III. EVOLUTION OF THE THEMATIC AND ADMINISTRATIVE STRUCTURES OF THE INITIATIVE

A. Program objectives and components

The technical objective of the Initiative at inception was "to contribute to the control of natural resource degradation, and, where applicable, to restore productivity of arid lands in the Middle East." This objective had been similarly expressed in a series of Arab-Israeli peace agreements, in which common environmental issues were identified as targets for peaceful cooperation. Several such bilateral agreements were in place. The *Memorandum of Understanding on Agriculture* between Egypt and Israel signed in March 1980 had called for cooperation on "joint applied agricultural arid and semi-arid zone research" and the conduct of joint inventories of wild species.

The Israeli-Palestinian agreement reached at Oslo, the *Declaration of Principles on Interim Self-Government Arrangements*, signed by Mahmoud Abbas and Shimon Peres in September 1993, contained annexes prescribing similar forms of cooperation. Annex IV called for "a regional plan for agricultural development, including a coordinated regional effort for the prevention of desertification" Annex IV 3 of the agreement identified the "various multilateral working groups" as the agents of this regional coordination, working through "inter-session activities" and conducting pre-feasibility and feasibility studies. Annex VI contained a *Protocol Concerning Israeli-Palestinian Cooperation Programs*, which called for "joint effort to combat desertification and encourage the development of agricultural projects in arid and semi-arid areas" (Article V.2.f), and the "development of programs of combating desertification" (Article V.3.b.5).

The Israeli-Jordanian Peace Treaty of October 1994 similarly contained an Annex devoted to *Environment*, calling upon the two parties to "acknowledge the importance of the ecology of the region, its high environmental sensitivity" and to "recognize the need for conservation of natural resources… and the imperative of attaining economic growth based on sustainable development principles" such that "both Parties agree to co-operate in matters relating to environmental protection." The Annex further prescribed combating desertification through the exchange of information and research knowledge and the implementation of suitable technologies (Figure 21).

The multilateral Dryland Initiative therefore shared well-defined objectives and themes with individual bilateral peace agreements between Israel and her neighbors. Desertification was one of a number of closely-related thematic areas to be addressed by regional cooperation on the environment. The August 1993 regional consultative mission organized by the WGE focused on four such themes: *Marginal Water and Saline Soils, Germplasm for Arid Lands, Economic Forestry and Orchards*, and *Rangeland and Livestock Management*. The availability of

Figure 21: Arid drylands in spring flowering; Tunisia (sandy soil).

Figure 22: Gully erosion in an arid rangeland, Negev Desert, Israel.

freshwater for agriculture could be improved with technologies to make marginal water resources like brackish and waste water usable for irrigation. The high incidence of saline soils in the region pointed to the development of salt-tolerant plants through plant breeding and germplasm utilization. Plant breeding would also focus on trees and shrubs used for soil conservation and restoration while providing economic returns from the production of forages, wood products, nuts, and fruits. Management of the region's vast rangelands, the most extensive natural resource in the drylands, would promote the judicious grazing rates calculated to assure sustainable returns. Research, technology sharing, training, and identification of investment priorities were to be undertaken along the lines of these four themes.

National membership in the Working Group on the Environment and its sister multilateral working groups formed at the Madrid Peace Conference was exclusive to countries participating in the Middle East peace process, and the Dryland Initiative was inextricably related to the peace process. Three of the countries that agreed to participate in the Initiative shared borders with Israel: Egypt, Jordan, and the Palestinian National Authority. Tunisia, the only non-contiguous party, joined based on the country's pioneering efforts to resolve the Arab-Israeli conflict during the period leading to Madrid, as well as on shared concerns over dryland resources management.

Once the selection of these five countries was agreed upon, responsibility for the regional activities based on the four themes set down by the WGE would be divided among the parties. The assignment of responsibility for the themes would be determined by the respective themes' prominence in each country, and by an estimation of the expertise on the theme residing in the country. Four thematic Regional Support Programs (RSPs) would be divided among the five parties accordingly.

Egypt, given its rich agricultural experience using dryland-adapted crops irrigated with Nile River water, assumed the role of coordinator of the *Germplasm for Arid Lands* regional program. Israel, renowned for its dryland afforestation initiatives, would coordinate *Economic Afforestation and Orchards*. Jordan, where a large proportion of the population subsist or otherwise rely on livestock, would coordinate *Rangeland and Livestock Management*. Tunisia, which had grappled with problems of soil salinization and low water quality in its southern regions for centuries, would coordinate the regional program devoted to *Marginal Water and Saline Soils*. Finally the PNA, given its recent emergence and urgent need for capacity building, would seek to develop this capacity through joint interaction with experts from the four other countries, participating in all four regional thematic programs simultaneously. Within each country National Support Activities (NSAs) would be organized around all four themes.

The arrangement of thematic Regional Support Programs (RSPs) and corresponding National Support Activities represented the structure with which the Initiative would seek to build mutual trust and confidence and tighten regional cooperation. Regional Experts of the five participating countries first met at the fourth meeting of the WGE in Cairo in December 1993 and would collaborate intensively for five months to define the roles and work programs of the RSPs and NSAs. Each Regional Support Program

would undertake analysis of data collected by the five Initiative partners, conduct training and joint study tours, and prepare feasibility studies based on the information collected and exchanged relating to the Program's theme. An additional program would be devoted to capacity building in the West Bank and Gaza Strip. National Support Activities would consist of pilot projects designed to identify suitable forms of investment in the four thematic areas within the particular contexts of the respective countries. The findings of these thematic national-level activities would inform and be incorporated into the formulation of larger RSP thematic strategies.

The development of the regional and national program components along these lines was facilitated by the World Bank, and also benefited from collaboration with the Arab Organization for Agricultural Development (AOAD), the European Union, the UN Food and Agriculture Organization (FAO), the International Center for Agricultural Research in the Dry Areas (ICARDA), and the government of Spain. The involvement and support of these international partners assured a high level of accountability in the overall conduct of the Initiative, and entailed regular reporting, sound management of financial resources, and responsible managerial oversight. It also encouraged the use of participatory approaches to involve local communities in the conduct of the National Support Activities. The capacities of the national institutions responsible for carrying out Regional Support Programs and their corresponding National Support Activities were carefully scrutinized by the national governments. The Regional Experts shared responsibility for implementing RSPs and NSAs with these national institutions, and were supported by a Facilitation Unit for the Initiative that ICARDA established in Cairo. ICARDA also sat on the Initiative's Steering Committee alongside participating country representatives, the Regional Experts, and donor countries and institutions – including the World Bank, which chaired the Committee.

