



Improvement of Irrigation Water  
Management in Lebanon and Jordan  
IrWa Project



# BUILDING ADAPTED SERVICES FOR FARMERS: RECOMMENDATIONS FOR IRRIGATION OPTIMISATION LESSONS LEARNED

## Partners

Istituto per la Cooperazione Universitaria – ICU  
National Centre for Agricultural Research and Extension – NCARE  
Associazione Volontari per il Servizio Internazionale – AVSI  
Litani River Authority – LRA  
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## OVERVIEW

Water is a key resource for agriculture, and the management of water scarcity has been the central concern for decision makers and farmers in Jordan. As one of the most water challenged countries in the world, the agricultural sector still consumes more than 60% of the national water supply, exerting an unsustainable strain on the water balance. Water authorities have been adapting a wide range of measures to reduce the deficit: rotation in water supply to farmers, reduced water allocation during summer and reclaiming wastewater from urban usage.

In Lebanon, water resources are also limited but to a lesser extent than in Jordan. Hundreds of farmers are affected by inefficiencies of the management of the distribution network in the Bekaa Valley. Moreover, poor maintenance of the Litani Riverbed, the main source of fresh water in the Bekaa Valley, causes periodical flooding which affects 1500 ha of cultivable land, impedes winter cropping, delays summer cultivations and reduces the annual production.

In addition, farmers in both Jordan and Lebanon are facing high water losses and high production costs resulting from poor irrigation management. This threatens the economical and environmental sustainability of the agricultural sector.

The Litani River Authority (LRA) in Lebanon and the National Centre for Agricultural Research and Extension (NCARE) in Jordan, are the local partners of the IrWa project. Both organizations are public institutions. Their mission is to support farmers in adopting proper irrigation and agricultural practices, and to provide them with reliable technical assistance.

The IrWa project addressed some of the main problems in water management during implementation: frequent floods and soil erosion in the Bekaa Valley (Lebanon), poor quality of irrigation water in the Jordan Valley (Jordan) and minimal skills of the farmers in dealing with advanced techniques for water management.

The main objectives of the project were:

- To increase the land for cultivation along the Litani River between Qaraoun Lake and the village of Bar Elias by preventing floods.
- To increase the availability of good quality irrigation water at the on-farm level in the Jordan Valley.
- To improve the technical know-how in the project areas in terms of irrigation and fertilization issues and to increase crop production and farmers' income.

IrWa project has made great progress in developing pilot extension services in Lebanon and Jordan. Extension agents were given intensive training in irrigation optimisation and other topics related to integrated agricultural practices. Communications skills training enhanced the ability of the extension agents to interact with farmers.

Having simple but high quality laboratories in Jordan and Lebanon enabled the extension agents to perform standard tests of soil and water quality. In addition, the use of demonstration plots physically demonstrated best practice irrigation techniques, integrated fertilisation, and generally provided an evolving and accessible example of what can be achieved with careful attention to applied science and agronomy.

Public Extension Services play a key role in irrigation modernisation processes and more generally in agriculture development. NCARE and LRA are empowered in providing such services to farmers but are subjected to major constraints that limit their reliability. The aim of this document is to present recommendations on how national bodies could develop adapted services for farmers in the framework of a better management of water resources.

Based on the IrWa project experience, and following the conclusions of two workshops on extension services held between 2007<sup>1</sup> and 2008<sup>2</sup>, two main levels of recommendations for the improvement of public extension services have been identified: both the institutional and methodological level. This document will highlight the recommendations, approved by the stakeholders, for the continuation of the IrWa experience and present the main conclusions of the group discussions.

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<sup>1</sup> Building an Adapted Strategy for Extension Services: Case Study on Integrated Fertilisation Promotion – NCARE Centre, Al-Baq'a, Jordan, on 22 November, 2007. Report available on [www.irwaproject.com](http://www.irwaproject.com).

<sup>2</sup> Building Adapted Services for Framers: Recommendations for irrigation optimisation – Amman – 16 April, 2008 Reports available on [www.irwaproject.com](http://www.irwaproject.com).

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## **WATER MANAGEMENT MODERNISATION PROCESS**

### **1. MAIN CHALLENGES FOR SUCCESSFUL MODERNISATION PROCESS**

Most Mediterranean countries face water scarcity problems while the agricultural sector is considered as the main consumer for water. To reduce the water share of the agricultural sector, governments have developed different policies ranging from quotas to new pricing, massive investments in infrastructure and new technologies. Recently, support to small private farms seems to be a most cost-effective policy as it promotes national and rural economies as well as local employment, and induces participatory management involving farmers in decision-making. However to be successful, the policies related to the optimisation of on-farm irrigation should focus on a global view of all agricultural stakeholders who are involved in the modernisation process. The success of such policies depends on:

- Adapted on-farm methodology with methods and tools consistent with farmers' technical skills.
- Financial support programs that can enable the modernisation process to reach farmers of all socio-economic backgrounds,
- Guidance and facilitation of the switch to an optimised system, where the farmers should be provided with irrigation techniques that are adapted to the local context, as well as agronomical and marketing support. Quality of equipment and presence as well as skills of extension service is a key for the success of technology transfer.

Irrigation efficiency is far under its potential, despite the widespread use of drip irrigation. The Jordanian farmers are challenged with poor water quality, limited water supply, and a deficit of impartial expertise. Elsewhere, uncertainty over water supply leads farmers to stockpile water by creating private reservoirs and/or to over water their fields when water is available, leading to problems such as soil salinity build up and leaching of nutrients away from the root zone.

Modernisation of farm irrigation is a convenient solution if it has adapted support to farmers via extension services. Publicly supported irrigation modernisation policies, designed to save water, typically involve either subsidies or credits for farmers. Unfortunately, the cost effectiveness and impact of social issues are seldom addressed. Indirect and secondary effects of modernisation are generally not considered. Farmers are not often involved in modernisation processes construction.

As moved forward, the need for an integrated approach that involves the end users in the process of crafting and implementing policies for the modernization of water networks and irrigation systems has been seen.

- Communication between the on-farm and the off-farm levels of planning and administration are often very weak or no existent.
- The consequences of the water modernisation processes may be quite different from what is expected.

From the Farmer's point of view, the decision to invest in modernisation requires:

- information about existing options and associated constraints, especially regarding costs,
- an extension service to give impartial technical advice (if not the decision will be influenced by dealers).

Thus, the goal should be to provide adequate technical expertise in the local context: agronomy, technology, adaptation to crops to soil and climate. With this expertise the farmers and the policy makers are better able to determine the cost effectiveness of modernisation and the cost return of a modernisation policy when viewed as a public investment.

