential villages, having total number of the surveyed samples 92: 90 of selected interviewees plus 2 of pre-tested samples.

4.2.3 Results of the Interview Survey

(1) Farm Structure and Socio-economics

- The number of family members is 13.2 in average. Ninety-three percentages of farmers live in village and have agricultural experiences for more than 20 years. Especially Daraa is newly cultivated and irrigated areas, and may be related to the own tribal tradition.
- In Rural Damascus, all sample farmers belong to small (0 - 19 donum) and middle (20 - 99 donum) scale, while all sample farmers belong to middle and large (100 - 299 donum) scale in Hama. The situation in Daraa is the middle of Rural Damascus and Hama.
- Owned irrigated land area per family is rather small in Rural Damascus, middle in Daraa and large in Hama.
- Irrigated areas including both traditional and modern irrigation are significantly correlated with farm scale. Small farmers depend on rainfed and large-scale farmers inversely depend on irrigation including modern irrigation.
- Some of the land is rented on the contract basis in all surveyed villages in Daraa, and two in Rural Damascus.
- Most of the farmers consider their income as "Sufficient for minimum needs" or "Sufficient for decent life". The rate of "Not sufficient" scored relatively high in Rural

Damascus.

- Off-farm income shares considerable part of the whole income.
- Most of the farmers consider on-farm income as their bases for supporting the household economy.

(2) Agriculture

1) Problems in Farming

- Most of sample farmers claimed the problems of "High prices of agricultural inputs (99 %)", "Low prices of selling products (98 %)" and "High prices of irrigation equipment (96 %)" followed by "Lack of market information (80 %)" in the interview. These 4 problems directly relate to farmers' income in their irrigated farming.
- "Lack of technical information" is the 5th problem (54 %) in all respondents. The technical supporting services are to be strengthened by public and private sector.
- About 40 % of respondents answered "Shortage of irrigation water" was their problem as a whole. The rate widely ranges from 63 % in Hama to 13 % in Daraa.
- About 42 % of respondents answered "Low quality of irrigation equipment" was their problem. The rate is as high as 83 % in Hama, and 6 % in Daraa.

2) Cropping Pattern

- The average size of the cropped area of all 92 respondents is 105 donum.
- The average cropped area is 37 donum in Rural Damascus, 154 donum in Daraa and 120 donum in Hama.
- The major crops in Rural Damascus are apple, potato, olive, and peas, in area percentage.
- The major crops in Daraa are wheat, grape, olive, and tomato, in area percentage.
- The major crops in Hama are wheat, cotton, potato, and sugar beet, in area percentage.

3) Irrigation Type

- The cropped area of all 92 respondents is categorized into 3 irrigation types, i.e., rainfed at 19 %, traditional irrigation at 36 %, and modern irrigation at 45 %.
- For 30 respondents in Rural Damascus, the cropped area under rainfed, traditional irrigation, and modern irrigation is 1 %, 35 % and 63 %, respectively.
- For 32 respondents in Daraa, the cropped area under rainfed, traditional irrigation, and modern irrigation is 36 %, 21 % and 43 %, respectively.
- For 30 respondents in Hama, the cropped area under rainfed, traditional irrigation, and

modern irrigation is 2 %, 57 % and 41 %, respectively.

(3) Farmers Organization and Institutions

- The rate of farmer's union membership is high in Rural Damascus and low in Hama. Middle-scale farmers tend to participate in the farmer's union actively.
- Small-scale farmers have tendency to feel the importance of group activities. Rural Damascus shows relatively higher rate, and the rate is low in Hama.
- Experience of group activities relating to farming shows the highest rate in small-scale farmers. Rural Damascus shows the highest rate among the three governorates.
- Experience of group activities relating to processing and distributing agricultural products shows rather high rate in Rural Damascus and in Daraa, and low in Hama.

(4) Marketing

1) Producer Price

- The strategy crops of Syria, i.e., wheat, cotton and sugar beet are sold at the fixed prices.
- The average producer prices of fruits are higher than vegetables in general, even though these indicated prices are at relatively high in wide range of seasonal fluctuation.

