

CHALLENGES OF CONVERTING TO EFFICIENT WATER SAVING IRRIGATION IN SYRIA

LES DÉFIS DE CONVERSION À L' IRRIGATION EN ÉCONOMIE D'EAU EFFICACE EN SYRIE

Shuichi Matsushima¹, Awadis Arslan², Bassam Al-Husein³

ABSTRACT

In Syria, irrigated agriculture is crucial in terms of food security, because of the uncertainty and fluctuation of rain-fed agricultural production. On the other hand, irrigated agriculture consumes water more than 90% of the total water use in Syria so that it hinders to provide water resource to other sectors such as industry and domestic water use. Based on the request from the Government of Syria in order to spread modern water saving irrigation, the JICA (Japan International Cooperation Agency) Project of Development of Efficient Irrigation Techniques and Extension Phase I in Syria (DEITEX I) was implemented from March 2005 to March 2008 during the three years. The Project was carried out under the basic strategy that farmers should select a water saving irrigation by themselves according to their ability and awareness enhanced by "extension activities" rather than to compel them by "control or enforcement". Succeeding to the DEITEX I, DEITEX II was started on December 2009 with the project period of three and half years. Through the implementation of the DEITEX I and II Project, every concerned division of irrigation research, training and extension works for an object to promote saving water in irrigation in right harmony.

On-going DEITEX II has achieved water saving in irrigation at the farmers' level reducing water consumption at about 20% in average. The challengeable approach of realizing water saving by extension activities are going to be verified its effectiveness. It is expected to apply the similar approach of water saving in irrigation for the other countries and regions hereafter.

1- Team Leader of JICA-DEITEX II Project; Advisor of Appropriate Agricultural International Co., Ltd., Japan; E-mail: matsushima@koushu.co.jp

2- Managing Director of DEITEX II Project; Director of ANRR, GCSAR, Ministry of Agriculture and Agrarian Reform in Syria; E-mail: abarslan@scs-net.org

3- Project Coordinator of DEITEX II Project; Engineer of ANRR, GCSAR, Ministry of Agriculture and Agrarian Reform in Syria; E-mail: bassamalhusein@yahoo.com

RÉSUMÉ ET CONCLUSIONS

En Syrie, l'agriculture irriguée est cruciale en termes de sécurité alimentaire en raison de l'incertitude et des fluctuations de la production liée à l'agriculture pluviale. Par ailleurs, l'agriculture irriguée consomme plus de 90% de la consommation totale d'eau du pays restreignant ainsi la part destinée à d'autres secteurs comme l'industrie et la consommation domestique. C'est pour cela, les 10e et 11e Plans quinquennaux de développement national (2006-2015) ont insisté successivement sur la nécessité et l'importance d'une irrigation en économie d'eau efficace.

Répondant à une requête du gouvernement de la Syrie cherchant à développer une irrigation moderne en économie d'eau, le Projet JICA (Japan International Cooperation Agency) de Développement et de Vulgarisation de Techniques d'Irrigation Efficaces Phase I en Syrie (DEITEX I) a été mis en œuvre à partir de mars 2005 à mars 2008 pour une durée de trois ans. Le projet a été réalisé en vertu de la stratégie de base que les agriculteurs devraient par eux-mêmes choisir une irrigation en économie d'eau selon leur capacité et à travers les activités de sensibilisation et de «vulgarisation» plutôt que sous la contrainte. DEITEX I a réussi à atteindre cet objectif avec une certaine réduction de l'eau d'irrigation dans les sites du projet.