Steering Committee meetings were held once a year, usually in the context of a larger annual meeting known as the Donor Consultation Meeting, which admitted participation by a broader range of interested institutions and countries. During these annual meetings, participants reviewed achievements and discussed and authorized the coming year's program and budget. Phase I of the Initiative was launched in August 1996 with a budget of US$7 million, contributed or pledged by the World Bank, Switzerland, Luxembourg, Japan, the US, the Republic of Korea, and Canada. These contributions and pledges were complemented by in-kind and financial inputs by the five participating countries.

The Initiative was thus served by broad international support and an innovative program purposefully designed to foster bilateral and multilateral technical cooperation between national teams of experts. In practice this scope of cooperation would not be realized. Mutual visitation between NSA and RSP teams was a fundamental guiding principle of technical cooperation set down in the Initiative's design. Thematic Regional Support Programs coordinated by one country were to support corresponding thematic National Support Activities in all five countries. Provision of this support was to take place in very large measure through RSP experts' visits to NSA sites. RSP coordinators were also charged with organizing periodic meetings of all NSA teams working on the RSP's theme, another important mechanism for cooperation. With the exception of three initial planning meetings convened in Cairo, Tunis, and Amman, no such meetings would take place. Annual Steering Committee meetings in Paris thus became the only meetings at which the Regional Experts came together to represent their national teams.

Despite the failure to fulfill the Initiative's optimistic agenda for Arab-Israeli technical cooperation, Phase I of the Initiative did see the implementation of all of

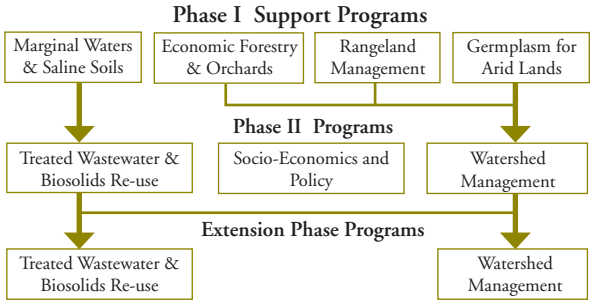

Figure 23: Support Programs of the different phases of the RIDM

the thematic NSA programs in each of the five partner countries (Figure 23).

Marginal Water and Saline Soils national activities operating within the Tunisian-led regional program tested and demonstrated the effects of irrigation using marginal waters on crops in Egypt, Israel, the PNA, and Tunisia. The effects of marginal water applications on fodder plants and fuelwood plantations were also studied by Jordanian and Tunisian NSAs. The Egyptian *Marginal Water and Saline Soils* program experimented with applications of mixed brackish, drainage, and treated wastewater, and the Tunisian NSA experimented with treated surface wastewater. Israeli national support activities used marginal waters for subsurface drip irrigation, and applied disinfected drainage water in greenhouses. PNA national activity trials experimented with wastewater treated in duckweed ponds. Jordan's NSA worked with biosolids and wastewater plantations. Saline soils were however not taken up by any of the national support activities under the Marginal Water and Saline Soils theme.

National Support Activities relating to *Germplasm for Arid Lands* took up a variety of experiments relevant to the regional program coordinated by Egypt. Egyptian and Jordanian NSAs undertook inventories of plant biodiversity in rangelands to identify indigenous forage, medicinal, herbal, and aromatic plant species. The Egyptian NSA also explored the development of techniques for propagating useful shrubs in nurseries. The Tunisian national activity treated the development of *in-situ* methods of conserving range species and endangered varieties of fruit trees within reclaimed run-off harvesting systems. The Israeli *Germplasm* team tested forage species for genetic variability along the aridity gradient.

NSAs relating to the Israeli-led *Economic Forestry and Orchards* RSP included the development of systematically monitored water harvesting systems combining livestock, fodder, and fuelwood production in Israel (Figure 24). The Jordanian NSA focused on the development of methods for regenerating natural oak forests. The Egyptian NSA experimented with water harvesting techniques for optimizing yields and increasing incomes using a variety of land use designs employing differing proportions of area allocated to the production of fruit trees, wood trees, shrubs, and fodder production.

Jordan coordinated the *Rangeland Management* RSP of the Initiative, which Egyptian and Tunisian NSAs pursued through the propagation of range shrubs and which the PNA pursued through the support of fodder, shrub, and tree species. Every party in the Initiative examined the potential roles of seed collection and sowing in improving rangelands.

Figure 24: Afforestation – saplings on large earth dykes, protected by plastic cylinders from browsing by livestock; Israel

Jordan's own activities tested and demonstrated water harvesting techniques to improve indigenous range species. The Tunisian NSA focused on planted range species.

Phase I of the Initiative suffered from a number of shortcomings. Whereas the Initiative was designed to treat desertification using integrated multi-disciplinary approaches, its actual implementation tended to address desertification as a technical problem, largely neglecting socio-economic and policy factors that contribute to land degradation. Priority was therefore generally given to the elaboration of technical solutions, with significantly less focus on the role of local populations in project areas, including their customs, needs, and tenure status. In order to quickly achieve visible results, incentives for participating farmers were often artificially and unrealistically raised, in some cases covering all investment costs for land preparation, seedlings, irrigation, and other inputs. Results in the field therefore often failed to establish whether an investment was economically feasible, self-sustainable, or socially acceptable to target groups. Most NSAs were moreover carried out on relatively small areas and involved very small target groups, making it difficult to calculate the potential for scaling the projects up spatially or among larger groups.

NSAs also tended to be carried out by practitioners of a particular specialization rather than by multidisciplinary teams. NSA teams tended to view land degradation strictly in terms of agricultural development, applying a flawed notion of dryland ecosystems' natural stability. Drylands in fact are inherently unstable, with naturally high variability between years. Several NSAs therefore attempted to reverse degradation where in reality it did not exist, but rather conditions at the time reflected a cyclical low point in the area's biological productivity. The overemphasis on agricultural solutions led NSAs to neglect alternatives to agriculture. Tourism for instance is growing in a number of areas in the five countries, and recreational uses of local ecosystems may well be less degrading to the resource base and more economically viable than agriculture or livestock production. The agricultural solutions that NSAs did arrive at tended to underutilize existing knowledge sources and the experience accumulated in earlier projects carried out in their countries.