2) Marketing Destination

- The major strategy crops of Syria, including wheat, cotton and sugar beet are sold to the government agencies.
- Most of field crops are sold to market, but some portion of potatoes is purchased by the government agency, GOSM, as seed potato for next season.
- All of vegetables, including eggplant, tomato, melon and watermelon, are sold to market through traders or directly to consumers.
- As for fruits, the shipping to market through traders is dominant. Some producers, especially in Daraa, have contract with the Dammans. A part of apple and cherry is exported to foreign countries. About two-third of olive is sent to pressing factories for oil extraction.

(5) Farm Economy

1) Gross Income, Production Cost and Net Income of Major Crop Production

- Net income per donum of fruits are generally higher than other crops; such as about SP 25,000 for grape and pear, SP 18,000 for apple, SP 15,000 for cherry, and SP 8,000 for

olive and peach.

- Net income per donum for field crops are relatively stable but low; such as about SP 10,000 for peas, SP 7,000 for potato, SP 6,000 for sugar beet, SP 4,000 for cotton and SP 3,000 for wheat.
- Net income per donum for vegetables are at middle range between fruits and field crops; such as about SP 16,000 for tomato, SP 9,000 for eggplant, SP 7,000 for watermelon and SP 5,000 for melon.
- From the data of the net income, the modern irrigation is seemed to be more profitable than the traditional irrigation in some cases, such as grape, apple, wheat, and potato.
- In case of olive and sugar beet, however, the net profit of the modern irrigation is lower than the traditional irrigation.

2) Detailed Production Cost of Major Crop

- The financial production cost of the field tomato using drip irrigation system mainly in Daraa is nearly SP 20,000 per donum in average of 7 respondents.
- The production costs of cotton and sugar beet under traditional irrigation are relatively low, at SP 6,000 and SP 8,000 per donum, respectively.
- The financial production cost of the potato using sprinkler irrigation system mainly in Hama is about SP 14,000 per donum in average of 21 respondents.
- The average production cost of grape, which grows mainly under drip irrigation system, is about SP 15,000 per donum.
- The production cost of apple is SP 13,000 per donum in average of 20 respondents.
- For apple, the financial production cost can be contrasted by irrigation type. The total production cost under modern irrigation is at SP 17,000 per donum, which is much higher than the average of SP 7,000 under traditional irrigation.

(6) Irrigation

- Tube well is a predominant water source for irrigation as indicated 61% in Rural Damascus, 88% in Darra and nearly 100% in Hama respectively.
- As to form of usage of water source, more than 80% of the water users practice in "individual use". The more the source of well become dominant, the more the type of common use becomes lesser.
- Rural Damascus and Daraa presently familiarize with the method of drip irrigation, especially indicating at high rate of 72% in the case of Daraa. About 80% of the

interviewed farmers apply sprinkler for irrigation exclusively or inclusively under applying modern surface watering method. The figures under the baseline survey are more outstanding rather than the same based on the global statistics due to the deliberated selection of interviewees.

- Farmers who identify the timing of irrigation starting taking moisture condition of soil or crops into consideration, are 23% in Rural Damascus, 10% in Daraa and 16% in Hama respectively. As to timing of irrigation stopping, ratio of farmers observing moisture condition of soil or crops adequately, are 17% in Rural Damascus, 3% in Daraa and none in Hama respectively. These facts show low skillfulness of irrigated farmers in the Project Area.
- Farmers in Rural Damascus feel threat to future irrigation at high rate of 73%, and reducing the ratio in Daraa showing at 53%. However, the results do not directly reflect the real physical condition of water because of differences of farmers in sensitivity of water threat.
- Measures of finding new water source, decreasing cultivating area and changing cropping pattern are overall attitudes of farmers against water shortage. No farmers mention about saving water at all.
- Dealers of irrigation equipment play a role of not only suppliers but also like a private consultant for farmers in modern irrigation practice as the significant percentage.
- As for frequencies of days of irrigation interval, multiplies of 5 days are conspicuous as the irrigation interval in Daraa, and convenient set of days from 7 to 12 are selected as farmers like in Hama. The case of farmers in Rural Damascus is likely to be intermixed with both senses. Local circumstances and farmers' convenience which lead to those facts should be taken into consideration for the decision of subjects for extension.
- Sense of saving water in irrigation is really weak in Syria. In order to evoke the sense of saving water, quasi-experiences of difficulties of severe water shortage e.g. inspecting deteriorated farmlands and communicating with concerned farmers might be effective.
- New irrigation improvement approach in cooperation with private sector is expectative so that private sector will be involved to contribute for the attaining the national target.
- Some problems on introduction of modern irrigation were unveiled in the Project Area. The problems are classified into seven categories, namely 1) On the use and management of water sources, 2) On the selection and installation of irrigation equipment, 3) On the usage and maintenance of irrigation equipment, 4) On the water management, 5) On the farmers awareness and understanding, 6) On the unsolved technical issues, and 7) On the issues of extension and training.