## 2. SOCIOLOGICAL ASPECTS OF IRRIGATION WATER MANAGEMENT

There are many examples around the world in irrigation and water management where a masterful technical plan is envisioned and implemented at great expense, only to fail in the short to medium time and not deliver the level of improved water use efficiency that was expected or promised, due to an insufficiently inclusive approach. There can be a range of reasons, and one aspect that is often overlooked in these situations is the social environment of the community. Society influences individuals in profound ways, and thus it is important for water projects to examine, understand, and involve local actors in the planning and implementation of irrigation systems.

Today there has been a policy shift that emphasises the involvement of local communities in the planning process for water management, and the need to build the capacity of local farmers and water management institutions, and finally on the importance of decentralizing the water distribution apparatus in favour of local decision making.

A discredited view was that technological modernity, for example the installation of a high pressure water distribution network, should have to overcome the “obstacle” of local opposition and their “backwardness.” Water projects often define the local beneficiaries with development categories that fail to recognize the heterogeneity and social dynamics between tribe, ethnic group, or socio-economic strata. Yet the interplay within these social and hierarchical dynamics of the community may confound efforts to organize equitable access to water for all users in a given area, especially if the entire spectrum of community members is not involved and supportive.

Although the modernization of irrigation and water management systems should not be portrayed as a technical affair, in fact irrigation reveals the encounter between different traditions of resource management, of ideas of local community and of the existing network of social relations. Irrigation is a social phenomenon where technical and managerial aspects are intimately interlinked with political, social, cultural, religious and historical dimensions.

Observations of nascent water management associations in Jordan lead to the conclusion that understanding the social traditions and the hierarchy that defines the community is the first step to understanding how water associations can work well, and how extension agents can best work with communities to achieve goals of improved water management and increased agricultural production, working with limited water availability.

The Jordan Valley Authority (JVA) is steadily expanding a pressurized water network system, and this kind of water network is more efficient when water is delivered over the entire wider network and not diverted to a single irrigation branch. This is pulling farmers across tribal alliances and geographic location into a tighter system of interdependence and cooperation, against a backdrop of historical mistrust towards water institutions. An earlier tradition of centralized and bureaucratic irrigation management has eroded traditions of local collective action or decision making about water distribution allotments and schedules.

The pressurized network requires the water users to be more knowledgeable about micro-irrigation techniques and supporting apparatus such as filtration systems, and about the mechanical workings of the entire water distribution network.

How can Water User Associations (WUA) in the Jordan valley become equitable and sustainable? The first step is to be aware of the local social resources, capacities, and systems of work. Water systems should work with them, not against them to the extent that is possible. The challenge is to find a balance between working with the grain of the society on one hand and overcoming existing inequalities on the other to ensure that water resources are available equitably to the agricultural operations in the vicinity.

Farmers in the Jordan Valley have expressed fear that new WUA will simply re-institutionalize existing social inequalities, by for example a powerful family (tribe) taking management positions and making water allocation decisions that favour their kin or their wider network of solidarity in the community. Marginal groups in the community (poor and poorly educated) fear being excluded again from new WUAs, and so they will prefer to work with the old, flawed system that they understand and know how to manipulate.

There are a number of points to be considered to ensure the successful organization and operation of new Water User Associations (WUA) in the Jordan Valley. In order to address these social issues, local communities should be involved in all stages of planning for water use. This has to be a gradual process that allows trial and error on the village level. In this way and with coordination between the local WUAs and the government, a more equitable and representative consensus can evolve that will, in time, allow the maximum number of farmers to benefit from the high pressure irrigation network as it spreads across the Jordan Valley.

First, micro irrigation systems have placed water channels underground in pipes and the water is no longer physically visible. This is a profound change in an environment where the irrigation water in surface channels was previously regarded as communal property.

Second, extension agents and other public sector representatives who interact with farmers on water issues are generally trained only in their technical specialty. Technical knowledge is only part of the skills set required by these public servants, they also must have the ability to understand and appreciate the social dynamics of the communities where they work, and communicate effectively and fairly with all actors.

Third, social mediators are needed. Social mediators are individuals with specific competencies that cannot be incorporated by extension agents. A social mediator has training in rural or development anthropology, and plays a crucial role at all stages of the project, from planning to implementation to ongoing maintenance. These social mediators work in the community at all stages of a project, and are able to mediate disputes, and to build the capacity of the community groups themselves to lobby the authorities when problems requiring government action arise.

Fourth, water authorities themselves will also require structural changes in order to allow farmers to participate in planning and decision making, as is not currently the case.

Finally, WUAs will benefit from well planned external interventions of outsiders for technical training. In this way a "neutral" party may introduce new ideas and practices of water management and side step some of the mutual mistrust that has accumulated over the years between communities, community leaders, and the government bureaucracy for water management in the Jordan Valley. However, even an outsider may not be seen as truly "neutral" by all constituents.

*In the Jordan valley, the ancient paradigm of social relations is the tribe. The tribe works as a form of patronage and a basis for affiliation. The state apparatus, civilian and military, has over the years absorbed key tribes into various parts of the administrative state apparatus. Today this paradigm is mixed with other active patterns of solidarity that go beyond kinship, such as education, socio-economic level, and social networks that develop through shared work such as military service.*

*Tribes, and the notion of tribal territory and spheres of influence, know in Arabic as "deerah," play a central role in society and the extended family plays a crucial mediation role in cases of conflict within the community. In the Jordan valley water use and water allotment is affected by lack of trust, lack of transparency in the water distribution apparatus, and widespread stealing or unauthorized diversion of water, which in turn leads to unpredictability of supply for farmers.*

## CURRENT STATUS OF EXTENSION SERVICE IN JORDAN AND LEBANON

In Jordan and Lebanon, farmers presently do not rely on public extension since it is challenged with major bottlenecks that limit its reliability. Among the major challenges are the following:

- Insufficient logistical facilities,
- low skills of the extension staff,
- unclear job descriptions,
- lack of working methodologies for on-farm follow-up, and
- low motivation of the extension agents.

These factors result in low presence of public extension agents on the field. Farmers instead obtain agricultural information and technical services from personal experience and observation or from the private sector (e.g. seeds companies, commercial vendors of inputs, equipment and materials). The private sector's role as a form of extension service has lately been increasing in importance, since it has been active in providing most of the new agricultural technologies and technical services. It must be noted though, that this private sector form of extension has the tendency to favour capital intensive enterprises and to induce over-use of agricultural inputs, or to provide low skilled farmers with equipments and products of poor quality or performance.