A la fin de DEITEX I, le Gouvernement syrien a reconnu sa responsabilité d'étendre l'irrigation en économie d'eau efficace dans tout le pays et à améliorer plus son efficacité. A cet effet, il s'est déterminé à mettre en œuvre une nouvelle phase de DEITEX I au titre de l'assistance du Gouvernement japonais. Ainsi, le gouvernement de la Syrie a de nouveau sollicité la coopération technique Japonaise afin de réduire la quantité d'eau d'irrigation en étendant les résultats de DEITEX I à de nouvelles zones cibles en plus des zones initiales du projet. Grâce à des évaluations et des études relatives à la mise en œuvre du projet, le Projet JICA de Développement et de Vulgarisation de Techniques d'Irrigation Efficaces Phase II en Syrie (DEITEX II) a débuté en Décembre 2009 pour une période de trois ans et demi. DEITEX II se déroule comme suit:

- Le Projet couvre cinq gouvernorats de la Syrie, en ajoutant deux nouveaux gouvernorats du nord aux trois initialement ciblés.
- Le Projet suit le concept de base de réalisation d'économies d'eau en irrigation au moyen d'activités de vulgarisation destinées aux agriculteurs.
- Le Projet recherche l'économie d'eau à travers la modernisation et la conversion de l'irrigation traditionnelle vers une micro-irrigation moderne par le biais des moyens matériels et techniques nécessaires. L'irrigation de surface améliorée est également introduite dans les zones qui se prêtent à son adoption.
- Le projet propulse les activités de vulgarisation par le biais de vulgarisateurs en eau formés dans ce cadre. Un certain nombre de ces vulgarisateurs ont été engagés dans les activités d'extension de l'irrigation moderne en économie d'eau dans le cadre d'un appui adéquat apporté au projet.
- Le projet a également entrepris des activités de recherche sur l'irrigation moderne en économie d'eau afin de résoudre les problèmes d'irrigation immédiats des agriculteurs.
- Le projet tient compte de la nécessité et de l'importance de la coopération avec les organisations impliquées dans l'irrigation moderne en économie d'eau.

A travers les diverses directions du projet mentionnées ci-dessus, DEITEX II a réalisé des économies d'eau en irrigation au niveau agriculteurs en réduisant la consommation d'eau à environ 20%. L'approche basée sur les défis de réalisation des économies d'eau par les activités de vulgarisation devrait confirmer son efficacité. Il est prévu d'appliquer la même approche en économie d'eau dans d'autres pays et régions dans le futur.

1. INTRODUCTION

Country balance of water in Syria has deadly come down because of rapid increase of water demand. Precipitation falling into Syria is in short supply giving about 250 mm in average, and in addition, water resources concerning Syria are so scant that it nearly reaches to its ceiling. Available amount of water resources is estimated at 16.6 BCM (Billion Cubic Meter) consisting of 14.3 BCM in surface water and 2.3 BCM in groundwater. On the one hand, water demand is estimated at 14.9 BCM, of which about 90 % is consumed by agricultural sector. Even though giving appearance of slight margin of available water remaining in its figure, it is very critical situation in fact. As to water use in groundwater consuming 7.0 BCM annually, it falls into excess of demand. It is an outstanding imbalance between supply and demand of water which causes remarkable hindrances like rapid lowering of groundwater level.

There are two substantial directions to correct such imbalance of water. One is an endeavor to reinforce water supply, the other is to make water use effective in the field of water demand. Syria just has to put importance to the later, because of difficulty in developing water resources from now on. Moreover, target sector of water saving has to be the irrigated agriculture because irrigation in Syria is far ahead in consuming water so that it shares most of all water demand. While agricultural innovations like introduction of dry-tolerant technology of crops must be effective in saving water, those are not due approach with high priority because of low adoptability of farmers and less reliability as a practical method at the time being. All things considered, irrigation modernization which is synonymous with modern water saving irrigation is the first way of doing because current irrigation efficiency is very low.

In Syria, irrigation is essential particularly for summer cultivation in which no available rainfall can be expected. Current irrigation ratio in Syria is summarized in Table 1.