(7) Training and Extension

- **Field day:** Although the field day activities organized by the Extension Directorate were not sufficiently performed at the village level, the interview survey revealed that more than 70 % of sample farmers participated. Field trip activities given by the Extension Unit as village-wise technology transfer are sometimes confused with the more popularized field day activities.
- **Seminar:** Although the seminar activities organized by the Extension Directorate were 5 times more number than the field day activities, the participation rate of sample farmers were as low as 45 %. Both field day and seminar activities are carried out for engineers and farmers at the same time. This might reduce the participation of farmers because farmers are not interested in theory but in practice.
- **Mobile theater:** It is understandable that the lowest participation rate was observed for mobile theater due to limited number of plays. Although more than 60 % of the participated farmers regarded the mobile theater as useful, only 40 % of them changed their farming practices accordingly. It means that the mobile theater can be more effective if there are more useful messages in the plays.
- **TV/radio program:** Although only 25 % of the sample farmers watched TV program, more than 60 % of them regarded the program as useful and also more than 70 % of them changed their farming practices accordingly. More advertisement might be needed because the useful TV programs are presently available on agricultural extension. The farmers are requesting the information on the state policy and support to the introduction of modern irrigation in TV program. As Hama farmers are frequently watching the program of "Our Green land" arranged by the Peasant Union, Extension Directorate should cooperate with Peasant Union for program preparation.
- **Extension messages:** Since the majority of sample farmers have not ever seen any extension messages, this activity should largely be improved.

(8) Support on Introduction of Modern Irrigation

- **System designing:** ANRR has been offering irrigation system design at free of charge to the farmers who want to apply agricultural loan to purchase irrigation equipment since 2000. However, many farmers purchase the equipment by themselves, not by loan so far. In addition, agricultural material shops also offer system design upon request from farmers. In most cases, the shops offer free system design to the farmers who purchase irrigation equipment from them.

- **Equipment selection:** As far as the selection of irrigation equipment concerns, many farmers select the equipment carelessly without having idea of quality. Most of farmers buy the equipment whatever available at the shops, and in general, cheaper equipment is better for them regardless the quality and the durability of equipment.
- **System Installation:** Some agricultural shops conduct irrigation system installation upon request from farmers with charging, but in most cases farmers install the system by themselves without receiving any assistance from ANRR or agricultural shops. According to the field observation, most of the farmers do not know how to install their system properly. Therefore, more appropriate guidance on the system installation is needed, and conducting training on the relevant subject is essential.
- **System Maintenance:** Generally, neither ANRR nor agricultural shops do not offer irrigation system maintenance. Farmers maintain their irrigation system by themselves. According to the field observation, similar to the system installation, most of the farmers do not know how to maintain their system properly. Therefore, supplying more appropriate guidance and conducting training on the relevant subject is essential.

4.2.4 Notable Outcomes of the Baseline Survey

(1) Effects to socio-economical aspects by extension of modern irrigation

1) Classification of Farmer's Scale

Farmers are classified into 4 types according to the size of irrigated area. It is useful to classify farmers by scales not only to clarify the characteristics of the regions, but to know the targets well and establish the strategies to disseminate efficient irrigation techniques. It will also be the basic information and indicator to judge introduction rates of irrigation and efficiencies of modern irrigation.

