SUSTAINABLE CROP MANAGEMENT MODEL IN SYRIAN STRATEGIC CROPS THE EXPERIENCE OF THE COOPERATION PROJECT RATIONALIZATION OF RAS EL AIN IRRIGATION SYSTEMS

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Abstract - This paper reports the main results of an integrated initiative of international technical cooperation in agriculture financed by the Italian Ministry of Foreign Affairs and jointly implemented by the CIHEAM MAI Bari and the Syrian Ministries of Irrigation and of Agriculture and Agrarian Reform. The project entitled: "Rationalization of Ras El Ain Irrigation Systems" started in January 2005 and ended in March 2008. The project was aimed at addressing the problem of water resources scarcity in the project area of Ras El Ain, around the springs of Al Khabour, located in the Hassakeh province (North Mesopotamia) of the Syrian Arab Republic. During the project implementation, a real field experience was carried out involving national and international researchers, local officers and technicians, and local farmers as direct beneficiaries. An appropriate sustainable model concerning the crop management practice was elaborated to save both water resources and production inputs for cotton and wheat. In this paper the main results of this innovative cooperation approach in a multiethnic context are presented.

Keywords: Cooperation, Agriculture, Sustainability, Syria, Herbaceous crops.

Résumé - Ce rapport illustre les principaux résultats d'une initiative de coopération technique internationale en agriculture, financée par le Ministère des Affaires Etrangères Italien et réalisé conjointement par le CIHEAM IAM Bari et les Ministères de l'Irrigation et de l'Agriculture et de la Réforme Agraire Syriens. Le projet intitulé: "Rationalisation des Systèmes d'Irrigation de Ras El Ain" a démarré en Janvier 2005 et a terminé en Mars 2008. Il visait à aborder la problématique de la pénurie des ressources en eau dans la zone du projet de Ras El Ain, autour des sources de Khabour, dans la province d'Hassakeh (Mésopotamie nord) de la République Arabe Syrienne. Pendant l'exécution du Projet, on a réalisé une expérience réelle de terrain qui a impliqué chercheurs nationaux et internationaux, fonctionnaires et techniciens locaux et les agriculteurs locaux, en tant que bénéficiaires directs, On a élaboré un modèle durable approprié concernant les bonnes pratiques de la gestion des cultures, permettant d'économiser tant la ressource hydrique que les input de production pour le blé et le coton. Dans ce rapport on présente les principaux résultats de cette approche innovatrice de coopération dans un contexte multiethnique.

Mots clés: Coopération, Agriculture, Durabilité, Syrie, Cultures Herbacées.

1. INTRODUCTION

The problems related to water resources in the Mediterranean region are quite complex and involve different countries, as shown by the frequent conflicts that have occurred through history and that are still affecting the *Mashrek region*.

An extremely interesting scenario concerns the water resources of one of the main trans-boundary catchments of the Middle East, the Euphrates river, which is formed in Turkey and runs through Syria and Iraq before flowing into the Persian Gulf. Actually it runs through the boundaries of three States, so the proper management of the water resources of Euphrates and of its tributaries is essential for the whole region for agricultural production. This strategic position is inevitably associated with territorial tensions related to the access, control and management of water resources, which necessitates special focus and the development of integrated management models and tools, especially when these water resources, which are declining due to climate changes, are shared by different economic and institutional bodies.

The Syrian national programmes have long been targeted to the support of irrigated agriculture, notably to irrigate the dry lands of the valley of *Khabour* stream, a tributary of Euphrates. The impressive works for the recent exploitation of water resources through the control of surface water flow (e.g. *Tishreen* reservoir, close to the Turkish boundary) and the pumping of groundwater resources for the cultivation of native species have strongly altered the equilibrium between human-induced activities and the resources of the natural environment. This is also associated with a progressive loss in memory of the traditional systems for the exploitation and management of surface water resources derived from rainfall (water harvesting systems). This is partly caused by massive migratory flows of different ethnic groups. In the agricultural areas crossed by the *Khabour*, the need to promote cropping solutions consistent with the available resources is particularly urgent to promote social stability, food security and sustainable economic growth. Promoting a sustainable crop management model appropriate to the local conditions in the Syrian areas and stimulating the cooperation of the parties concerned has shown to be essential for the economic, social and environmental sustainability of the local agricultural production.