Table 1. Irrigation ratio by crop seasons in Syria
(Ratio de l'irrigation par saisons de la récolte en Syrie)

Item	Cultivated Area (thousand ha)	Irrigated Area (thousand ha)	Irrigation Ratio (%)
Summer Crops	382.7	349.4	91.3%
Winter Crops	3,139.3	868.6	27.7%
Tree Crops	977.8	173.5	17.7%
Total	4,499.8	1,391.5	30.9%

Source: The Annual Agricultural Statistical Abstract, MAAR in Syria

Irrigation efficiency in Syria is in the 40 % range because traditional surface irrigation is still a mainstream method. In spite of still low irrigation ratio of about 30 %, irrigation in Syria overloads with country water balance due to such low irrigation efficiency.

According to the series of study in irrigation before starting the DEITEX I and after starting the Project, following matters were concluded:

- Saving water in irrigation could be effectively achieved through disseminating irrigation modernization.
- Dissemination of efficient water saving irrigation to farmers must be carried through by extension approach as well as regulative and controlling arrangement.
- Method of saving irrigation water should come up with physical, sociological and agricultural characteristics peculiar in region.
- Farmers could be easily motivated to the water saving irrigation by a direct

gain/incentive rather than abstractive instructions. Besides disseminating knowledge and skills to handle water saving irrigation, farmers have to be encouraged to the mode of new irrigation by concrete incentives.

- Operation of extension works has to be dynamic. Elastic and interactive extension method should be adopted as the situation requires.
- Solid extension structure is required to manage the extension activities significantly.
- Clear and concrete policy of extension activities has to be established and maintained.

JICA-DEITEX Project has tried challenges of converting to efficient water saving irrigation in Syria on the basis of understandings mentioned above.

2. JICA-DEITEX PROJECT

The Syrian Government had issued a decree declaring to change all the traditional irrigation system to modern irrigation by the year of 2004. However, the decree's target had not achieved as designated. According to the analysis for the hamper to the Syrian Government's deal, some constraints in transferring irrigation research results to farmers, in technical assistance for designing, installing and maintenance of the modern system as well as dissemination of proper information on the system were unveiled. In addition, it was clarified that most of irrigation farmers were reluctant to introduce the modern irrigation due to some reasons such as high cost of the irrigation system. Though farmers loan service were established by the Government, 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.

2.1 DEITEX I Project

For the request of Syrian Government, "Project on Development of Efficient Irrigation Techniques and Extension in Syria (DEITEX I)" had been being implemented to attain the project purpose of disseminating modern efficient water saving irrigation since March 2005 with the project period of three years. The Project area were three governorates of Rural Damascus, Daraa and Hama where were the typical regions appearing inconvenience in water by over-consuming of irrigation water.

DEITEX I was implemented in several project components of training, extension, research on irrigation techniques. In March 2008, DEITEX I was successfully phased out achieving the project purpose so that "Proper amount of irrigation water has been used for each crop in the specified project sites, through providing adequate supports by strengthened training/extension activities. Capability for promoting water saving modern irrigation has been raised in the organizations /staffs concerning the project areas".

2.2 DEITEX II Project

On December 2007, the terminal evaluation study of DEITEX I was carried out. The evaluation study report assessed that the process accomplished by the efforts of the staff contributed to establishing a model of changing farmers' awareness of water saving in Syria, and pointed that the expansion of the activities to other districts in Rural Damascus, Daraa and Hama governorates, furthermore, to other governorates are to be accomplished. To address these issues, the Syrian Government requested Japan a technical cooperation project in order that proper amount of irrigation water is

used through expanding the outcome of DEITEX I Project to the remaining areas in Rural Damascus, Daraa, and Hama governorates and new target area (Aleppo and Raqqa), improving surface irrigation technique and cooperating with international research organizations. For the re-request of Syrian government, DEITEX II Project was started on December 2008 with the project period of three and half years. At present, DEITEX II has been implemented with favorable progress taking a challengeable approach of project activities as mentioned as follows.

3. APPROPRIATE METHOD OF SAVING IRRIGATION

Currently, modern irrigation such as micro-irrigation is not yet common in Syria. Though kind of crop applying affects farmers' choice of irrigation method, traditional surface irrigation with excessive waste of water is still prominent in general. Distribution of every irrigation method in Syria is summarized in Table 2.