### In Jordan

Until mid 2007, the responsibilities of the Ministry of Agriculture (MoA) and the National Centre for Agricultural Research and Technological Transfer (NCARTT) to provide technical assistance (extension services) to farmers overlapped. Since July 2007, the mission of NCARTT was amended and extended to include the extension services previously attributed to the MoA. NCARTT became the National Centre for Agricultural Research and Extension (NCARE). As the expansion of the mission of NCARE implies stronger focus on extension services, the Centre will have to re-orient its professional and financial means to eventually shift from purely fundamental and academic research activities to applied research activities to be able to answer technical constraints encountered by local farmers.

### In Lebanon

During IrWa project, an extension service centre was created. Extension service achieved significant acceptance from the farming communities in which it worked, however the project was interrupted by the critical political situation in 2006.

The centre includes:

- High tech laboratory for testing and analysis
- Weather station to record weather data for studies and future assessment
- Equipped training and meeting rooms
- Specialized technical offices

Extension agents were trained on presentation skills, on both theory of irrigation design and the practical implementation of the work, as well as on GIS systems, and the interpretation of weather data.

In addition, 20 hectares of land were organized for demo plots to study irrigation and water issues for crops. The extension service did outreach to farmers, and worked intensively to identify farmers' irrigation problems, identify their optimal irrigation schedules, and to test equipment on farm, fine tuning plans for optimal irrigation using existing technology.



The aim of the next section is to present how NCARE and LRA could be a major actor in the modernisation of irrigation management in the Jordan Valley and Bekaa Valley through their new mandate of extension service. In addition, a step by step method for on farm irrigation modernisation based on IrWa's experience will be presented.

## 1 INSTITUTIONAL LEVEL: A FRAMEWORK WITH A CLEAR MANDATE FOR EXTENSION SERVICE

The challenge is to establish the extension service of NCARE and LRA into one that is decentralised, participatory, pluralistic and sustainable.

The new extension service should be responsible of providing **impartial** and **unbiased** technical information using convenient approaches that correspond to the farmers' technical backgrounds and interests. A clear border should differentiate between fundamental and applied research, however both services should collaborate and complement one another to come up with applied solution to farmers' problems. To do so, the both centres should develop competent and efficient human, logistical and financial means.

### 1.1 Develop specialised services for farmers

The creation of a Research and Development Unit (RDU) in charge of developing applied research in collaboration with NCARE and LRA researchers can embody the link between research and extension. In the irrigation domain, the RDU can be the national entity in charge of assessing the quality of irrigation materials, by for example testing the irrigation materials and performance before introducing them to the farms.

Developing **specialised extension services** is necessary for the successful dissemination of the extension research results and recommendations. Besides irrigation, the extension service should address other technical topics (such as marketing, post harvest techniques, IPM and IFM). According to the farmers' needs assessments and taking into account NCARE's and LRA's current human resources and technical skills, four services could be identified:

- **Optimisation of Irrigation** service could provide farmers with technical support to adapt irrigation design and materials with the main aim of improving water use efficiency and irrigation systems durability.
- **Post Harvest and Marketing** service to present new collection, grading and packing methods for fruits and vegetables. A Marketing Unit could test new high-value crops (variety screening) and establishing links between farmers and buyers (local and international) through the organisation of workshops, conferences and field visits.
- **Integrated Pest Management** service to provide farmers with application methodologies, standards, new perspectives (chemical and biological) and security measures that are required for environmental and healthy treatment approaches.
- **Integrated Fertilisation Management** service to use soil laboratory analysis to provide farmers with accurate fertilisation plans that take into account the water and soil mineral contents. Particular attention must be given to develop adapted methodologies while using treated wastewater in agriculture and promote soil conservation<sup>3</sup>.

The Research and Development Unit, in collaboration with researchers, will be in charge of coordination and information exchange between services and consistency in scientific approaches.

### 1.2 Develop the human resources: Establish a pool of skilled field engineers

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<sup>3</sup> The guidelines for Reclaimed Water Irrigation in the Jordan Valley developed by GTZ could be used as reference.

IrWa's experience demonstrated that well trained extension agents with adapted tools and clearly defined methodologies were able to answer farmers' irrigation technical problems. Also, an accurate definition of tasks and functions should be set for each service. Field engineers should be objective-oriented (e.g. they should be assigned a minimal number of farmers to follow-up) and regularly evaluated during the season. Provided convenient indicators are defined and agreed upon, financial incentives according to the accomplished results could also increase motivation and improve the agents' willingness and diligence for work. Continuous training for extension agents in their specialisation is another key point.

### 1.3 Create networking channels and meeting platforms that include farmers

The creation of national forum for coordination, acting as a steering committee, between farmers and other agricultural sector stakeholders (policy makers, universities, NGOs, private firms, donors, etc.) is required to:

- share common objectives and frame policies,
- harmonise working methods and tools,
- capitalise experiences and exchange of information,
- follow up and evaluate activities,
- define research and development priorities and
- centralise training and research facilities.

Cooperation among the different institutions and stakeholders will guarantee the complementarities of their efforts and reduce repetitions and duplication of tasks and responsibilities among them. It will also contribute to mutual understanding, which will finally benefit to the whole sector (Figure 1).

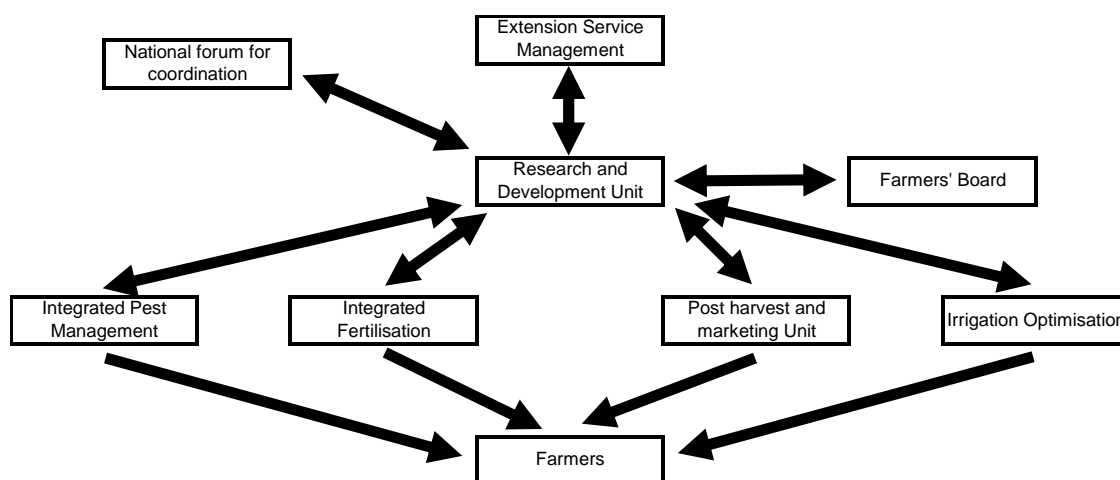


Figure 1: Proposed organization of an extension service

*16 April 2008 Workshop output:*

*The different stakeholders involved in the IrWa project supported the above recommendations. They emphasised that close cooperation and communication between the extension agents and the farmers was essential.*