2. GENERAL FRAMEWORK

2.1. Origin of the initiative

Over the last half-century the agriculture of north-eastern Syria has been transformed mostly by irrigation. This expansion of irrigated agriculture has responded to the nation's food security policy objectives to satisfy the food requirements of an increasing population that features one of the highest growth rates in the world (MAAR, 1999). A growing concern in Syria is the design and implementation of sustainable irrigation water policies aimed to increase the water use efficiency in agriculture and to preserve water resources by reducing future consumption.
The cooperation project *"Rationalization of Ras El Ain Irrigation systems",* implemented between 2005 and 2008, was aimed at tackling the problem of water resources scarcity in the project area of Ras El Ain around the springs of Al Khabour River, located in the Al Hassakeh Governorate in the North of ancient "Mesopotamia", *toponym* for the area of the Tigris-Euphrates river system, largely corresponding to modern-day north-eastern Syria.
The great importance of the initiative is the pre-condition for the renewal of the agricultural activity of the area, which has caused, over the last few years, severe economic losses and harmful social and environmental effects due to insufficient water resources and poor management resulting from the use of inappropriate and poorly efficient irrigation techniques.
The major objective of the initiative is the food and income security for local farmers that might be achieved by improving agriculture and stabilizing the agricultural production through the sustainable development of irrigation techniques. The project is framed in the international cooperation programmes of the Italian Ministry of Foreign Affairs, funded by the Italian

Cooperation and assigned to CIHEAM – Mediterranean Agronomic Institute of Bari (MAIB) for its implementation.

2.2. Project area

The project area is located in the *Al Hassakeh* Governorate (fig.1) in the district of *Ras El Ain*, which means in the local language «origin of water resources». The project area is flat, slightly undulated and quite homogeneous; its altitude is in the range of 350 to 370 m a.s.l.

Figure 1. Map of Syria and project area

This area is the ancient land where an agricultural and urban civilization was developed around 7,000 years ago and has been strongly influenced by the climate changes over the last millenniums. The main drainage arteries *Khabour* River and its left tributary, the *Jirjib* River. The recent works for the exploitation of water resources that involves the control of surface water (dikes) and the pumping of ground water used to irrigate local crops, has strongly altered the equilibrium between man and natural resources.
The climate is classified as transitional between the Mediterranean and desert climate, with a medium yearly rainfall of 250 mm. Rainfall is mostly concentrated in winter, whereas summer is characterized by the nearly total lack of precipitation for about six months. The maximum temperatures (43 C°) are recorded between July and August; the minimum ones (2 C°) in December. The rain season starts in October, peaks in January and ends in May. The period from June to September is nearly completely dry.

2.3. Existing Problems

The use of inappropriate irrigation techniques associated with a water policy that was not calibrated on the actual requirements and availability in the area, has led in a relatively short period of time, to severe economic losses and harmful social and environmental effects. Agriculture is made possible by groundwater pumping systems (fig. 3); only in the early '2000s the Authorities started to tighten the regulations on the indiscriminate use of groundwater, with a view to limit the permissive policy that has prevailed since the '50s.
In the project area, the non-sustainable management of water resources has jeopardized the economic sustainability of agriculture in the medium to the long run, and has accentuated the hydro-geological risks of the area where some portions of land have collapsed by subsidence due to the drawdown of ground water level (fig. 2). The occurrence of such phenomena seems to be related to the over-exploitation of underlying groundwater and it might constitute the future scenario of the area in the absence of a sustainable management with the current trend to climate change. The flow of the *Al Kebrit* springs, which supply the *Al Khabour* River, has sharply dropped, over the last few years, from 50 m^3/s to nearly zero. This has made the water balance of the river negative, with subsequent effects on the two water reservoirs (with a

capacity of 230 and 92 million m^3, respectively), which are partly supplied by it and used for multiple purposes (irrigation, drinking water, energy). To preserve groundwater and spring flow, irrigation by wells has been forbidden during summer in an area of 34,000 ha. In this area there are as many as 1,652 privately owned authorised wells with a mean depth of 100-200 m. Water is usually lifted by vertical axis pumps (driven by a diesel engine) and applied by furrow irrigation. Water losses are estimated to about 40 - 50%. The Syrian Government has recently authorised cotton cultivation over 20% of the area in summertime, provided farmers use modern water saving irrigation techniques.

Fig. 2. Collapses in project area (2005)

Fig. 3. Groundwater abstraction (2005)

Figure 4. Low efficiency irrigation system (2005)

Actually poorly efficient and water-demanding irrigation techniques have been used so far and the techniques used to irrigate the major crops (wheat and cotton) do not seem actually suitable for the local conditions (Fig. 4). Sprinkler and drip irrigation are not very efficient due to the high salt content of irrigation water that often causes soil salinization and silting.
For achieving a sustainable use of water resources it is essential to carefully monitor these resources, but this has never been done so far, and the consumptive uses have been calculated on an empirical rather than scientific basis. Another problem is also that in the agricultural research station of Hassakeh they have only the recorded values of water used for irrigation. Due to the poor attention to the water use, wrong national water policies have been adopted that have not assessed the actual cost of consumed water. This has caused waste of water resources and has encouraged farmers to mostly cultivate wheat and cotton, which are not sustainable in the long run.