Figure 25: A new cistern built by the Initiative in the Jordanian rangeland

Phase II saw a change in the Initiative's formal designation. The original title, the "Initiative for Collaboration to Control Natural Resource Degradation (Desertification) of Arid Lands in the Middle East," was replaced by the "Regional Initiative for Dryland Management" (RIDM). The change of orientation from *desertification* to *dryland management* reflected a broader conception of dryland resources that transcended the narrower dimension of land degradation. A new program structure was developed in the year leading up to the transition from Phase I to Phase II in 2000. This transition period saw a brief spike in regional cooperation that had been lacking during most of the life of Phase I. A series of five national planning meetings took place in the respective participating countries between November 1998 and March 1999, as Phase I was approaching completion. The five national planning meetings used a participatory workshop format based on GTZ's participatory *Oriented Project Planning* (ZOPP)

model, and included national stakeholders outside of Initiative teams. In June 1999 an External Review Mission visited all Initiative sites and interviewed NSA teams and other stakeholders, submitting a comprehensive report to the Steering Committee in September 1999 recommending that planning for Phase II should begin. A planning meeting of all Initiative teams took place the following month in Israel, the first time that every Initiative party came together to meet in Israel. In January 2000 Initiative teams participated in a traveling workshop that visited Phase I sites in each partner country. The transition period culminated in February 2000 with a joint planning ZOPP-guided workshop of all country teams in Sharm el Sheikh, where a detailed Phase II plan was agreed upon. The plan was presented and endorsed at the Steering Committee meeting in Paris in June 2000. Phase II—the RIDM—was launched the following month.

Phase II was designed to shift the Initiative's emphasis away from relatively discrete, self-contained technical projects and toward more mainstream projects that were embedded or "anchored" within larger national development programs. Non-Initiative national project teams would be encouraged to design projects to produce results of greater regional significance, and more suitable for the exchange of information and technical cooperation. *National Coordinators* would replace the Regional Experts employed in Phase I and National Management Committees would bring together National Coordinators and colleagues representing national projects, within which Initiative projects would now be anchored.

The design of Phase II also reflected recognition of the fragility of the peace process and of the limits that political concerns impose on collaboration between team members of different nationalities. (Most RSP and NSA team members were after all employed by their respective governments.) While the promotion of technical cooperation between Arab and Israeli counterparts remained the *raison d'etre* of the Initiative, Phase II was designed with contingency elements to allow for possible interruptions to the peace process. Regional cooperation would be channeled into a set number of meetings held at sites of mutual convenience, including sites outside the region.

Phase II was organized into three programs: *Watershed Management* (WSM), *Treated Wastewater and Bio-Solids Use*, and *Socio-Economy and Policy* (SEP). Linking these three thematic elements together would make Phase II substantially more multidisciplinary than its precursor, and was intended to achieve greater integration of biophysical and socioeconomic work.

Watershed Management programs continued and elaborated on the work of the germplasm, forestry, and rangelands thematic programs and activities of Phase I. Watershed Management would focus on the use of water harvesting practices in cultivating a range of agricultural, horticultural, and forage plants (Figure 26). Community demonstration sites involved in the Egyptian, Jordanian, and Tunisian programs experimented with forage species, cereals, olives, and almonds. New forage species were introduced in the Jordanian and Tunisian programs,

Figure 26: Contour terraces in a Wadi; West Bank.

and the Jordanian program demonstrated the use of feeding blocks and animal sheds in curtailing overgrazing in protected areas. The PNA program worked on the regeneration of natural forages and the Israeli program focused on afforestation species. The use of nurseries for propagation of a variety of plant species for transfer to local communities was undertaken in Egypt, Jordan, the PNA, and Tunisia. The cultivation of herbal and medicinal plants was promoted in Jordan.

Treated Wastewater and Biosolids Re-use programs built on the work of the Phase I Marginal Waters NSAs and were likewise introduced in all five countries. The Israeli and Tunisian programs experimented with tertiary treatment. Egyptian, Israeli, and Jordanian programs experimented with secondary treatment, and the PNA program addressed both primary and secondary treatment. These different quality water sources were applied to an array of crops and soils.

Socio-Economy and Policy programs carried out a number of cost-benefit analyses of water harvesting techniques in Egypt, Israel, and Jordan. The Jordanian National Coordinator co-authored several governmental policy documents, and an Israeli Team Leader was a member of an inter-ministerial policy forum charged with setting standards for treated wastewater and with developing a suitable wastewater pricing policy based on these standards. The Palestinian National Coordinator attended all regional Initiative meetings accompanied by the Director General of the PNA Environment Ministry, suggesting that the meeting proceedings had the attention of a senior policy maker. Neither the cost-benefit analyses nor the participation of important officials, however, fulfilled anything close to the broad policy studies which had been planned under the program, and which were supposed to be instrumental in guiding national policy-making.

At the national level, embedding Initiative activities and projects into existing national development projects and programs created considerable confusion. Since all National Coordinators and team leaders were government officials or government appointees, it became difficult to say whether an Initiative activity was *coordinated with* or was *part of* the national project within which it was anchored. Despite the outward-looking mandate to relate Initiative activities more directly to national or bilateral projects, such integration and coordination was generally low in all five countries.

The question of whether the Dryland Initiative should itself be allowed to expire at the end of its second Phase was discussed during a second external review in December 2002 and January 2003. The weaknesses of Phase II were to some extent attributable to exogenous political events, and the external review concluded that an initiative designed to increase regional scientific collaboration within the context of the Middle East peace process is intrinsically worthwhile, regardless of whether the peace process itself is advancing or deteriorating. Indeed, the availability of such channels of communication is very arguably *more* valuable and urgent during difficult times, and is worth having readily in place for when relations improve.

On technical grounds, too, the external review found compelling justification for extending the Initiative for two years beyond the conclusion of Phase II in June 2003. Issues of dryland management had clearly lost none of their significance since the inception of the Initiative. Water management issues persisted with glaring urgency, and were shared by all five Initiative partners and by other countries in the region. The depletion of land and water resources among the five parties and in MENA clearly persisted at the end of Phase II, and issues of sustainability were by no means resolved despite the accomplishments of the Initiative. Nor had a sufficient or satisfactory picture

of environmental, social, or economic policy impacts been assembled. Knowledge sharing initiatives were found to be particularly important to avoid redundancy and inefficiency in conducting national research programs.

Based on the external review recommendations, a two-year extension of Phase II was designed, approved by the Steering Committee in June 2003, and launched the following month, covering the period through December 2005 with legal closure in April 2006.

The design of the Extension mainstreamed the socio-economic and policy work into the *Watershed Management* and *Treated Wastewater and Biosolids Reuse* themes, leaving two technical programs to be carried out by regional teams that would meet twice a year. Again, meeting venues outside the region were deemed permissible if necessary to assure participation by all five Initiative parties. During these *Regional Thematic Workshops*, also attended by external thematic experts, progress reports were presented and reviewed and work programs were discussed. In addition to these Regional Thematic Workshops, a similar number of *Regional Capacity Building Workshops* were to be held in venues outside the region.

The Extension's program was less ambitious than the designs of the two preceding phases both in terms of regional cooperation and technical objectives, representing further modification to allow for political contention and confrontation. In fact all workshops convened during the Extension would take place outside the region. In the end, the eight thematic workshops and three capacity building workshops were attended by all Initiative partners despite further deterioration of the peace process. The atmosphere in the workshops was collegial and saw substantial exchange of technical advice and information. Workshop recommendations however were seldom implemented in the field by national technical teams, and projects continued to operate as independent "islands". This was surprising, given that technical activities had been clustered into "sub-projects" according to common interests shared by all five partner countries as expressed during the program planning workshop held in Geneva in April 2003.