*Demonstration plots were considered very effective, and the participants suggested expanding the plots by leasing small plots on the land of private farmers in order to facilitate interaction and bring the fruits of research and development to farming community. There is also a need for reference plots in the different specific areas to be used as model for defining water requirements, pest infestation risks and other location - specific technical concerns.*

*The importance of a well equipped laboratory was emphasised, and it was recommended that NCARE be equipped to test irrigation equipment. Laboratories in Lebanon and Jordan should establish protocols and cooperation for testing of equipment and methodologies. Considering the good level of cooperation displayed during the IrWa project lifetime, it is strongly recommended to consider initially having complementary instead of overlapping activities between the two countries.*

*A complete summary of the comments on the above recommendations from the workshop is presented in Appendix II: Summary of IrWa Working Group Recommendations: Working Group 1.*

#### **1.4 Assure financial sustainability of extension services**

While the missions and activities of LRA in Lebanon and NCARE in Jordan are similarly concerned with irrigation for agriculture, there is substantial difference in the way the organizations are financed.

The Litany River Authority is a Lebanese government body that generates a significant portion of its income through the management of the Litany river resources and watershed. Specifically, the LRA generates incomes through water management, selling water for irrigation or for drinking. Indeed the LRA also manages three hydroelectric plants, which also provide revenue from the sales of electricity.

NCARE in Jordan is a government agency that is specifically restricted by its charter from generating its own income. NCARE is nearly exclusively funded by the Jordanian government. At present, 90-95% of NCARE annual budget comes from the Jordanian government and the rest from donors.

NCARE runs six research stations across Jordan, and it controls some proprietary products, and provides services from its laboratories such as soil and water analysis. Last year, in June 2007, a mission from USAID evaluated the work of NCARE they suggested to make NCARE an autonomous body, but this has not yet been implemented.

It is essential that NCARE develops an extension approach that matches its allocated financial resources. Presently, external resources are too often used to implement agricultural extension activities (EU, USAID, World Bank, etc.) and NCARE must find new opportunities to sustain its activities. On the short term, the extension system must be developed in such a way that minimises operating costs and creates funding opportunities generated by the agricultural sector stakeholders (private companies, farmers and retailers, etc).

In an attempt to suggest financial sustainability for NCARE, the following could be proposed:

##### *1.4.1 Increase financial participation by agricultural stakeholders*

Direct and indirect financial participation from farmers is an easily foreseeable resource. A direct, annual fee or subscription could be collected from the farmers in return for receiving technical backup from the extension service (field day invitations, participation to trainings, etc.) Other specialised services (such as soil analyses, fertilisation plans and irrigation designs) can also be co-financed with the farmers and offered by the Centre.

Indirect contribution can be shared between farmers and commercial intermediaries using a low value tax (0.01% for research and development for instance). This contribution can be collected at the central markets, which would then be deducted from the already existing 4% shared by the farmers and the trade intermediaries.

#### *1.4.2 Adopt a commercial approach for marketing the production of NCARE Stations*

The current mandate of NCARE does not allow its Research Stations to market any agricultural production, neither on the national nor international level. Theoretically, NCARE owns more than 3000 du of agricultural land scattered all over the country, which represents a significant potential for fruit and vegetable production. In addition, the Deir Alla Research Station (more than 100 du) was recently EuroGAP certified, expanding the horizons towards lucrative export markets. To differentiate itself from the local producers, NCARE should target the production of high value crops that are well standardised and packed. On the short term, direct contracting with local exporters might also enable rapid returns. Another opportunity would be to provide farmers with additional services like the establishment of a nursery to produce certified seedling (grafted and un-grafted) for sale on the local market.

The commercial approach should take into consideration the surface areas required, available means and the needs for scientific purposes. An NCARE plot should be clearly oriented toward the acquisition of reference knowledge to be used further by extensionists, rather than a strictly commercial venture. Part of the surface area could be dedicated to extension support and the remaining part to the production of certified seeds or plants with a clear and different status, in order to avoid any confusion between missions and objectives. Prior to implementation, a complete analysis of these factors must be conducted in order to define a sustainable methodology.

#### *1.4.3 Increase support from the private sector*

As mentioned previously, private companies are currently the main suppliers of technical innovations. While NCARE and LRA could provide these companies with visibility (through field visit as example), their technical and financial support could be used to establish other demonstration sites in the Research Stations.

#### *16 April 2008 Workshop output:*

*In the workshop, the stakeholders supported the above recommendation. They stressed that NCARE can benefit from the experience of LRA in terms of generating its own income. LRA receives revenue from water management services and also from selling hydro generated electricity. It is an area for future discussion to identify what services NCARE in Jordan could offer to generate a sustainable income to fund its extension activities.*

*The LRA has an upcoming project with the University of Berlin to use specific properties to both grow crops for cash export and at the same time to demonstrate best practices and experiment with new seeds and plants. It was discussed that NCARE has the potential to similarly exploit its resources and its expertise to grow and sell crops for export. A possible scenario is that instead of entering the traditional commercial market NCARE should investigate some "niche markets" requiring more technical skills than commodity mass production. However, NCARE would have to substantially reorganize and restructure itself in order to become a semi-governmental organization.*

*A complete summary of the comments on the above recommendations from the workshop is presented in Appendix II: Summary of IrWa Working Group Recommendations: Working Group 2.*

## **2 METHODOLOGICAL LEVEL: PROMOTING A GRASSROOTS APPROACH**

## 2.1 Involve farmers in extension planning

### 2.1.1 Include farmers in extension methodology planning

Key actors and farmers' associations should take part in the overall extension strategy elaboration through farmers' boards. Efforts to build the farmers' capacity to take initiatives will enable technical solutions that are more relevant to the farmers' constraints and contributes to the sustainability of actions. The aim of the farmers' boards would be to convey the communities' extension needs and follow-up the applied research set up as presented in the following extension cycle (Figure 2). Participation in farmers boards should reflect a broad social spectrum but should also be segmented according to the technical skills and extension requirements of the category of farmers. For example, a traditional tomato grower does not have the same export requirements as a grower of cut flowers for export.