Furthermore, food and income security policies have been implemented by a strong national support to agriculture through subsidised prices on production and aid to farmers. Recent reforms in the sector seem to indicate that in the future there will be less public involvement in the agriculture, and more freedom to farmers in the production and marketing-related decisions. However, farmers are used to a strong public control over agriculture and are not ready to such a change.

3. FEATURES OF THE COOPERATION APPROACH

3.1. Institutional synergies and participatory approach

The general objective of the initiative was the food and income security for local farmers, obtained by improving and stabilizing the agricultural production through the sustainable development of irrigation techniques. To achieve this objective, the work plan of the project has involved the analysis of traditional farming systems in the project area, in order to promote improved crop management practices and introduce new annual crops in the rotations, thus breaking continuous cereal cropping and increasing water use efficiency.
A network of international skills has been established, creating institutional synergies between Italian Universities (Faculty of Agriculture of Bari, Bologna, Foggia, Lecce), Research centres (INAT), International organizations (ICARDA, FAO – NAPC), Certification bodies (ICEA, BTT, Consorzi di Bonifica), Italian industrials (GASPARDO, DIVELLA, NICOTRA Sistemi) and Public organization (Regione Puglia). Meanwhile, through its network of international skills coordinated by MAIB, the project enabled developing assistance activities with the Italian industrials involved in irrigation; supporting economic planning; favouring the opening of international networks to Syrian experts; encouraging the optimization of crops' chains; updating and training of technicians and senior staff. The Syrian community (technicians, officers and local farmers) and the local authorities of the Ministries of Irrigation and Agriculture and Agrarian Reform supported continuously the implementation steps of the project.

3.2. Increase Yields

The increase in crop yields was one of the main project's objectives, as it could allow local farmers to increase their income. The action carried out may be summarized by three main steps: studies, on-field experimentation and dissemination activities. **The studies** were aimed to prepare an overview of the agricultural sector in that area. The applied methodologies included the following: identification of the target group in agreement with the project beneficiaries; fieldwork to collect the data through questionnaires and semi-structured interviews with farmers; 4 *Participatory Rural Appraisal* sessions in the project area to have a preliminary feedback of the collected data; Data interpolation through the use of a suitable electronic spreadsheet set up for the farms of that area; analytical comparison of the data according to the local statistics from MAAR and NAPC.
Another part of studies concerned the completion of the local marketing analysis: it concerns a detailed study on the costs, benefits, sale channels and market trends of "alternative crops" such as cumin, sesame, lentil, watermelon seeds, chickpea, cucumber, soy- bean, sorghum and tomato. The NAPC was also involved to prepare a study on the national and international markets for cumin, sesame, soy-bean, organic cotton, sorghum and lentil crops. **The experimentations** were run in the experimental farm (which covers 37 Hectares) in 24 plots with different crops and different irrigation systems. **The dissemination** of the results involved three sectors: Extension Service, Training for local farmers and technicians, Demo plots and Field days (fig. 9 and 10). It was essential to suggest to farmers new technologies and new crops and varieties, to be tested and compared with the local ones. For this reason, an experimental farm was set up in the Research centre in Ras El Ain within *Arnan Shemaly District*, covering a total area of 31.7 Hectares.

Figure 5. Field day with local farmers (2006)

Figure 6. Training with local farmers (2007)

Trials on crops and technologies were carried out by participatory methodologies with the aim to transfer knowledge and techniques and convince farmers to introduce innovations and compare their old techniques and crops with the new tested ones. For this reason, the project implemented, on a voluntary basis and with the help of Farmers' Union, 22 demo fields, involving local farmers. To better monitor these fields and to fully compare the new with the traditional techniques, the project defined "**cropping data sheets**", in which all daily agricultural activities and economic data are reported, requiring farmers' involvement.
The demo fields were cultivated mainly with the strategic crops as *Wheat and Cotton* but also with *Chickpea, Maize Sunflower, Soybean*, *Sorghum*. An innovative tested crop, *"Brassica Carinata"* could be used to produce "Bio Diesel", as it is drought tolerant (Tab. 1).