Table 2. Distribution of irrigated areas by irrigation methods in Syria
(Distribution de régions irriguées par méthodes de l'irrigation en Syrie)

Irrigation method	Traditional irrigation	Group irrigation by nation irrigation system	Improved surface irrigation	Individual micro-irrigation
Share of every irrigation method	47.4 %	29.5 %	0.4 %	22.7 %
Irrigation efficiency	30% - 50%	About 50 %	40% - 60%	65% - 90%

Source: Observation by DEITEX II Project

Scope for irrigation modernization transferring from traditional surface to a modern irrigation method including improved surface, or from a provisional modern irrigation to more advanced modern irrigation is still vast in Syria. Taking its situation of water crisis into consideration, irrigation modernization should be urgently accelerated. But the most advanced micro-irrigation is not always suitable and acceptable in everywhere and every farmer. It must be dependable of kind of crop, type of irrigated agriculture and status of farmers.

Irrigation could take many shapes and forms according to the necessity of artificial supplying water to the crop and manageability/affordability of the irrigation actor who is farmer. Ordering thoughts simply, irrigation could be specified by two representative factors of "scarcity of water to the crop" and "financial and technical manageability of farmers". If it is no scarcity of water to the concerned crop, rain-fed agriculture without any irrigation could be applicable. If water scarcity occurs for crop in a slight level, firstly supplemental irrigation will be introduced. The more severe water scarcity rises, the more comprehensive irrigation should be required. Irrigation in such stage varies in shape from traditional to improved surface or micro-pressurized irrigation depending on the farmers' financial and/or technical manageability, sometimes by the profitability of applied crop.

In general, farmers are used to select their irrigation methods according to their circumstances in "water scarcity to crop" and their "financial and technical manageability in irrigation" as Figure 1 indicates. Its figure schematically shows, the severer water scarcity is, the more irrigation modernization is accelerated if the condition of farmers' manageability is similar (as showing B – B'). On the same way, the better farmers' manageability is, the more irrigation modernization is accelerated if the condition of water scarcity is similar (as showing A – A').

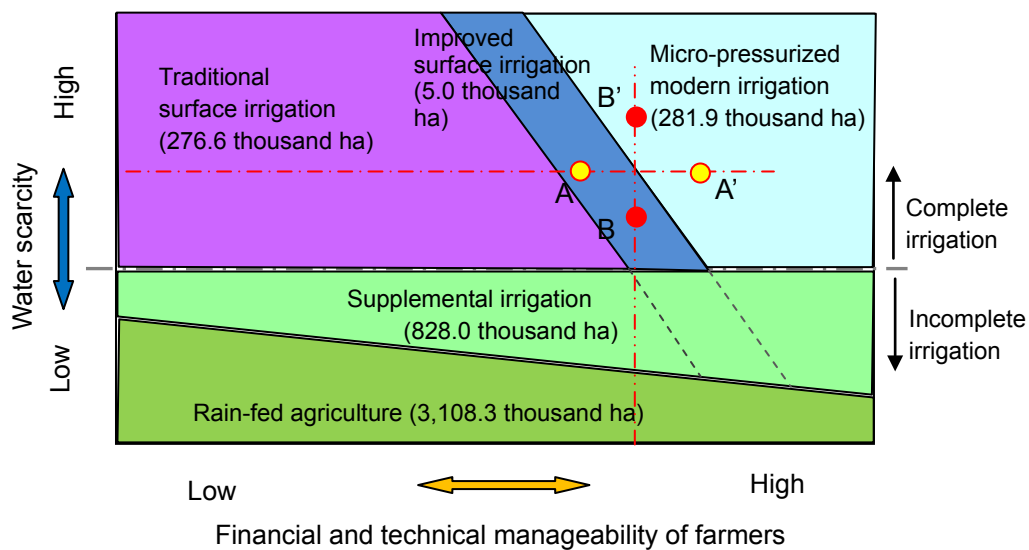


Figure 1. Irrigation categories interpreted by two representative factors in Syria
(Catégories de l'irrigation interprétées par deux facteurs représentatifs en Syrie)