The *Watershed Management* program saw an extensive range of projects and activities during the two year Extension Phase. Egyptian Watershed Management projects and demonstration activities applied advanced irrigation, fertilization, and seed treatment methods in a variety of farming systems. Seedlings and saplings propagated in nurseries were distributed to farmers, and training courses were carried out for local stakeholders. Botanical surveys of rangelands and studies of agro-pastoral systems were conducted in Egypt, the PNA, and Tunisia and detailed field guides were compiled. Interviews with Egyptian land users and cost-benefit analyses of farming practices were used to evaluate the socio-economic impacts of alternative interventions. Egyptian and Jordanian teams surveyed and undertook rehabilitation of wells and cisterns, and parallel activities in the PNA related to the rehabilitation of springs. Israeli Watershed Management activities continued to focus in large measure on afforestation, and experiments were conducted on different methods to reduce evaporation from surface soils. The Israelis used simulated rainfall in a number of field experiments, and worked to construct the water balance of an afforested watershed (Figures 27 and 28). Non-timber services of forests, including biodiversity conservation and carbon sequestration were also treated by fieldwork in Israel. Jordanian Watershed Management activities demonstrated the results of experiments with runoff water harvesting techniques adapted for a variety of soil types, landforms, and land uses, including rangelands. Work on restoring

rangeland productivity by reducing grazing pressure continued in both Jordan and Tunisia. Other fieldwork in Jordan related to milk marketing by rangeland users. Conservation of plant materials took place in botanic gardens in the PNA, and in gene banks in Tunisia. In addition to reducing grazing pressure, Tunisian work on rangeland restoration introduced irrigated plants to stabilize sandy soils. The PNA carried out a number of Watershed Management public awareness campaigns.

The *Treatment of Wastewater and Biosolids Reuse* program saw Egyptian teams work on the reuse of treated wastewater, drainage water, and composted sludges and manures – monitoring the effects of their application to soils and a variety of cereals, vegetables, and fruit trees, including sugar beets. Egyptian experts also monitored the effects of irrigation using mixtures of freshwater and drainage water and of treated biosolids on a variety of vegetables, legumes, and medicinal plants. Different types of marginal, saline, and polluted water and fertilizers and biosolids were applied in Egyptian field, greenhouse, and lysimeter experiments.[3] Egyptian, Jordanian, Palestinian, and Tunisian activities experimented with a number of manure qualities and alternative composting methods. The Egyptian and Jordanian work in this area included series of economic evaluations and cost-benefit analyses of a variety of applications and application methods. Egyptian teams also established training centers and undertook extension activities related to this theme, similar to the training programs established under Watershed Management. Egyptian, Palestinian, and Tunisian teams all conducted studies on the public acceptability of these practices, and Palestinians made wastewater and biosolids reuse the subject of a public awareness campaign. The PNA also built and demonstrated a number of biogas units. Israelis produced guideline sheets detailing the risks of irrigation using treated wastewater. Social, economic, and political analyses undertaken by Israeli teams produced recommendations for standards and pricing policies for treated wastewater allocated to farmers. Israeli monitoring activities

Figure 27: Measuring rainfall and the resulting surface runoff generated by the forest surface; Yatir forest; Israel.

Figure 28: Water collection and measurement through tipping buckets (inside box); Israel.

3. A lysimeter is a container enclosing a column of soil, equipped with devices for sampling and monitoring the movement of water and chemicals through the soil column.

concerned longer term effects of experimental irrigation using treated wastewater and biosolids on soils in orchards and farms growing cereal crops. Jordanian monitoring activities concerned the effects of irrigation using wastewater on aromatic and medicinal plants and on trees. Tunisians monitored the effects of irrigation using tertiary-treated wastewater on cash crops, and the effects of irrigation using secondary-treated wastewater on cereals, forages, and fruit trees. A new wastewater treatment plant was also built and tested in Tunisia.

B. The Participating Institutions

The national institutions responsible for carrying out Dryland Initiative support programs, projects, and activities were appointed by the respective governments to which they belonged. This varied between the five partners according to which ministry or agency represented the country in the Multilateral Working Group on the Environment. Agriculture ministries assumed this role in Egypt and Jordan; Egypt's Ministry of Agriculture and Land Reclamation, and Jordan's Ministry of Agriculture. Environment ministries served as Initiative focal points in the PNA and Tunisia, and in both instances underwent transitions as new ministries and agencies replaced their successors. The Palestinian Environment Agency originally assumed the role of Initiative contact, before being reorganized as the Ministry of Environmental Affairs, and finally the Environmental Quality Authority. In Tunisia, the *Ministere de L'Environnement et de L'Amenagement du Territoire* first assumed responsibility for conducting Initiative activities before being replaced in this role by its successor the *Ministere de L'Environnement et du Developpement Durable.* In Israel the Ministry of Foreign Affairs was assigned responsibility for the conduct of Initiative activities. The wide range of technical issues to be addressed by Initiative field activities would require these lead ministries to rely extensively on national research institutions, and to commission or sub-contract substantial parts of the necessary field work.

In Egypt, the Agricultural Research Center (ARC) – the principal agency for technology generation under the Ministry of Agriculture and Land Reclamation – became responsible for the technical field work under the Initiative. Among the 16 research institutes attached to the ARC, the Soil, Water, and Environment Research Institute (SWERI) – charged with improving agricultural productivity and monitoring soil and water pollution and their impacts – was deeply immersed in the Marginal Water and Saline Soils and the Treated Wastewater and Biosolids Reuse themes. Its activities relate principally to the Nile Delta, though it commissioned the Desert Research Center (DRC) to undertake Initiative activities related to water and land resources in deserts away from the Nile Valley, including biodiversity. Members of the DRC were also involved in the Germplasm for Arid Lands program, and some components of the Egyptian Watershed Management program.

The Jacob Blaustein Institute for Desert Research (BIDR) at Ben Gurion University of the Negev served as the implementing agency for Initiative activities in Israel. The Institute sub-contracted the Treated Wastewater and Biosolids Reuse program to the Ministry of Agriculture's Regional Rural Extension Service for Land and Irrigation, owing to the Service's extensive involvement in that theme.

In Jordan, the Rangeland Department in the Ministry of Agriculture was responsible for Initiative-related activities and carried out much of the range management program with their own technical staff, but commissioned elements of the program to the semi-autonomous National Center for Agricultural Research and Technology Transfer (NCARTT). NCARTT was also responsible for the Germplasm for Arid Lands program, and elements of the Economic Forestry and Orchards, Treated

Wastewater and Biosolids Reuse, and Watershed Management programs. In addition, the Jordanian Royal Society for the Conservation of Nature was involved in biodiversity and protected areas issues addressed by the Jordanian Initiative teams.