2) *Damman* and Renting System

Damman is a system for farmers making contract with agricultural businessmen or other farmers to sell farm products before harvesting and transporting and the person engaged is also called *Damman*. Daraa is one of the special and active regions in Syria where both *Damman* and renting system are both popular. As land use is uncertain and complicated in Daraa, areas of agricultural production may shift year by year. These situations will also be measured in extension of modern irrigation.

3) Way to Organize Groups for Water Management

The ideas of organizing groups for efficient water management like Water Users Association (WUA) have been proposed by the Government. However, there seems to be a little incentive for farmers of the area to combine their wells and might face strong resistances from the farmers. Basic studies about this matter are insufficient at the moment and required.

There are various other ideas in organizing group of farmers relating to rotational water use, e.g. 1) a small-scale rotational (*Addaan*) system in Daraa, 2) renting system of sprinkler irrigation kits in Hama, and 3) encouraging the activities of existing farmer's union. These ideas may have plenty of potentialities and give a hint of formulating cooperative units for efficient water management.

(2) Modernization of Irrigation

In order to realize water saving efficient irrigation in Syria, the Government intends to take two principal lines of "providing adequate equipment" and "providing adequate techniques". The new national project deals with the former, and DEITEX Project assumes the responsibility of the later. It is convinced that the DEITEX Project is completely incorporated into the Government strategy of irrigation modernization.

In order to attain the government objective, well-harmonized coordination among organizations concerning to irrigated agriculture is essential.

(3) Agro-Economy

1) Impacts of Modern Irrigation on Domestic Market of Agricultural Commodities

The introduction of the modern irrigation methods could improve land productivity of traditional irrigation or rainfed farmland. Furthermore, the saved water by the modern irrigation can expand the irrigated area, causing increase crop production.

From the information on trends of production, imports and exports, the market outlook made by JICA in 2001, and the monthly price trend of the major crops, some recommendations are derived.

- The field tomato production is matured in domestic market. The field tomato production should be careful to maintain its reasonable price.
- The domestic market of potato is firm. The price of potato is relatively stable. The expansion of the potato production is promising in middle term.
- The domestic market of most fruits including apple and grape are saturated already. The fruits production should be carefully promoted, taking domestic and international market

into account.

2) Impacts of Modern Irrigation on International Market of Agricultural Commodities

Needs of some crops for foreign exports are expected to rise further as the modernization of irrigation is promoted in the future. There are three categories of the crops how to promote exporting of 1) crops presently holding a significant competitive advantage like anis, apricots, beans, garlic and lentils etc., 2) crops having possibility to increase export by improving such as grapes, peaches and tomatoes etc., 3) crops having less advantages for exporting such as cucumbers, olives and oranges etc. For the crops categorized into 1) foreign trade should be promoted positively. For the crops categorized into 2), structures and manners for producing and trading must be improved comprehensively so as to raise competitiveness in foreign trade.

3) Impacts of Modern Irrigation on Farm Economy

The modern irrigation methods could be more profitable for farmers than traditional irrigation due to increasing land productivity and lowering production cost, according to the former studies. The MAAR research papers and the FAO study report conclude the modern irrigation method not only contributes conservation of water resources, but also gives positive economic impacts to farmers.

The result in this baseline survey could barely prove the economic advantageous of modern irrigation rather than traditional irrigation. However, it is concluded that the current inadequate management of the modern irrigation causes the uncertain advantages in economy. In the other way, the baseline survey results show that ample room for improvement still remains in the present practice of modern irrigation.

In this questionnaire survey, the pre-project situation of farm economy was obtained as a benchmark. The valuable information acquired in the survey includes farming area, cropping pattern, irrigation type, land productivity, and crop budget. The baseline data is useful for comparison before and after the project. The data can be primarily used for the indicators of monitoring the impacts of the project. The data on farm economy shall be collected continually in the course of the project implementation, as a follow-up survey to the specific farmers on economic impacts of the modern irrigation.

4) Impacts of Modern Irrigation on Market of Agricultural Inputs and Instruments

It is expected that a new introduction of 121,410 ha will be advanced every year according

to the Syrian Government' execution plan of the new project that aims at the irrigation modernization of 1,439,500 ha by the year of 2015. Expected amount of handling modern irrigation equipment in the near future is about four times of the present handling amount, and shall push rapid growth of the industry concerning to modern irrigation. In addition to maintaining and expanding the irrigation equipment market, a need for the good quality is also emerged.