Acreeage of each irrigation form shown in Figure 1 gives a vivid description of irrigation situation in Syria. Present water crisis presses for irrigation modernization transferring from loose irrigation to more sophisticated irrigation. For that purpose, the figure indicates to make the farmers manageability of irrigation be more sophisticated. Extension work is a right measure to improve farmers' manageability of irrigation. Farmers' manageability of irrigation would be improved by the applying a better irrigation practice, farmers' affordability could be up by the effect of it. Then farmer could have capability to apply more advanced irrigation. It is a virtue cycle.

Therefore, policy of extension in DEITEX Project is;

- 1) The Project will recommend appropriate irrigation method to meet the current circumstance of target farmers in the two factors of "water scarcity to crop" and "financial and technical manageability in irrigation", not recommending the ultimate modern irrigation method.
- 2) Extension should make a circumstance to move a virtue cycle.

4. STRATEGY OF EXTENSION

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, DEITEX Project ambitiously focused 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. As "extension activities" requires skilled extension workers, "training" must be an important component in the Project. Furthermore, the training/extension has to be backed by an appropriate "irrigation techniques and skills on saving water". Therefore, the DEITEX Project must be composed of three major components.

Matter-of-factly, farmers are generally reluctant to proceed to save water unless concrete incentives provided, neither do farmers hold affordability and manageability to the practice of water saving irrigation. Fortunately, modern irrigation could provide many advantages such as reducing cost and laborious burden of farmers, as well as certain effect of water saving. Modern irrigation methods utilizing "handy pressurized

irrigation equipment like drip or sprinkler” which is counted upon to give water saving affects more is 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. The DEITEX Project put such advantages in front with intension to proceed saving water simultaneously. 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 more and more.

5. IMPREMENTATION OF TRAINING/EXTENSION ACTIVITIES

Over the implementation of completed DEITEX I Project and current DEITEX II Project, extension activities have expanded in many shapes with developed extension contents by the water extensionists who are trained by the Project.

5.1 Training activities

According to the training structure proposed by the DEITEX Project, two kinds of extension actors have been established in the field of irrigation, namely water extensionist and SMS (Subject Matter Specialist) on irrigation. The water extensionist is supposed to be a front line worker who contacts with farmers closely and frequently. On the other hand, SMS on irrigation is expected to have higher and deeper knowledge, experience and skills on irrigation than the water extensionist, who shall guide and teach water extensionists.

Based on the role of the water extensionist, the four steps of training courses have been established so as to train competent water extensionist who has basic knowledge and skills on irrigation, and is able to identify farmer’s problems related to irrigation. As an extensionist, he has also to be capable to prepare extension materials and to organize extension activities for dissemination purpose. In addition, more specialized training on irrigation system has been organized to train the SMS, by delivering more details regarding design, installation and operation of modern irrigation system. The candidates of SMS were selected from the trained water extensionists, who accomplished successful results through the training courses. Since SMS is expected to work as trainer of water extensionists, TOT (Training of Trainers) course has been also provided to them in order to improve teaching skills.

Based on the necessary training subjects principally based on farmers’ needs on irrigation, training program was prepared, which consists of four steps. Consequently, the first training course is focused on conducting farmers’ survey to identify their needs and problems especially related to irrigation. The training subjects are followed by topics on design/installation/operation and maintenance of modern irrigation system, preparation of extension materials, and conducting field day for farmers as a dissemination activity.

As increasing numbers of trained water extensionist and SMS in every governorate, the water extensionist training course has been managed by the initiative of Syrian side. At the present, more than 200 water extensionists were trained through the Project. Since DEITEX II Project has been implemented, follow-up training to the existing water extensionists has been initiated.