Table 1. Distribution of demo plots by crops (2006-2007)

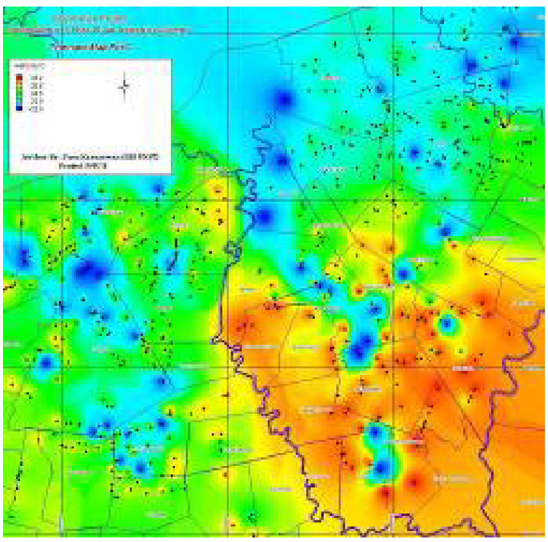
Farm n.	District	Fields n.	Season	Crop	Variety	Plots area (ha)
1	Tewmeh	1	winter	*Wheat*	Cham- 6	0.70
		2	winter	*Brassica*	Carinata	0.50
		3	winter	*Chikpea*	Ghab- 3	0.65
		4	summer	*Cotton*	T.ST-453	1.96
		5	summer	*Cotton*	Alepo-90	0.47
		6	summer	*Maize*	Ghouta-82	0.39
		7	summer	*Maize*	T.Konsur	0.50
		8	summer	*Sun flower*	T.Sirena	0.48
		9	summer	*Sun flower*	It.-Tuscania	0.42
2	Tewmeh	10	winter	*Brassica*	Carinata	0.85
3	Halabia	11	winter	*Wheat*	Cham- 6	4.60
		12	summer	*Cotton*	Alepo-90+T.	1.00
4	Tel Snan Garby	13	summer	*Cotton*	Alepo-90	0.25
		14	summer	*Cotton*	T.ST-453	1.70
		15	summer	*Soybean*	local	0.50
5	Halabia	16	summer	*Cotton*	T.ST-453	1.60
		17	summer	*Sorghum*	T. SNOW	0.30
		18	summer	*Soybean*	T. Nova	0.45
6	Tal Gazira	19	summer	*Cotton*	T.ST-453	1.80
7	Tal Magdal	20	summer	*Cotton*	T.ST-453	0.73
		21	summer	*Cotton*	Alepo-90	0.27
		22	summer	*Soybean*	Local	0.27
	Total	**22**				**20.4**

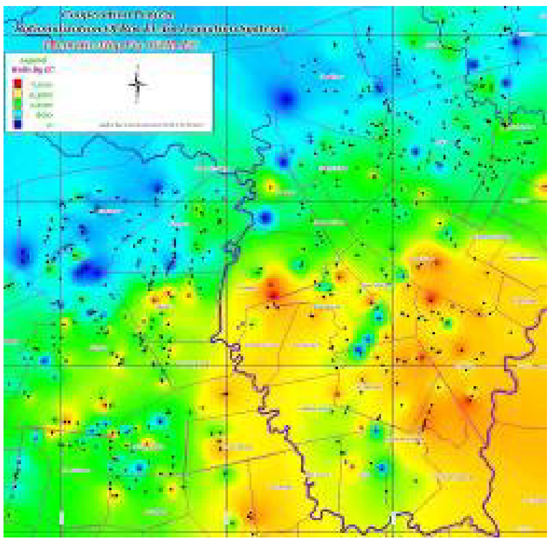
3.3. Save water resources

The second objective of the project was to reduce the use of ground water resources in the project area, through well mapping so as to create GIS maps. To map the water quality in the project area, a database on the chemical-physical properties of water and soil for 1,392 wells was set up for establishing the first Territorial Information System (TIS) of the area. The planned activities involved two steps: office and field works. **Office works** included: preparation of detailed program, updating of technicians' knowledge and supply of all materials required (PS devices, maps, district schemes for the area under study, instruments, tools and documentation). **Training courses** for technicians on the instructions and indications have been provided by MAIB experts. The Ministry of Irrigation has been actively involved in this activity, supplying 8 technicians and covered most expenses for the water analyses carried out in the *Al Hassakeh* laboratory.