(4) Training and Extension

1) Irrigation Research

Review of the past irrigation studies revealed that lots of efforts have been dedicated to researches on comparison of irrigation methods and determination of crop water requirement. As far as the target crops of the irrigation researches concerns, field crops such as wheat and cotton have been the most dominant followed by fruit trees such as grape and olive. Irrigation researches for vegetables were very less.

It is essential to convey farmer's problems and needs to researchers, so that research can support farmer's activities by solving these problems and by meeting their requirements. According to the result of the interview/questionnaire survey, some farmers complain that they have little information/ knowledge on proper amount of irrigation water and optimum irrigation schedule. Others demand to clarify the profitability of modern irrigation. Plenty of experiments on the relevant subjects have been conducted so far, more applicable and specific researches are now needed in order to meet the requirements of farmers.

2) Training Activities

ANRR also has some training and extension activities which consist of training course, seminar and field day for engineers, technicians and farmers. Furthermore, the Directorate of Training and Qualification has been managing various kinds of training activities for the same target people. Collaboration work with the relevant organizations and enhancement of existing training activities will be inevitable in order to implement effective and practical training activities related to efficient water use in agriculture.

Subjects of training activity should be based on the needs and capacity of the target people of training, so that training activity can support the trainees by solving these problems and by meeting their requirements. According to the results of the questionnaire survey, needs and difficulties of farmers regarding modern irrigation are; a) proper amount of irrigation water, b) optimum irrigation schedule, c) proper irrigation design, d) installation and maintenance

methods of irrigation system, e) financial difficulty, f) profitability of modern irrigation, g) poor quality of irrigation equipment, and so on.

3) Agricultural Extension and Farmers Support

Field Day activity on water saving agriculture should be specially designed for farmers separately from engineers. From this viewpoint, the field trip activities carried out by the extension unit should be encouraged. Extension agents should carry out the field trip activities not only to disseminate the technologies but also to investigate the farmers' needs. The contents of Field Day should be more practical in order for farmers to apply the knowledge and the technologies directly in their fields.

Since the seminar activities are not very effective for farmers, the seminar should be designed mainly for the irrigation engineers and the extension agents. The seminar should be carried out as training activities for the capacity building and therefore the training contents should include not only irrigation technologies but also communication skills, preparation methods of effective extension messages, and field survey methods for proper needs assessment.

Various opinions of participated farmers should be reflected into the dramas to be played, and the story of the drama can be improved by adding many other alternative characters such as the staff of agricultural bank, the staff of agricultural shop and the local progressive farmers. A new trial should be made to create a drama on water saving played by villagers under the supervision of Extension Directorate.

In order for more farmers to watch TV programs, more advertisement might be needed that the useful programs are available on agricultural extension. Since farmers are requesting the information on the state policy and support to the introduction of modern irrigation in TV program, such arrangement should be made. Extension Directorate should have more cooperation with Peasant Union for the preparation of TV programs.

Extension messages to be distributed to farmers should be designed according to the results of needs assessment, and the contents should be simple enough for farmers to understand easily. In general, the contents of extension messages such as leaflet, text and guidelines should always be designed considering who will read them and for what purposes.

The suppliers of the irrigation equipment should be more involved in the support activities including system designing, equipment selection, installation, and operation and maintenance of the irrigation network through the collaboration with the chamber of agriculture. More practical training for farmers should be carried out under the coordination among ANRR,

extension sector and the suppliers.

(5) Quantification of Baseline Indicator

Verifiable indicators on the Project Design Matrix (PDM) of the Project were practically benchmarked in consideration with the obtained results of the baseline survey. Identified values of project indicators are shown within the main text of this report, while a few indicators remain to be benchmarked after establishment of demonstration farms.

4.3 Demonstration Activities

4.3.1 Demonstration Sites and Installed Irrigation System

(1) Site Study and Selection

The Project was basically designed to develop an efficient irrigation technique by way of improving wasteful manner of irrigation devising and verifying at the actually practical site of a demonstration farm. In order to put this idea into action, one demonstration farm was established in each concerned governorate of Hama, Rural Damascus, and Daraa during the 2nd Field Work.