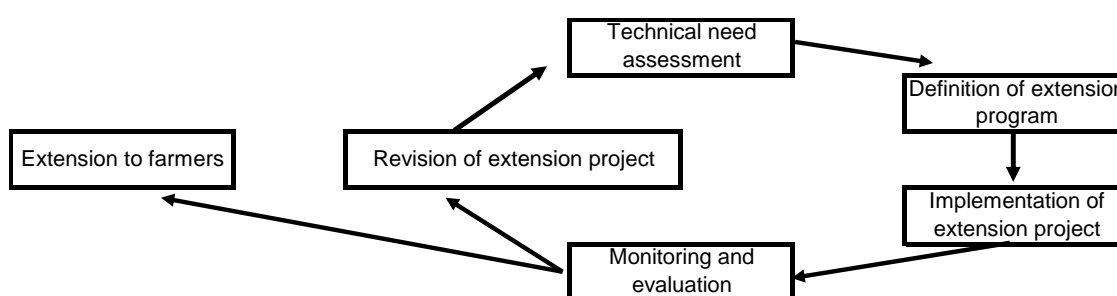


Figure 2: Proposition of an extension cycle

The technical need assessment would be the starting point of the extension cycle carried out annually in collaboration with the farmers. During this phase, the farmers would have to identify the problems encountered and examine the constraints that are causing the problems. This first step would develop the extension programs that will be carried out in NCARE Research Station by the RDU. A participatory monitoring and evaluation of the extension program should occur during its implementation to validate the first conclusions or define possible adjustments. After its technical and scientific validation, the extension message could be delivered to a broader population of farmers using the corresponding service.

### 2.1.2 Develop an interactive training process

Knowledge should be gained through interactive processes and the participants must be encouraged to make their own decisions. The learning by doing process, through the establishment of pilot farms and demonstration sites already experimented, should be replicated at a larger scale and must include other agronomic topics (e.g. IPM, fertilisation, variety screening). Training contents should be planned depending on farmers' technical skills and should not be addressed only to farm owners but also to permanent labour.

### 2.1.3 Improve the visibility of planning

The visibility of actions and experimental results should be presented through the publication of technical reports and field visits. Main technical messages should be summed up and presented using technical sheets that utilise an adapted scientific language convenient for farmers. Media to broadcast results could also be used to reach a broader population of farmers (e.g. radio, newspaper, etc.)

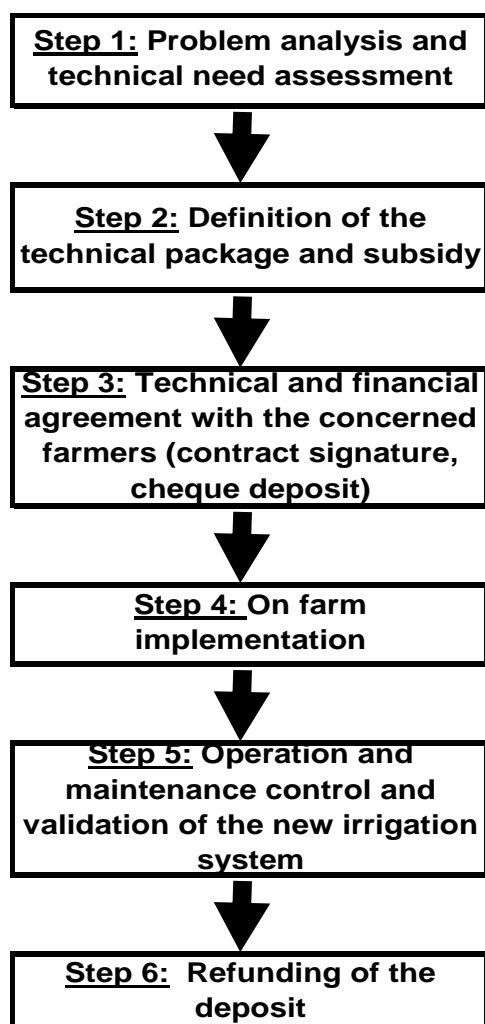
16 April 2008 workshop output:

*The participants supported the above recommendations of the IrWa Project and called attention to the urgency of ensuring Water Users' Associations be structured to include all water users without any socio economic class differentiation. It is imperative that the entire community have a voice in the allocation of water for irrigation. The failure to include a portion of the community leads to misuse of the resource and conflict in the community.*

*Another comment of the participants was that in Lebanon and Jordan until recently extension service has been weak, and the private sector has filled the role of advisor to farmers, albeit with a product specific agenda. The group felt that the private sector has important experience and connections in the agricultural communities, and that it should not be excluded from contributing to public extension services in the future.*

*A complete summary of the comments on the above recommendations from the workshop is presented in Appendix II: Summary of IrWa Working Group Recommendations: Working Group 3.*

## 2.2 Develop on-farm methodology for irrigation system modernisation



A similar approach, including farmers' participatory management, is required to develop adapted on-farm irrigation modernisation. The step by step methodology developed by IrWa project in collaboration with farmers associations has shown encouraging results and could be used as baseline to reach a broader population of farmers and strengthen existing WUA. This policy would match JVA policy to promote decentralised water distribution management at the network level. The financial and technical support provided through the WUA will encourage membership and promote the sustainability of the project's activities.

Below are some propositions to ameliorate the existing methodology with emphasis on the empowerment of WUA and NCARE extension service in the process of irrigation modernisation in the Jordan Valley

### 2.2.1 Coordination among the different actors

The Irrigation Optimisation Unit of NCARE extension service could be in charge of the field assessment, definition of the technical package and irrigation network validation. The farmers benefiting from the modernisation process will be responsible for the material installation, operation and maintenance.

The WUA should not only benefit from the financial and technical support but also be involved in the overall process of modernisation, starting from approval of the technical recommendations all the way to their dissemination to the farmers' communities. In addition, the association should be in charge of the farmers' technical commitment. For example, the farmer could provide the association with a deposit after the contract signature. This deposit will be provided back to the farmer once the new irrigation network has been validated by the Irrigation Optimisation Unit.