5.2 Extension activities

As being in line with the strategy of the Project, what the Project disseminate to farmers by means of extension activities are pluralistic, like knowledge of modern

irrigation system and its operation in the sense of hardware and software, and knowledge/information relating to the mind-setting for water saving. Prior to and simultaneous with implementation of the other project components, "extension materials/extension contents" have been prepared by the respective extension purpose. Those materials were devised through need assessment and on the basis of the specification to the intended extension events.

Extension activities of the Project targets individual farmers and small groups of irrigation farmers. Interactive approach and un-interactive mass approach are applied for the extension activities to the farmers according to the disseminating subjects, receptiveness of participants and scale of the target. Every extension activity could perform by various extension methods like field day, seminar, workshop, delivering of poster/brochure, and broadcasting by TV/Radio. As introducing and orientating those methods and the way of its operation, "extension guideline" including instruction about extension methods and extension performing has been prepared.

Skills and knowledge on modern irrigation have been disseminated to farmers by means of the conventional extension methods. Besides implementation on an event basis as such, the Project carries out an uninterrupted extension work of demonstration activities for appropriate modern irrigation at the demonstration farms which were established in every concerned governorate. Those demonstration activities at the demonstration farms have been sometimes performed linking with the each extension activities or sometimes with training activities.

Extension activities have been also implemented by focusing on the incentive factors that can touch off the motivation towards irrigation modernization and water saving. Based on the past survey activities in the village level, such incentive factors can be summarized into five items, namely monetary benefit, mutual relation, religious belief, scientific rationality and problem solving. The degree of impact on each incentive factor by the farmers differs from governorate to governorate. Incentive on monetary benefit is rather strong in Daraa than other governorates. In Hama and Rural Damascus, other incentive factors which are helpful to solve their immediate problem, are held in great account.

The Project has performed series of "model extension activities" so that the water extensionists become accustomed to new extension activities effectively, and so as to acquire lessons to improve every extension materials and its operation. Through implementation of more than 200 times of model extension activities in every concerned area of extension units, useful knowledge and information for the extension activities have been accumulated. And it gives significant occasions to the services of the water extensionists.

6. CONCLUSION AND RECOMMENDATIONS

Currently DEITEX II Project has proceeded significantly. Through the implementation of the DEITEX I and II Project, every concerned division of irrigation research, training and extension works for an object to promote saving water in irrigation in right harmony. Trained water extensionists deploy in their own places of duty, and carry out various extension activities keeping joint efforts each other. And training has been implemented to increase number of water extensionist and to reinforce the existing water extensionists. As a result of the extension structure working properly, irrigation water has been saved at more than 20% within the range from 5% to 50% by crops in every concerned governorate without losses in production yield.

The Project envisages attaining the overall goal that the project achievement on saving water in irrigation expands to entire Syria after a while of termination of the Project. It is promising unless interrupting the project activities after the project termination.

Land productivity that is synonymous with irrigation efficiency has been pursued to

improve in every country for a long time. Recently, the concept of water productivity is highlighted in the sense of advanced saving water technology in irrigation. Irrigation modernization has to go through a chain of stages of traditional surface, improved surface, modern irrigation, and what's more, deficit irrigation that is an ultimate goal. Syria is now at the midway stage of modern irrigation, even though deficit irrigation might be common in future.

DEITEX Project is a challenge to go up the process of irrigation modernization by means of extension approach. So far, it is confident of significance of the project approach. It is expected that the experience of saving irrigation water by means of extension approach done in Syria, extend to the other areas/reasons and persons concerned.

REFERENCES

1. NAPC, 2007, Water Use Efficiency in Syrian Agriculture, Working Paper No.26.
2. NAPC, 2008, The State of Food and Agriculture in Syria 2007: 15-22.
3. Japan International Cooperation Agency (JICA), 2008, Final Report "Project on Development of Efficient Irrigation Techniques and Extension in Syria", JICA.
4. Department of Planning and Statistic of MAAF, 2010, The Annual Agricultural Statistical Abstract, Ministry of Agriculture and Agrarian Reform (MAAR) in Syria.