Figure 29: Experimental production of Rye Grass; Jordan.

In the Palestinian Territories, the Palestinian Institution for Arid Lands and Environmental Studies (PIALES) was responsible for program management and technical implementation. PIALES was subsequently renamed the Palestinian Environmental Authority (PEnA), and finally the Environmental Quality Authority (EQA).

In Tunisia, collaborating institutes administered under the *Ministere de l'Agriculture* included the *Centre International des Technologies de l´Environnement de Tunis* and the *Office Natinale de l'Assainissement*, the *Institut National de la Recherche en Génie Rural Eaux et Forêts* and *Direction General des Forets.* Other collaborating institutes included the *Insitut de Regions Arides* and the *Commissariat Regional de Developpement Agricole.*

The fact that the institutions participating in the Initiative were generally government institutions carried a number of drawbacks, despite the merits of government commitment implicit in the arrangements. Little if any outsourcing took place, and because government employees charged with the conduct of Initiative activities were usually not relieved of their existing duties outside the Initiative, their ability to focus on work under the Initiative was limited. When their Initiative and non-Initiative duties did not overlap or relate to each other, Initiative responsibilities tended to assume less priority. When Initiative and non-Initiative work was more closely related, greater commitment to Initiative activities was apparent, though differentiating the results and value added from Initiative and non-Initiative work became difficult. The status of technical experts as government officers clearly limited their independence and freedom from outside political constraints, from their obligation to follow official policy to formal restrictions imposed on communication with foreign counterparts. Involvement in the Initiative by independent non-governmental professionals, which would not have shown these constraints, was very limited.

C. Program Management

In response to the request by the Multilateral Working Group on the Environment and as subsequently approved by the Initiative's donors, the World Bank assumed overall responsibility for the Initiative. Based on consultations between the Bank and the five participating governments, ICARDA was selected as the implementing agency on the Bank's behalf, bearing the sole responsibility for the implementation of the work program, including procurement and financial management, and hence was the principal interlocutor for the five national partners. The World Bank administered and transferred to ICARDA the grant funds received from donors and from its own resources. The highest authority for program design, monitoring, and budgeting was the Steering Committee (SC) which was composed of the five partner countries, ICARDA (as the implementing agency), the World Bank (as Chair of the SC, Trust Fund administrator, and donor), other donors, and the two gavelholders Japan and the USA. The SC met in the context

of a broader Donor Consultation Meeting, usually held annually at the Bank's office in Paris in June. The Donor Consultation Meetings served as an international forum for the technical review of the work program and achievements, with budgetary and other management decisions subsequently taken by the SC. While these annual meetings served as the principal instrument for program supervision, the World Bank advised program implementation between meetings, ensuring compliance with Grant Agreements and SC decisions.

ICARDA's Cairo office hosted the Initiative's Facilitation Unit (FU) which was headed by an International Facilitator and was staffed with administrative and financial officers. The International Facilitator was directly responsible for Initiative administration, management, technical advice, and coordination. Four such Facilitators would serve in this capacity over the life of the Initiative, each experienced in agricultural research and extension in the Middle East. ICARDA's "Facilitation" essentially consisted of technical and managerial support to the country parties, which in turn were expected to "own" and manage the Initiative within the five countries, though in practice the Facilitation Unit's coordination role went somewhat further. The FU organized the regional meetings and workshops, commissioned the parties' national technical and financial reports, disbursed funds to the parties, inspected the activities in all the countries during site visits, meetings, and in regular phone and electronic communication. The Facilitator also hosted the supervision and review missions sent to the partner countries to visit sites, institutions and governments. The Facilitator—along with the Regional Experts—reported to the Steering Committee, and was directly responsible for overseeing the implementation of all decisions taken by the Steering Committee.

The Regional Expert – later termed National Coordinators – were appointed by their respective governments and were responsible for assembling and coordinating national teams, allocating funds received from the Facilitation Unit, and monitoring the performance of the national activities. In Egypt, Israel, and Jordan, they were paid an honorarium for their work under the Initiative, which was in addition to their existing obligations, and was intended in part to offset administrative costs. In the PNA the position was gradually mainstreamed in the national environmental authority where the National Coordinator in the last phase of the Initiative became a full staff member paid by the authority. In Tunisia, the National Coordinator was a governmental employee from the start who managed the work load as long as disbursements were limited. Towards the end of the Initiative, when speed of implementation and the number of transactions increased, Tunisia decided to recruit a short-term consultant (equivalent to the payments to the NC in other countries) to support the management of the Tunisian program.

In Phase II National Coordinators were required to appoint and to chair a *National Management Committee* composed of team leaders, stakeholders, and representatives of institutions directly or indirectly involved in the Initiative. National Management Committees were responsible for facilitating cooperation between the different national teams, and promoting the involvement of local stakeholders in national activities. They were charged with monitoring the impact of these activities, and requested to minimize overlap with other, non-Initiative national programs. National Coordinators were to present the National Management Committees with reports detailing completed activities, and to submit plans for future activities for Committee approval. Information on the actual functioning of the Committees is however limited, and the ultimate significance of their roles in carrying out the Initiative remains unclear.

Review and supervision missions from outside the region monitored and evaluated performance regularly throughout the life of the Initiative. World Bank supervision missions – conducted in close collaboration with ICARDA's FU – took place at least once every year, visiting the FU, field sites, and the national institutions responsible for the Initiative's conduct in-country. The World Bank also commissioned external reviews by independent experts three times during the life of the Initiative. These reviews provided the occasion and analytical substance to adjust the structure and work program of the Initiative to reflect the changing environment in which the Initiative was being implemented, resulting in the Initiative's three "Phases".

D. Donors and Partners, Financing and Budgeting

Eight donors together provided US$12.5 million grant funding to the Initiative (listed in alphabetical order): Canada, European Union, Japan, Luxemburg, Republic of Korea, Switzerland, USA, and the World Bank. Canada and Japan elected to provide support bilaterally rather than through the Facilitation Unit. Canadian investment was provided through Agrodev and CIDA, and supported Jordanian projects. Japanese funds directly supported projects in the PNA and Tunisia, in addition to providing initial seed funding for the Initiative itself. The five partner countries themselves provided in-kind support to match donor contributions.

While overall support to the Initiative during Phase II fell to US$5.7 million from the $6.8 million provided in Phase I, the composition of donors changed substantially over ten years. Only Switzerland, the US, and the World Bank supported both phases, including the Extension of Phase II. Canada, Japan, Korea, and Luxembourg contributed funds only during Phase I. EU support was exclusive to the Extension Phase (Figure 30).