Figure 3: Step by step methodology for on farm irrigation optimisation

*16 April 2008 Workshop output:*

*The working groups only had time to discuss 2.2.1 "Coordination among the Different Actors." Overall the participants accepted all of the recommendations of the IrWa project. In their discussion, they stressed that farmers take time to decide to accept and invest in modern irrigation systems requiring long term project approaches. The more farmers of all kinds participate in the planning for modern irrigations systems, the more likely they will be to adopt them on-farm.*

*Again, demonstration plots of land leased from private farmers are an effective tool that allows extension agents to both gather information and enable farmers to understand and compare quantified improvements in water savings and agricultural outputs that can result from modernized irrigation technology.*

*A complete summary of the comments on the above recommendations from the workshop is presented in Appendix II: Summary of IrWa Working Group Recommendations: Working Group 4.*

### 2.2.2 *Determination of subsidy rate*

Implementing modern water saving techniques are activities that entail significant investments which are currently out of reach for small Jordanian farmers and therefore requires setting a clear financial policy. In this context, two major issues should be distinguished: the amount of subsidy received by the farmers to modernise their irrigation systems, and their financial contribution paid to the WUA. If the amount of financial contribution provided to the association can be settled according to the association's internal policy, the subsidies for modernisation should be fixed according to criteria that allow all community segments to benefit from the modernisation process.

The socio-economic criterion, as basis for subsidy evaluation, has been broadly used in the Middle East (e.g. Syria and Egypt). This criterion, in addition to others such as the efficiency of the farm technology chosen by the farmer, are currently being used by the IOJoV<sup>4</sup> project in Jordan (financed by AFD) and could be replicated.

### 2.2.3 *Investigation of new means for financing the modernisation process*

According to the local context, the development of a credit policy does not seem efficient, in a first attempt, to support irrigation modernisation (time-consuming and requires important educational skills from farmers). On the contrary, adapted subsidies policy could enable farmers of all social classes to benefit from the technological transfer. In an attempt to investigate new financing programmes, the following hypotheses could be studied:

- Financing through regular grants provided by the state or donors with consistent frame (rates, maximum amount per farmer / farm / area, equipment aimed, technical requirements...).
- Reimbursing modernisation cost through maintenance operations at the network level performed by the beneficiaries themselves and through the WUA.
- Subsidising parts of the required materials needed for modernising the irrigation systems, provided the recipient purchases component parts to complete the installation.

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<sup>4</sup> A project implemented in the North Jordan Valley by Société du Canal de Provence (SCP) and Methods for Irrigation and Agriculture (MIRRA) in collaboration with JVA.



## CONCLUSIONS

The global approach proposed by the IrWa project to promote irrigation modernisation strongly relies on two aspects: the empowerment of farmers and building an effective public extension service. The quality of the extension messages and the concrete involvement of farmers in extension strategy planning are key elements for the success of extension services and for re-establishing its credibility by the farming community. To accomplish this, NCARE and LRA will need to develop an innovative approach for agricultural extension to accommodate their mandate. The focal point should be the efficient transition from the persuasive and paternalistic technology transfer towards developing an educational and participatory methodology that focuses on the empowerment of farmers. Moreover, to be a key player in irrigation modernisation, NCARE will have to overcome its current organisational and financial constraints.

NCARE needs the flexibility to generate income adequate to ensure the financial sustainability of its operations, as is already the case for LRA in Lebanon. IrWa project strongly recommends that NCARE's charter be modified to become a semi-public body with the mandate to assist farmers through extension service and the flexibility to engage in self sustaining revenue generating activities. This can best be achieved with a two pronged approach, first to increase the financial participation of agricultural stakeholders through a direct or indirect contribution, and second to adopt a commercial approach for marketing the production of the six NCARE research centres in Jordan.

To reach these objectives and implement its new mandate, NCARE will have to launch important internal institutional reforms. The collaboration with international funding agencies and international and local expertise is regarded as a tool that will facilitate the establishment of these new structures.

In Lebanon the LRA has made a good beginning in the area of extension services, and the IrWa project recommends that the extension methodology be refined and expanded with the goal of ensuring a sustainable and ongoing extension program for Lebanese farmers.

If the WUAs are to play a concrete role in water management in the future, then it is an absolute necessity to build their knowledge and capacity for irrigation modernisation and for them to assume their new functions. Adapted and well-oriented capacity building programmes will need to be provided to the WUAs to enable them to serve their core function: equitable water distribution to all the users relying on existing social structure. Furthermore, a constant focus on policy efficiency should be institutionalised and a periodical evaluation by an independent body will be required.

With government commitment, extension services can rapidly evolve to become innovative and consensus building organizations that empower farmers to influence policy making in their communities. With widespread adoption of modern water management techniques and with good quality and impartial advice and testing services available to farmers, Jordan and Lebanon can create sustainable agricultural systems that will be productive and profitable and make maximum use of restricted water supplies. The possibility to share the activities and avoid duplication between the two countries could also benefit other neighbouring countries.

## APPENDIX I : ACRONYMS & ABBREVIATIONS

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AFD:	Agence Française de Développement (French Development Agency)
APREL:	Association Provençal de Recherche Expérimentation Légumière
Ctifl:	Centre technique interprofessionnel des fruits et légumes
CEMAGREF	Agriculture and Environmental Engineering Research
EC:	Electrical Conductivity
GDP:	Gross Domestic Product
GTZ:	Gesellschaft für Technische Zusammenarbeit (German Technical Cooperation)
IFM:	Integrated Fertilisation Management
IOJoV:	Irrigation Optimisation in the Jordan Valley
IPM:	Integrated Pest Management
IrWa:	Improvement of Irrigation Water Management in Lebanon and Jordan
JVA:	Jordan Valley Authority
LRA:	Litani River Authority
MIRRA:	Methods for Irrigation and Agriculture
MoA:	Ministry of Agriculture
MREA:	Mission Régionale Eau Agriculture
NCARE:	National Centre for Agricultural Research and Extension
NCARTT:	National Centre for Agricultural Research and Technological Transfer
NGO:	Non Governmental Organisation
RDU:	Research and Development Unit
SCP:	Société du Canal de Provence
WUA:	Water User Association

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**APPENDIX II: SUMMARY OF IRWA WORKING GROUP RECOMMENDATIONS**

**Working Group 1. BUILD A PROPER FRAMEWORK WITH A CLEAR AND STABLE MANDATE FOR THE NEW EXTENSION SERVICE**

- a. Develop specialised services for farmers
- b. Develop the Centre’s human resources: Establish a pool of skilled field engineers
- c. Create networking channels and meeting platforms that include farmers

The Working Group<sup>5</sup> agreed with the IrWa recommendations, but they made some clarifications outlined below. Because of time constraints, the group did not have time to discuss networking platforms for coordination.