The Project intended to select demonstration farms from the interviewed farmers in the baseline survey conducted during the 1st Field Work, because the interviewed farmers were already qualified through the selection of interviewees, and conditions about their lives and agriculture were made clear. In this intension, pre-selection procedures for the demonstration sites were taken as followings during the 2nd Field Work and the 1st Domestic Work in Japan prior to starting the 2nd Field Work:

- 1) One priority village was tentatively chosen among 3 referential villages in each concerned governorate.
- 2) A few numbers of priority farmers was selected among 10 interviewed farmers in the chosen priority villages.
- 3) All selected priority farmers, which are as the focused-candidates of Demonstration Farms were visited and inspected the conditions of their agriculture and shape of their farmlands.
- 4) First assessment of the focused-candidates of farmers was done based on criteria for the selection.

At the beginning point of the 2nd Field Work, the pre-selected farmers and their farmlands as the focused-candidates of Demonstration Farms were preparatory assessed in viewpoint of following 8 criteria for the selection.

- (1) Cultivating representative crops in the region
- (2) Being motivated to irrigated agriculture
- (3) Having capacity to adopt water-saving irrigation
- (4) Being a leader and cooperative among neighbors
- (5) Having active exchanges with extensionists
- (6) Locating at the suitable site for demonstration
- (7) Being under proper land form easy for installation of equipment
- (8) And, having registered or now registering water source.

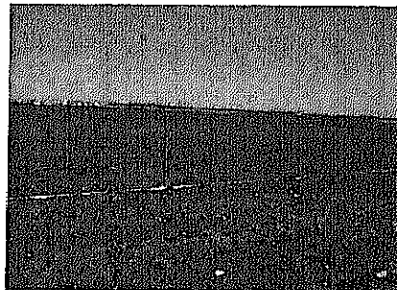
Based on the results of pre-selection through above-mentioned procedures, Project Team again visited each focused-candidate of Demonstration Farms in order to compare their respective superiorities for the purpose of demonstration. Furthermore, avoiding overlooking other proper Demonstration Sites, Project Team made careful efforts to catch information about other possible sites by means of inquiring to the local counterparts and farmers. Through taking these preparatory procedures, a single Demonstration Farm site was settled.

(2) Site of Demonstration farms

The selected demonstration sites in each governorate are overviewed as follows:

Kafr Zeita Demonstration Farm in Hama

Governorate:	Hama	Total Farmland Area (don.)	37
Name of Village:	Kafr Zeita	Irrigated Land (don.)	37
Name of Farmer:	Faris Al Abdan	Modern Irrigation Area (don.)	37
Code No.:	HK03	1 st Major Irrigated Crop	Wheat
		2 nd Major Irrigated Crop	Sugar Beet
		3 rd Major Irrigated Crop	Cotton



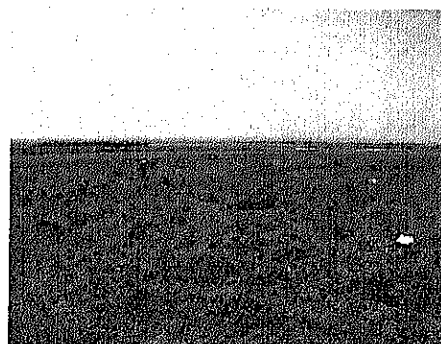
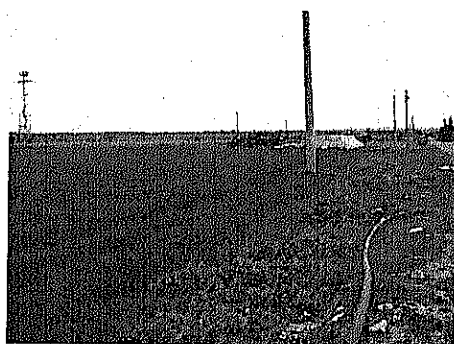
Kafr Hour Demonstration Farm in Rural Damascus