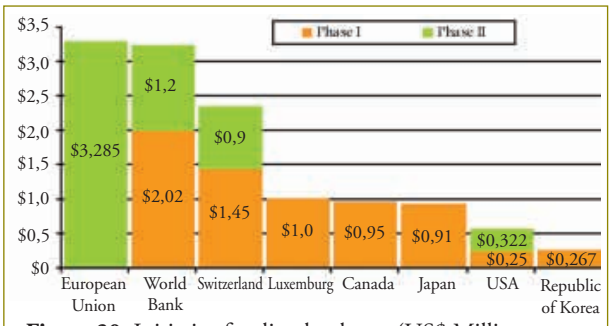

Figure 30: Initiative funding by donor (US$ Millions equivalent). Phase I includes the "transition" period between Phase I and Phase II, and Phase II includes the Extension period.

The allocation of funds between countries and programs changed substantially between Phase I and Phase II. In Phase I funds allocated to the Regional Support Programs (RSPs) were clearly distinguished from those allocated to the National Support Activities (NSAs). 28 percent of multilateral funds went to RSPs, 44 percent to NSAs – the remaining 28 percent went to overall project management by the Cairo-based Facilitation Unit. The possibility of donors earmarking funds to specific countries or Initiative components led to large disparities. Most donors were reluctant to fund Israeli and Tunisian national activities based on their relatively high gross domestic product – Tunisia would ultimately receive support for its RSPs and NSAs, while Israel would receive funding only for its RSPs. Switzerland earmarked its entire contribution to RSPs (Figure 31).

Budget allocations for the three year period of Phase II were intended to bring greater balance to the distribution of international contributions. The Facilitation Unit maintained responsibility for the

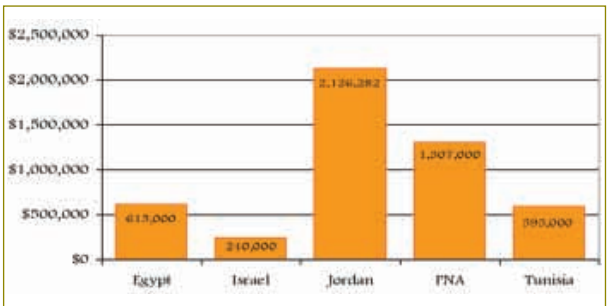

Figure 31: Phase I Funding by Recipient Country (excluding Facilitation Unit).

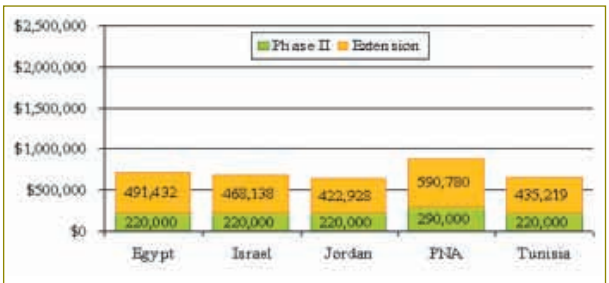

Figure 32: Phase II Funding by Recipient Country

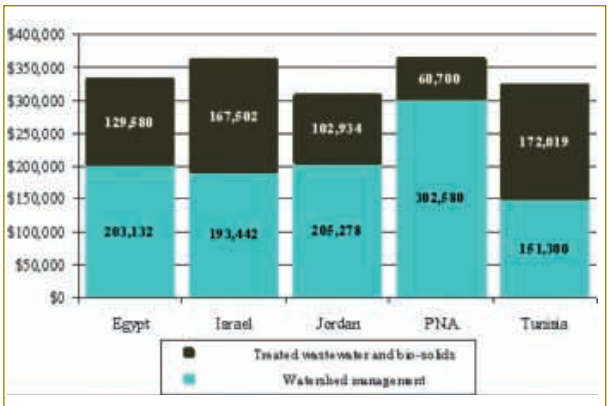

Figure 33: Extension Phase 2003-20005: Funding by Theme

regional budget. Budgeting for national Watershed Management, Treated Wastewater and Biosolids Re-use, and Socio-Economic and Policy programs was allocated fairly evenly. Palestinian national programs received higher allocations to provide for greater capacity building (Figures 32 & 33).

E. Relationships with Other Regional Programs

The Dryland Initiative was not the only multilaterally-supported, multinational program that was operational in the Middle East and North Africa between 1996 and 2006. A number of parallel programs addressed issues related to the environment-development nexus in the region, whether the region was defined as MENA or the larger West Asia and North Africa (WANA) definition employed by the United Nations and the Consultative Group on International Agricultural Research (CGIAR). Some of these programs aimed at promoting Arab-Israeli peace as well. Yet the Initiative found few opportunities to interface with other programs, which in several instances were operational in the near vicinity of Initiative activities. Comparing the Initiative with some of these different initiatives yields insights that suggest the limitations and setbacks experienced during the conduct of the Initiative were by no means exclusive to it.

The UN Convention to Combat Desertification (UNCCD) conducted a *Joint Study of Desertification Risks in the Wadi Araba Rift Valley* in 1994, a joint one-year Israeli– Jordanian–Palestinian undertaking that was substantially inspired by the Oslo Accords. The Swiss-funded study represented the first ever joint Arab-Israeli project on desertification, and was in several respects a precursor to the Initiative. The three national project leaders appointed by Israel, Jordan, and the PLO would all go on to become Initiative Regional Experts. The Wadi Araba section of the Rift Valley is shared by Israel, Jordan, and the Palestinian Territories and the study undertook a survey of the area looking for indicators of desertification risk. Joint tours of the respective parties' study areas and a number of mutual visits led to a report encompassing a package of 15 joint project proposals. The report was presented at a joint meeting in Amman, where it was considered by a number of prospective donor countries and UN organizations.

The success of the *Joint Study* was admittedly attributable in some measure to the "peace euphoria" prevailing during the project's implementation, which was completed well before the upheavals the Initiative would have to contend with. It was also of course far smaller in scope and duration than the ten-year, five-party Initiative. Yet other contrasts between it and the Initiative may be informative. The Joint Study project had no facilitator, implementing agency, task managers, or steering committee. Once the parties signed the project agreement, the project leaders and teams

would not see the Swiss underwriter or the UNCCD officer who arranged the financing and negotiations again until the end of the project. It is important to qualify that this participatory element applied in no way to *Joint Study* planning. The Study's program document was prepared by the Intergovernmental Negotiating Committee that negotiated the UNCCD's establishment, with the assistance of a consultant recruited from within the MENA region – a decidedly non-participatory planning process.