Recommendation	Stakeholders Identified:	Required Action
<ul style="list-style-type: none"> <li>▪ Activate the technical units that provide assistance to the farmers</li> <li>▪ Extension services must be close to farmers, 10 km away not 100 km.</li> <li>▪ Research should be conducted on-site. This will help farmers be convinced of results.</li> <li>▪ Provide impartial evaluations of irrigation equipment systems to enable farmers decision making.</li> <li>▪ Create a national forum to coordinate activities</li> </ul>	<ul style="list-style-type: none"> <li>▪ Ministry of Agriculture</li> <li>▪ NCARE</li> <li>▪ JVA</li> <li>▪ JISM</li> <li>▪ LRA</li> <li>▪ Other Water Authorities</li> <li>▪ Ministry of Energy and Water</li> </ul>	<ul style="list-style-type: none"> <li>▪ Make a clear integrated strategy for working units and provide them with means and incentives to cooperate.</li> <li>▪ Provide the technical units with logistical facilities (laboratories, communication, transportation)</li> <li>▪ Ensure that laboratories are adequately equipped.</li> <li>▪ Create on-farm demo plots</li> <li>▪ Equip NCARE to test irrigation equipment and be able to give recommendations</li> <li>▪ Work towards standardization of equipment and evaluation criteria. Establish protocols for this.</li> <li>▪ Fix periodic meetings.</li> <li>▪ Engage in capacity building exercises for farmers associations to enable them to participate effectively.</li> </ul>

In Jordan, the Ministry of Water & Irrigation is in the process of developing a policy for irrigation equipment. Eventually, they will offer certification for technicians to design irrigation equipment in the field, and also they will certify the equipment itself, be it imported or local manufacture, according to three categories.

<sup>5</sup> Working Group 1 members included Mohammed Abu Hammour (NCARE); Eng. Alaa Wahbeh (NCARE), Kamal Kaara (LRA), Guillaume Panzani (French Embassy), Andre Zouein (LRA), and Nassim Abou Hamad (AVSI).

**Working Group 2. GENERATE FINANCIAL STABILITY FOR EXTENSION SERVICE AGENCIES:**

- a. Develop specialised services for farmers
- b. Develop the Centre’s human resources: Establish a pool of skilled field engineers
- c. Create networking channels and meeting platforms that include farmers

In the workshop, the participants<sup>6</sup> accepted the above recommendation for NCARE in Jordan .

Recommendation	Stakeholders	Required Action
<p><b>Jordan:</b></p> <ul style="list-style-type: none"> <li>▪ Change the current status of NCARE to become independent or at least semi-governmental. Then NCARE can legally generate income.</li> <li>▪ This would require creating a new organization and a new structure in Jordan.</li> <li>▪ Increase cooperation between LRA &amp; NCARE &amp; JVA</li> </ul> <p><b>Jordan &amp; Lebanon:</b></p> <ul style="list-style-type: none"> <li>▪ If an agriculture support organization wants to be financed by the stakeholders, than the organization should focus on giving stakeholders opportunities to generate more income themselves.</li> </ul>	<p>NCARE</p> <p>Min of Finance</p> <p>Farmers Associations</p> <p>Private Sector</p>	<ul style="list-style-type: none"> <li>▪ Increase farmers’ financial contribution to NCARE or subsequent organization.</li> <li>▪ Increase farmers’ income by providing adapted services.</li> <li>▪ The participants agreed that after the IrWa project ends, coordination between Jordan and Lebanon should continue.</li> <li>▪ Consider the UN Program ESCWA. It has a mandate to support inter-regional agricultural cooperation.<sup>7</sup></li> <li>▪ Benefit from the LRA experience: it is an autonomous body that can generate its income through water management, selling water for irrigation or for drinking, also selling electricity.</li> <li>▪ Developing marketing units,</li> <li>▪ Test new crops to open new market perspective on the regional or local level.</li> <li>▪ In Lebanon, the LRA and partners plan to create production units both to generate income and at the same time to demonstrate to farmers how they too can improve yields and profitability with modern agricultural techniques and new seeds/plants.</li> </ul>

Regarding sources of financing, there are positives and negatives to various sources of financing to support modernization of agriculture. These sources include donors, and systems of subsidies or credit for farmers or farmers’ associations. The Working Group stressed that intensive analysis was one approach to identifying the best system of finance. It is urgent to understand the cost structure of individual farms. What is their capacity to self-finance, and knowing their budget we can suggest best modernization appropriate for their budgets? Then it becomes more possible to define the potential pace of progress in the total sector.

<sup>6</sup> Working Group 2 members included Ali Aboud (LRA); Selim Catafago (LRA); Adrien Peyre (IrWa); Dr. Esmat Al Kharadsheh (IrWa), Nayef Seder (JVA), and Annemarie Vanderspek (RMSU).

<sup>7</sup> Contact is Mohammed Abdul Razzak, Chief of PPTCD - water & energy project (00961-1 978818)

**Working Group 3:<sup>8</sup> METHODOLOGICAL LEVEL: PROMOTING A GRASSROOTS APPROACH**

Include farmers in extension methodology planning

Develop an interactive training process

Improve the visibility of planning

The Working Group supported the above recommendations of IrWa project. However, some working group members did not agree that the farmers' association should be in charge of determining the technical need, instead they felt that this can be done better by experts or by extension agents. Others felt that farmers are competent to identify what kind of technology they need. Both stressed the importance of farmers associations including all kinds of farmers (rich, poor, small, large, across ethnic boundaries).

Recommendation	Stakeholders	Required Action
<ul style="list-style-type: none"> <li>▪ Create Farmers' board of advisors</li> <li>▪ Encourage the introduction and adoption of new crops and varieties.</li> <li>▪ Strengthen the institutions in charge of extension.</li> <li>▪ Consider farmers' responsibility to agricultural workers who are not nationals.</li> </ul>	<ul style="list-style-type: none"> <li>Farmers associations</li> <li>Universities (are not well linked at present)</li> <li>International experts</li> <li>Ministry of Agriculture</li> <li>Ministry of Energy</li> <li>Ministry of Water</li> <li>Private sector</li> <li>Non profit orgs</li> <li>Municipalities</li> <li>Local Water Authorities</li> <li>Agricultural Research Institutions, public &amp; private</li> </ul>	<ul style="list-style-type: none"> <li>▪ Create interaction b/t stakeholders via regular meetings.</li> <li>▪ Extension must stay close to farmers, to define their needs, and to meet them. Needs may change ongoing basis.</li> <li>▪ Bear in mind that Farmers Associations are not always representative or inclusive.</li> <li>▪ Formalize agreements w/ farmers to make demo plots in their own fields for the benefit of researchers and extension agents.</li> <li>▪ Strengthen government involvement in extension services</li> <li>▪ Use the private sector's experience to extend and provide extension services. At present the private sector is the only active party in extension. Despite conflicts of interest the private sector has an important voice.</li> <li>▪ Decentralize the extension centres to ensure proper budget and proper policy INDEPENDENT of the govt.</li> <li>▪ The contribution of Egyptian workers in Jordan and Syrian workers in Lebanon to the success of farm enterprises should not be overlooked.</li> <li>▪ Create applied action and research centres at universities, and linkages with international scholarship. Influence university students to do practical trainings/research at the farm level.</li> <li>▪ Involve women in trainings.</li> </ul>