Field surveys were run by three teams, consisting each of three technicians, to take the coordinates of wells using GPS instrument; to analyse the well water quality directly for the following parameters: EC, pH, temperature, smell and colour (based on the measurement of the three first parameters by means of portable instruments, and on the evaluation of the others), collecting a water sample for the chemical analysis in the laboratory, and to assess the characteristics of the engine, pump, well and of the related irrigated area. In the end the technician painted a number in each well that might be identified in the database. This procedure also involved the owner of the wells (farmer). These analyses on water and soils are very important to evaluate the environmental aspect of the project area and the possible use and management of water for irrigation. The local technicians became able to plan the best irrigation solution for the local area, based on water and soil quality. These data have been collected in databases and developed in GIS maps and Territorial Information System (TIS), available on-line. The maps (fig. 21 and 22) extracted from the T.I.S aims to stimulate the local and national Authorities and Institutions towards a strategic planning of local and national water resource management in the medium and long period.

Figure 7 and 8. Thematic maps for temperature (C°) and electro- conductivity (EC)





3.4. Efficient irrigation techniques

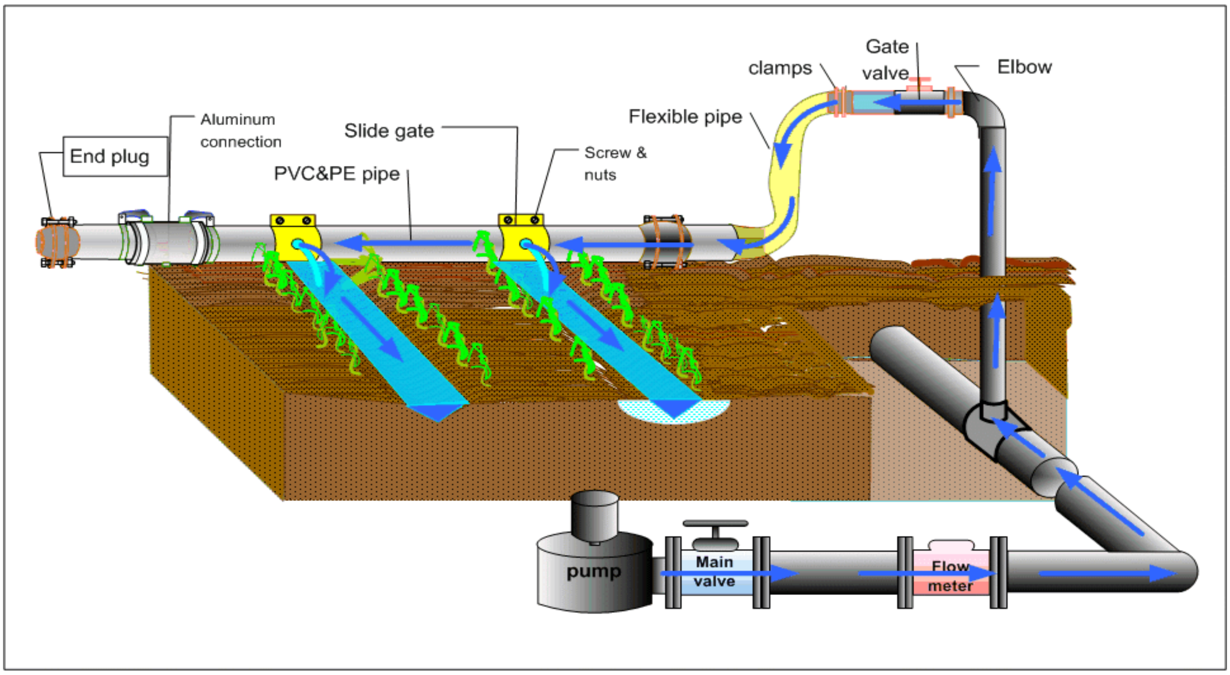
The third objective has been the introduction of innovative and sustainable irrigation systems: sprinkler and drip irrigation and mainly the "*Improved surface irrigation System",* a system developed in collaboration by the MAIB, the Syrian researchers and the project management unit, based on local farmers' needs.

The philosophy of these systems is based on the three dimensions (environmental, social, economic) of sustainability and can be summarized as follows:

- Flexible and adaptable to different farms and different crops for saving water resources *(environmental sustainability) ;*
- Easy to be used by farmers because they are conceptually close to farmer's knowledge (*social sustainability);*
- Economically viable both in terms of investment and running costs *(economic sustainability).*

The project developed an innovative system: "**improved surface irrigation system",** based on local background and farmers' needs, which allows the farmer to use less seeds and to save in terms of cropping practices, water, labour and energy (fig. 15).
The project also introduced in the area a new **sprinkler irrigation system**. This system, less expensive than the local one, enabled saving more water than the improved surface irrigation system. Both systems had no depressing effect on production. Usually, crop yields in the plots irrigated by these systems were higher than in the plots irrigated by the traditional system. The new system was extended to farmers by a fully participatory approach. In addition, the demo fields for irrigation involved farmers' participation, also from an economic point of view. Extension service and training on the use of the new systems have also been provided to farmers.