Governorate:	Rural Damascus	Total Farmland Area (don.)	34
Name of Village:	Kafr Hour	Irrigated Land (don.)	34
Name of Farmer:	Mr. Isam Yehia, Mr. Adal Fatmeh, Mr. Ahmad Fallah, Mr. Gazi Gazi and Mr. Ali Fallah	Modern Irrigation Area (don.)	0
Code No.:	1st Major Irrigated Crop		Apple
	2nd Major Irrigated Crop		Pear
	3rd Major Irrigated Crop		Olive



Tafas Demonstration Farm in Daraa

Governorate:	Daraa	Total Farmland Area (don.)	60
Name of Village:	Tafas	Irrigated Land (don.)	60
Name of Farmer:	Mr. Mhd Al Natour	Modern Irrigation Area (don.)	0
Code No.:	1st Major Irrigated Crop		Tomato
	2nd Major Irrigated Crop		Eggplant
	3rd Major Irrigated Crop		Green Pepper



(3) Concept of the Demonstration Activities by Demonstration farms

The concept of the Demonstration Farms was formulated aiming at practical solution of several problems on applying modern irrigation identified in the sites. The problems to be improved in Demonstration Farms were set up as summarized below:

Table 4.3.1 Problems to be Improved in Demonstration Farms

Site	Demonstration Items	Problems to be Improved	Target of Demonstration Activities
All sites	Proper water management by control unit.	Control unit is indispensable for controlling operation and maintain of modern irrigation network in efficient and intensive manner.	Control unit is composed of flow meter, pressure gauge, fertilizer injector, filter, The project provides well equipped control unit serving systematic water management at farm level, and presents effective operation manner by control unit.
	Rational irrigation practice on the basis of irrigation schedule.	Adequate water management has not established among the farmers who have set up modern irrigation network.	The demonstration farm presents rational irrigation practice on the basis of the irrigation schedule endorsed by scientific irrigation technique.
Hama	Improving wasteful manner by uniform water spraying of sprinklers.	Unreasonably longer sprinkler line causes the waste of irrigation water due to uneven water spraying.	Proper (shorter) arrangement of sprinkler line was set up in order to demonstrate recommendable uniform water spraying; keeping the difference of water discharge not over 10% → the difference of water pressure not over 20%.
	Advantage of drip irrigation for cotton field.	Sprinkler irrigation and surface irrigation are prevalent for cotton cultivation; while, drip irrigation has not developed in Hama.	Water saving effect of drip irrigation for cotton field is presented
	Advantage of underground burial pipeline.	Pipeline for modern irrigation network is commonly placed on the ground for convenience of movable use; however, it sometimes causes fatal damage of the pipes in transportation process or other accidents.	Improvement of material duration and water tight is presented by protecting the pipes in the way of underground burial.
Daraa	Application of venturi-type fertilizer injector.	Tank type fertilizer injector is commonly in use for modern irrigation network; meanwhile, venturi-type fertilizer injector has not developed despite its availability was verified by GCSAR irrigation research center.	The availability of venturi-type fertilizer injector is presented in the demonstration farm as well.
Rural Damascus	Proper selection and arrangement of drip emitters	There exist some cases that uniform water spraying is not kept due to wrong installation of using different types of drip emitters in same irrigation network.	Four or six drip emitters with same specification shall be set for each fruit tree on two lateral lines being laid along the tree alignment.
	Irrigation network corresponding to the fluctuation of well discharge.	Well discharge fluctuates time to time and year by year. Modern irrigation network shall be formulated to meet these situations.	The demonstration farm provides the divided small irrigation blocks ensuring irrigation practice by rotation even in critical case of minimum well discharge.
	Irrigation network in consideration of tree species.	Modern irrigation network shall be formulated taking tree species into consideration for fruit tree field where different species are being planted.	The irrigation blocks divided into small are presented so as to ensure irrigation practice by tree species.
	Application of micro sprinkler for fruit tree field.	Micro sprinkler has not developed despite its availability was verified by GCSAR irrigation research center.	The availability of micro sprinkler is presented in the demonstration farm as well.

(4) Design and Installation of Irrigation System

In line with the design concept of the Demonstration Farms described in the paragraph (3), the Demonstration Farms were established in Kafar Zeita of Hama, Tafas of Daraa and Kafr