This initial success of the UNCCD in masterminding a joint regional project addressing a cross-boundary shared ecosystem was very likely instrumental in prompting the UNCCD Secretariat membership in the Multilateral Working Group on the Environment, and to send representatives to most Initiative Steering Committee meetings. Initiative participation in UNCCD programs on the other hand never materialized. A meeting between the Regional Experts and UNCCD officials was held in Geneva in April 1998 to discuss opportunities for UNCCD – Initiative cooperation, but no such cooperation ever did materialize.

According to UNCCD criteria and definitions, Israel would be classified as a *developed desertification-affected country*, and would therefore be responsible for implementing its National Action Plan on desertification using its own means. This would distinguish Israel from *developing affected countries* like Egypt, Jordan, the PNA, and Tunisia, which were expected to pursue partnerships with a donor country to support them in implementing their National Action Plans. Nor was Israel accepted in either the Convention's *Regional Implementation Annex for Asia* or its *Regional Action Plan for Asia*. Israel was therefore a Party to the Convention without membership in any of the Convention's Regional Implementation Annexs. The country could therefore not be active in the Convention at the regional level, but only at its own national level. This effectively prevented the Convention Secretariat from being active in the Dryland Initiative, despite its membership in the Initiative Steering Committee.

UNCCD activities under the *Fourth Thematic Programme Network on Water Resources Management for Agriculture in the Drylands* would have provided an exceptionally strong topical interface with the Dryland Initiative. The Syria-based *Network* explored methods to rehabilitate degraded soils and to prevent soil salinization in West Asia. The *Network* functioned within the UNCCD *West Asia and North Africa Sub-Regional Program to Combat Desertification*, with overall implementation coordinated by ICARDA. Yet the opportunity lost by the absence of any Dryland Initiative interface with the Network was limited in consequence, since Network activities were limited to conferences, without funding and with no joint action on the ground.

Within the multilateral peace process itself, the Working Group on the Environment's sister *Multilateral Water Resources Working Group* established the *Middle East Desalination Research Center* (MEDRC) in Muscat in December 1996. The Center's founding members were Oman, Israel, Japan, the EU, the Republic of Korea, and the US, which were joined by Jordan, the PNA, and the Netherlands on its board of directors. The MEDRC is an international non-profit organization funded mainly by Oman, with a requirement that project funding be matched by another donor. It has been active since its establishment, irrespective of the status of the Multilateral Peace process. The Center invites researchers from around the world to compete for MEDRC grants, with a provision that all projects approved include at least one researcher from MENA. The MEDRC also invests in capacity building by organizing training courses and conferences in the MENA region. Its selection of research projects is competitive, based on

scientific merit, and with little if any government intervention. Its location in an area geographically removed from the core of the Arab-Israeli conflict made the MEDRC more resilient to political circumstance. Like the Dryland Initiative, the mission of the MEDRC was conceived around technical objectives deemed to be a promising focus for regional cooperation, and hopefully instrumental in establishing channels of dialogue and exchange that would serve the peace process. While Center projects see considerable cooperation between scientists inside and outside the MENA region, cooperation between Arab and Israeli researchers is limited. Very few MEDRC projects have seen participation by Israeli scientists, although a few donors support projects that aim to promote Israeli-Arab cooperation through joint research on environmental and agricultural issues.

The Middle East Regional Cooperation (MERC) program of the US Agency for International Development (USAID) was established in the wake of the Camp David Accords and is similarly geared to support cooperative research between Arab countries and Israel. Projects under the program relate to agriculture, the environment, health, economics, and engineering. Topically the program is very closely related to the Dryland Initiative, with projects in recent years relating to watershed management, wastewater treatment, and desertification. Egypt, Israel, Jordan, Lebanon, the PNA, and Tunisia have all participated in MERC-funded projects, which are selected through a highly competitive process based both on scientific merit and evidence of effective arrangements for collaboration. Projects considered consist of at least one Arab and one Israeli institution, and those selected can be funded for between three and five years and for as much as US$3 million. The number of pre-proposals submitted has increased from 24 to 93 during MERC's last three (2003-2005) annual cycles.

While a number of Jordanian and Palestinian students conducted graduate research in Israel under the MERC program, and Israelis traveled to Arab countries to participate in MERC-sponsored projects – collaboration under the program faced a number of limitations similar to those experienced under the Dryland Initiative. Most meetings between Arabs and Israelis took place outside the region. One MERC-supported project carried out during the life of the Initiative led to the construction of a resource center for technical training on wastewater treatment technologies in the West Bank, the work of a Palestinian–Israeli–Egyptian partnership.

Despite such direct topical parallels between the MERC program and the Dryland Initiative, the Initiative would engage in just one MERC project, *Monitoring and Evaluation of Watersheds in the Middle East*. Even this engagement was limited to an Israeli Watershed Management team under the Initiative, even though the MERC project itself included Jordanian and Palestinian teams. This single instance of Initiative cooperation with a MERC project was made possible by MERC's contracting of the project to a US institution, which acted as a project coordinator rather than as a facilitator. Most members of the Initiative's Israeli Watershed Management team were moreover also members of the Israeli MERC project team, which used the Watershed Management project site in the Yatir forest. The arrangement was therefore especially cost-effective and naturally conducive to achieving a number of technical and scientific synergies. The Principal Investigator of the MERC-supported Monitoring and Evaluation of Watersheds in the Middle East project also participated in several meetings of the Dryland Initiative Steering Committee.

The Danish International Development Agency (DANIDA) supported a number of joint projects between Israelis and Arabs during the life of the

Initiative. These began with Egyptian-Israeli cooperation in agricultural training, and later expanded to engage Jordan and the PNA in agricultural research and development, including livestock husbandry and marketing of agricultural produce. The Dryland Initiative established no relationship with any of these projects.

The Hansen Institute for World Peace at San Diego State University in California contributed to two agricultural research projects of direct relevance to the Dryland Initiative. The Institute supported an initiative to support Egyptian-Israeli research collaboration, and this collaboration would lead to the establishment of the *Maryut Agro-Industrial Complex Project* in Egypt. The Hansen Institute also contributed seed money and secured additional funding sources for the development of the *Middle East and Mediterranean Desert Development Program*, a cooperative agricultural research and development project to be carried out jointly by Egypt, Israel, Jordan, Morocco, and the PNA. Collaboration between the Initiative and the Hansen Institute, however, did not go beyond a joint workshop held at San Diego State University in March 1997.

Another foundation based at a US university and active in topics of direct relevance to the Dryland Initiative was the *International Arid Lands Consortium*. The University of Arizona-based Consortium was founded by five US universities and the Jewish National Fund, and was supported by a US government grant. A member of the Consortium's board served on the Initiative Steering Committee. The Consortium supported research and demonstration projects in the Middle East that addressed a variety of environmental and development issues. Projects were selected through a competitive process and explicitly required cooperation between Israeli and Arab researchers and institutions. US researchers and research institutions were involved in all projects with components to be carried out within the United States. However, no interaction with the Dryland Initiative ever developed.