Figure 9. Schematic structure of the improved surface irrigation system



3.5. New irrigation system: sowing and furrowing combined

During the project implementation, an innovative system to combine good sowing and good preparation of furrows has been planned. It makes use of a modern seeding while digging furrows for surface irrigation (mainly for the improved surface system). In this way the farmer can use less seeds (from 450 – 500 Kg/Ha to 200 – 250 Kg/Ha with this system). At the same time the machine makes two regular furrows much better than the traditional furrow system. The system is made up of a seeder with two furrowers and two rollers that provide a light compaction of the soil. This system allows planting also inside the furrow without losing any cultivated surface. By this system it is not necessary to pass again in the field to make the furrow (reduction of soil compaction). Indeed you can decrease the usual cost of cultivation. The system has shown good results in demo fields. (fig. 16 and 17).

Figure 10. Furrow applied in front of the seeder machine for wheat and other crops

Figure 11. Rollers applied behind the seeder machine

3.6. Capacity building

To improve the Ministry of Irrigation (MI) and Ministry of Agriculture and Agrarian Reform (MAAR) performance, several training courses were scheduled for the local technicians, either engineers or agronomists, who work in the local administrations. For preventing any duplication and providing adequate training, it has been useful to assess previously their background and competence. At the same time, the project promoted the improvement of MI and MAAR performance also in the area of extension service. The main aim of this activity is that the technicians and the workers involved in the new technologies became able to manage them autonomously. A total number of 9 training courses for 118 trainees has been carried out in Italy, Syria, Egypt from 2005 to 2007 on several subjects (GIS and remote sensing; soil and water analysis; irrigation techniques; farm management; participatory planning; information and communication technologies; management of development projects).

4. RESULTS

The project has been implemented with the active involvement of local stakeholders, through the spreading of technologies, the dissemination of the main project outcome by different media, and the participation in national events and local fairs.
As to the technical management, the project operated to optimize crop yields (for cotton and wheat) in 22 demo fields, over a total area of 21 hectares. The proposed new irrigation systems have been tested and enabled using lower amounts of water than those traditionally applied by farmers. The reduction of water for irrigation use, achieved by the proposed improved methods, did not involve any decrease in income; it resulted instead in a reduction of running costs and working time.

Table 2 - Wheat Yields in 2006 and 2007 comparing the traditional irrigation system to the sprinkler and improved irrigation system

Crop	***Irrigation system***	***Year 2006***		***Year 2007***	
Wheat		***Yield (t/ha)***	***Applied water (m^3/ha)***	***Yield (t/ha)***	***Applied water (m^3/ha)***
	Sprinkler	4,9	2.027	3,9	2.224
	Improved	5,1	3.920	3,5	2.910
	Traditional	4,3	5.530	3,2	5.000

Table 3 - Cotton Yields in 2006 and 2007 comparing the traditional irrigation system to the improved irrigation system

Crop	***Irrigation system***	***Year 2006***		***Year 2007***	
Cotton		***Yield (t/ha)***	***Applied water (m^3/ha)***	***Yield (t/ha)***	***Applied water (m^3/ha)***
	Improved	3,7	11.200	4,6	8.106
	Traditional	3,6	16.125	4,0	14.054

As compared to the fields cultivated with traditional methods, the introduction of new irrigation and cropping techniques resulted in considerable yield increases both for wheat (11% for improved irrigation systems and 13.6% for sprinkler system) and cotton (9.6% using the improved system). The abovementioned yields were obtained applying lower water amounts lower than those normally applied by farmers. Specifically, the average water saving in the 2 years for wheat was 35% in improved irrigation and 59% in sprinkler systems; for cotton the improved system allowed 36% water saving (Tab. 5 and 6).