One participant commented: "In Lebanon we have farmers of high and low technical knowledge. Normally extension is addressing the lower knowledge base, because they have greater need of assistance. Those that have experience will need another kind of assistance, not extension but credits and investment." The aim of the researchers is to find proper technology for the farmers.

<sup>8</sup> **Members of Working Group #3 were:** Samiir Abdel Jabbar (GTZ); Laith Al Wakid (MREA), Renata Raad (IrWa Lebanon), Celine Papin (ACP), Mauro van Aken (University of Milan), Majida Mcheik (ICU Lebanon).

### Working Group 4:<sup>9</sup> Develop adapted on-farm methodology for irrigation system modernisation in collaboration with farmers' associations

The Working Group #4 approved IrWa Project's recommendations. The participants stressed that encouraging farmers to adopt modern irrigation systems takes time, time for farmers to become convinced that it is necessary and time for farmers to gather the financing to enable what can be a substantial investment in current irrigation technology.

The Working group stressed that there should be participatory management involving all of the stakeholders, and that a step by step approach should be adopted, to enable farmers to adopt modern irrigation technology at a pace that they and their workers can manage successfully.

In the workshop, the group had time only to focus on 4.a. Coordination among the different actors.

Recommendation	Stakeholders	Required Action
Develop adapted on-farm methodology to modernize irrigation systems in cooperation with Farmers Associations.	<ul style="list-style-type: none"> <li>▪ End Users: Farmers &amp; Water Users Associations (WUA)</li> <li>▪ Research institutions such as NCARE, LARI, LRA and others who will develop adapted methods.</li> <li>▪ Extension agents within public organizations such as NCARE, the LRA, and the Ministries of Agriculture in Lebanon and Jordan.</li> <li>▪ Dealers of agricultural equipment</li> <li>▪ Manufacturers of irrigation equipment, local or international.</li> <li>▪ Water Management Organizations such as the JVA and the LRA</li> <li>▪ National government</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify the current local situation, this can include a cost/benefit analysis at farm level as well as an evaluation of the social position of individual farmers within each FA.</li> <li>▪ Identify bottlenecks, this can include bottlenecks in the water distribution system, in the technology available for adoption, in the current traditional irrigation practices of the farmers, as well as the legal structure in the country.</li> <li>▪ Propose solutions for each bottleneck. Will farmers need support to meet the cost of implementing the new technology? Will modernizing their irrigation require more or less manpower, and if less will it cost valuable jobs for the community?</li> <li>▪ Extend the strategy and the ongoing implementation of research and development on test farms and on private farms, both to gather information and, importantly, to enable farmers to understand and to compare the quantified improvements in water saving and agricultural outputs that result from modernized irrigation using various methods or product lines.</li> </ul>

In the discussion, the Working Group felt that agricultural equipment dealers are important stakeholders, and that they and the equipment manufacturers have an interest in making upgraded equipment available to farmers. This can lead to conflicts of interest, for example a dealer's interest to sell products could override best practice for the farmers. .

The government should clarify where money should be spent. Farmers and stakeholders will benefit if they can access unbiased evaluations of the performance of competing irrigations systems and products from elsewhere.

<sup>9</sup> Working Group 4 was composed of Michele De Sanctis (IrWa Lebanon), Haidar Malhas (MREA), Dr. Moein Qaruti (NCARE), Akram Bqain (University of Jordan), and Dr. Bruno Molle (Cemagref).

### APPENDIX III: IRWA CONCLUDING WORKSHOP PARTICIPANTS

IrWa Final Workshop Participants 16 April, 2008 Amman		
	Organization	Name
1	IrWa Jordan	Esmat Karadsheh
2	IrWa Jordan	Adrien Peyre
3	IrWa Jordan	Tommaso Merlo
4	IrWa Lebanon	Michele Desancitis
5	IrWa Lebanon	Renata Raad
6	ICU	Josè Antonio Naya
7	ICU (Leb)	Majida Mcheik
8	AVSI	Nassim Abou Mana
9	LRA	Ali Abboud
10	LRA	Selim Catafago
11	LRA	Kamal Kaara
12	LRA	Andre Zouein
13	NCARE	Moein Qaruti
14	NCARE	Majid Dibaj
15	NCARE	Mohammed Dabbas
16	NCARE	Alaa Wahbeh
17	NCARE	Ali Garaibeh
18	NCARE	Mawiya Mufti
19	NCARE	Ahed Qudah
20	NCARE	Mohammed Abu- Hammour
21	JVA	N. Seder
22	GTZ	Samir Abdel Jabbar
23	ACP	Celine Papin
24	French Embassy	Guillaume Panzani
25	MIRRA	Nour Habjoka
26	MREA	Haidar Malhas
27	MREA	Laith Wakid
28	EU	Danuta Ghuff
29	RMSU	Gert Soer
30	RMSU	Annemarie Vanderspek
31	Jordan University	Akram Bqain
32	Balqa Univ	Basim Abbasi
33	Cemagref	Bruno Molle
34	University of Milan	Mauro van Aken
35	MoA Jordan	Ahmad Garrageir
36	MoA Jordan	Hani Zidan
37	MoA Jordan	Nidal Bader
38	Facilitator	Ibba Augustein
39	Reporter	Sarah Harpending
40	JVA/ Mwi	Khaled Qussous
41	JVA/ Mwi	Yousef Hasan
42	aimas	Walid Awwad
43	aimas	Lara Zyadein
44	JEPA	Mutassin Hiyari
45	JEPA	Anwar Haddad
46	Italian Cooperation for Dev	Amjad Yaaqba
47	Petra	Hamzeh Mizhir
48	Petra	Mohammed Asha
49	IRWA Jordan	Sajeda Shawa
50	IRWA Jordan	Samanta Ferrari

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