Table 4. Saving of water resources – Wheat

Irrigation system	***2006***		***2007***		***Average*** *(2006-2007)*		***Increase in Yield*** *(%)*	***Saving***		
	Yield *(t/ha)*	***Applied Water*** *(m^3/ha)*	***Yield*** *(t/ha)*	***Applied Water*** *(m^3/ha)*	***Yield*** *(t/ha)*	***Applied Water*** *(m^3/ha)*		***Water (%)***	***Energy (%)***	***Manpower (%)***
Sprinkler	4,9	2027	3,9	2224	4,4	2126	***13,6***	***59,6***	**47,3**	**58,7**
Improved	5,1	3920	3,5	2910	4,3	3415	***11,6***	***35,1***	**42,3**	**69,3**
Traditional	4,3	5530	3,2	5000	3,8	5265	***0***	***0***	**0**	***0***

Table 5. Saving of water resources – Cotton

Irrigation system	***2006***		***2007***		***Average*** *(2006-2007)*		***Increase in Yield*** *(%)*	***Saving***		
	Yield *(t/ha)*	***Applied Water*** *(m^3/ha)*	***Yield*** *(t/ha)*	***Applied Water*** *(m^3/ha)*	***Yield*** *(t/ha)*	***Applied Water*** *(m^3/ha)*		***Water (%)***	***Energy (%)***	***Manpower (%)***
Improved	3,7	11.200	4,6	8.106	4,2	9.623	***9,5***	***36,0***	**42,6**	**22,2**
Traditional	3,6	16.125	4,0	14.054	3,8	15.090	***0***	***0***	**0**	***0***

For wheat, the Project applied two irrigation systems: sprinkler and improved surface irrigation. Moreover, new agricultural machines such as mechanical seeding, cultivator and ripper were also used. Thanks to the new applied technologies, the wheat cultivated by improved surface irrigation systems resulted in a 43% rise in income. The wheat cultivated by sprinkler irrigation led to a 23% income increase (fig. 18).

As to cotton cultivation, the Project applied the improved surface irrigation system, whereas the new machinery such as the pneumatic seeding, the weeding cultivator and the ripper were not present in the area. The new applications (agricultural machinery and Improved surface irrigation system) used by the Project resulted in a 45% increase in the operating margin (fig. 19 and 20).

From the social point of view, this result allowed farmers to save manpower and time and carry out additional rural activities and alternative crops (e.g. lentil, cumin, sorghum…) to be sold on the local markets for increasing their income. Through the dissemination of project results, about 100 hectares cultivated for the “replication activities” based on farmers’ initiatives allowed local farmers to understand and familiarize with the proposed irrigation systems and test a sustainable water resources management.

Figure 12. Economic comparison between traditional and improved irrigation systems

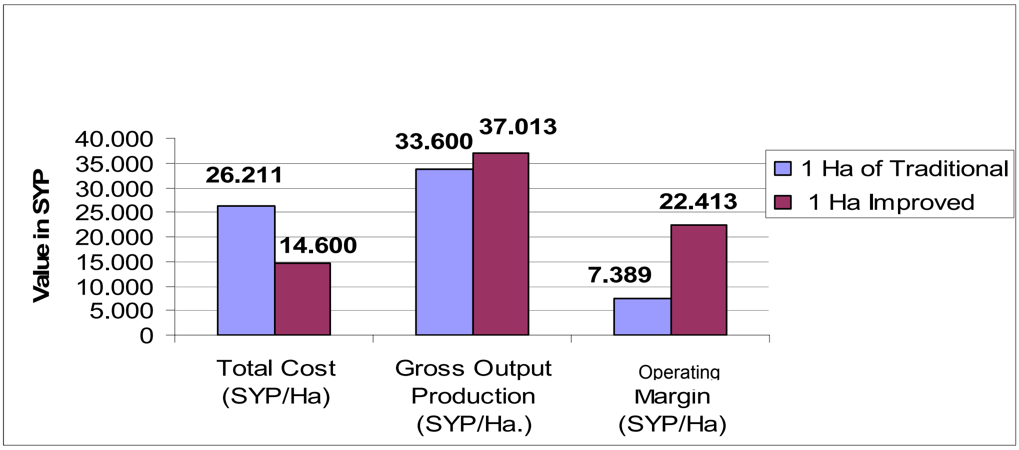


Figure 13. Economic comparison between traditional sprinkler irrigation system

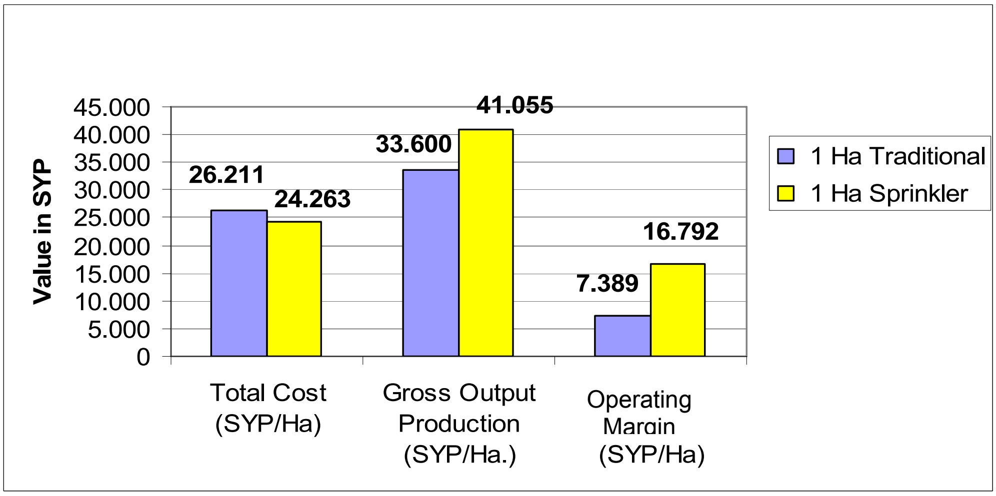
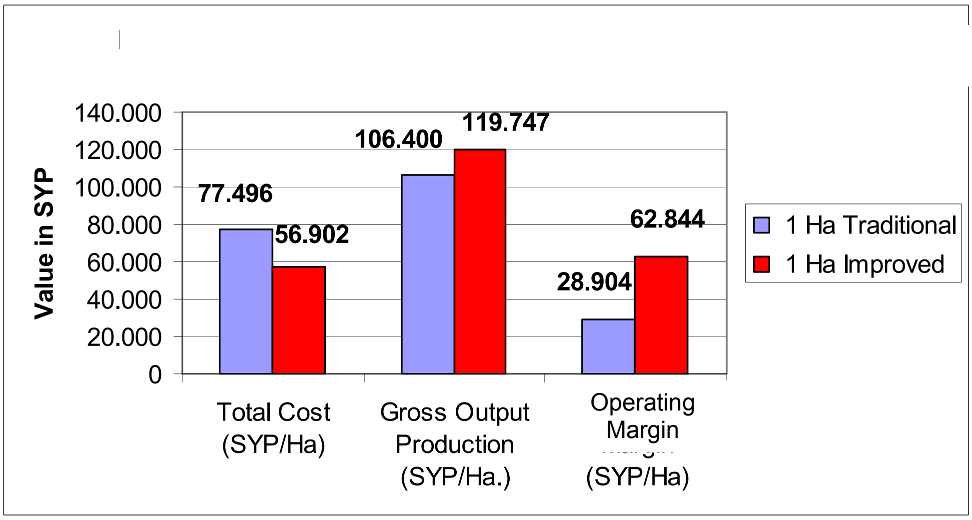


Figure 14. Economic comparison between traditional and improved irrigation systems



CONCLUSION

The case study proposes a sustainable crop management model and provides indications and helpful information for the future planning of the available resources, to balance the traditional knowledge heritage with the modern technologies. Constant attention has been paid to the **participatory approach and to the involvement of farmers in the sustainable management of irrigation systems**, made possible through on-going training and information activities: the *capacity building* of the local technicians will contribute to the sustainability of the actions beyond the end of the project. Anyway, significant extension service in terms of marketing strategies, quality control and farm management analysis would be therefore required. In addition to an integrated regional water management plan for agriculture making use of modern methodologies and technologies, it is necessary to widespread modern irrigation techniques while still recovering and optimizing the traditional water management systems on the farm scale, improved and made more efficient and sustainable. The increased man-made pressure on the availability and distribution of local resources necessitates innovative technical solutions by the agricultural sector to prevent social conflicts, but it also requires specified governance skills by the institutions and the decision-makers, and above all medium and long-term policies, aimed at orienting over time the economic and productive models and the individual and social life and consumption models to emphasize the value of resources and their best use. In conclusion, providing innovative technical solutions to favour the proper water management has enabled achieving a good level of efficiency in the use of water resources and an improved performance of irrigation systems by reducing the applied water volumes but keeping at the same time good crop productivity in the medium – long run. The available technical knowledge, embodied in the sustainable cropping practices and techniques adjusted to the local conditions, has enabled achieving significant results; however this *know how* should become a diffuse and shared heritage, notably for the protection of resources. Within this framework, the technological innovation is to be promoted and favoured by further developing integrated management policies, models and tools, which are a priority to face the above issues effectively. To this purpose, it will be essential from an institutional point of view to work synergically with the *National Irrigation project (N.I.P),* which will enable the further dissemination of the proposed model and its sustainability over time, also during the "second phase" of the project in other Syrian governorates, financed from the Italian Cooperation in 2009: the continuity of this collaboration between the Italian and Syrian communities is the sign of the concrete willingness of the Syrian Institutions to the modernization and to the integration toward the international community.

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