These regional programs differed from the Dryland Initiative in obvious ways. Unlike the Initiative, the human resources available to them were generally not limited to staff formally employed by government agencies. Their access to non-governmental and civil society organizations and to scientists without any implicit political obligations relieved them of many of the pressures and constraints that characterized interaction and communication under the Initiative. Project selection was in all instances notably more competitive than project selection under the Initiative. Nor did the mandates or missions of these other regional programs share the Initiative's unequivocal purpose of linking cross-boundary technical cooperation to the Middle East Peace Process.

A number of joint programs and projects in the MENA region related to activities undertaken under the Initiative, but did not involve Israel. These programs were not related to or motivated by the peace process in any way, and generally applied a definition of MENA or WANA that did not regard Israel as part of the region. They were implemented by international organizations and were principally financed with resources from outside the region. Analysis of these programs and projects may be instructive in assembling a picture of regional cooperation devoid of its preeminent stumbling block.

Between 1995 and 2002 the International Center for Agricultural Research in the Dry Areas (ICARDA) and the International Food Policy Research Institute (IFPRI) carried out the *Mashreq/Maghreb Project*, which related to the development of integrated crop-livestock production in low rainfall areas of West Asia and North Africa. The objective was to

develop systems for meeting national demands for small ruminant products while conserving the natural resource base. Project activities were carried out in Algeria, Iraq, Jordan, Lebanon, Libya, Morocco, Syria, and Tunisia. Parallel activities were carried out in each member country: laboratory and field experiments, technology development and dissemination, analysis of policy and property rights, and socioeconomic and biophysical impacts of the innovations introduced. The Project was supported by the Arab Fund for Economic and Social Development (AFESD), the International Fund for Agricultural Development (IFAD), and the Canadian International Development Research Center (IDRC).

The *Conservation and Sustainable Use of Dryland Agrobiodiversity of the Fertile Crescent* project was initiated in 1997 using Global Environment Facility funds administered through the UN Development Programme. The project was also co-financed by ICARDA, the International Plant Genetic Resources Institute (IPGRI), and the Arab Centre for the Study of Arid Zones and Dry Lands (ACSAD), as well as by the governments of Jordan, Lebanon, the Palestinian National Authority, and Syria. The project focused on agricultural biodiversity in the Levantine Uplands, which are an important center of plant diversity and genetic material, with many wild relatives of traditional crops. The project studied the conservation and sustainable use of sixteen target crops and their wild relatives, including wheat, barley, clovers, olives, pistachios, and figs. National agricultural research systems in the participating countries each established two project sites in which national level activities were carried out. ICARDA was responsible for the project's conduct at the regional level, in cooperation with IPGRI and ACSAD. Regional level coordination involves providing training and technical assistance to the national programs and integrating national activities. In Jordan the project was executed by the Ministry of Agriculture and implemented by the National Center for Agricultural Research and Technology Transfer (NCARTT). The UNDP *Programme of Assistance to the Palestinian People* is the project's executing agency in the PNA in cooperation with the Palestinian Ministry of Agriculture.

In conclusion, the evolution of the Dryland Initiative over ten years reflects adaptations to both external political circumstance and internal, systemic attributes of Initiative programs themselves, a process within which external reviews provided the critical analytical substance and opportunity for adaptations. Dropping the four National Support Activities and Regional Support Programs of Phase I, and replacing them with the more project-based Watershed Management and Treated Wastewater programs in Phase II, amounted to a more modest definition of "Arab-Israeli cooperation." Yet while the prescribed cooperation was scaled back and reduced in scope until arriving at the Regional Workshops held in Europe between 2003 and 2005, the idea of regional cooperation was never abandoned. The Workshops were still designed to fulill the original purpose of technical cooperation between Arabs and Israel that the planners of the original program had envisioned in the optimism of the mid 1990s. Much of the delay and reduction in international funding was attributable to the loss of that immediate hope - the donors had wanted their investments to serve a much greater objective than agricultural research, water resource management, or conservation of genetic resources. These areas of research and technology already had funding, and much of it by the very same donors. Yet investment in the Initiative continued despite its diminished expectations. Neither the donors nor the participating national actors gave up on the program, and as a result a substantial level of regional cooperation was ultimately achieved.

IV. COMMUNICATION, KNOWLEDGE SHARING, AND CAPACITY BUILDING

The technical cooperation around which the Dryland Initiative was conceived and designed was to take place between parties with few or no existing channels of normal communication. These channels therefore needed to be established, and to be developed through the generation and sharing of knowledge, based on the assumption that this knowledge would serve as a crystallization point for regional (Arab-Israeli) technical dialogue and cooperation. Ideally, knowledge generation would lead the five parties to jointly develop technical solutions for common problems. At a minimum, technical teams would solicit feedback and suggestions from peers in the program and consider recommendations in their field work. Capacity building for Initiative participants was a core element of the work program throughout the Initiative's three program phases, and with special attention to the capacity of the Palestinian National Authority – a purpose which required a higher-than-average budget allocation to the PNA. Commonly perceived capacity building needs would later be addressed through the Regional Capacity Building Workshops conducted during the Extension Phase.

In addition to communication and capacity building among Initiative teams themselves, the technical teams would also need to liaise with local communities, farmers, agricultural service providers (such as extension agents), policy makers, and other technical experts inside and outside of their countries and the Initiative itself, involving these partners in planning and carrying out applied research.

A. Regional Communication

Regional Meetings and Workshops

The principle of the five participating countries building a network of technical cooperation and exchange in which each party could capitalize on the partners' expertise and experience in a given thematic area rested on an ambitious agenda of visits and regular communication. The kind of substantial regional exchange and interaction envisaged in the Initiative's original program would take place at two points: during the period leading up to the first phase in 1996, and during the so-called "transition period" that preceded the second phase in 2000. These exchanges related to the development of the programs of Phase I and Phase II. The implementation of Phase I was initiated at a series of three meetings in May and June 1996 in which at least two participants from each country took part. A two-day meeting in Amman in May 1996 addressed the *Rangeland Management* theme and was attended by seven Jordanians and six Israelis, in addition to smaller delegations from the other members. The *Marginal Water and Saline Soils* program was the subject of a three day meeting in Tunis-Jerba-Gabez in June, and was immediately followed by a two day meeting in Cairo on the *Germplasm for Arid Lands* program. Each of the five delegations in these meetings made technical presentations and took part in constructive discussions.

The most productive interaction however took place during field trips to prospective project sites, where the teams found opportunity to socialize and exchange formal and informal information. Over the course of the Initiative, site visits and in-country travel (Figure 34) would afford participants the opportunity not only for productive on-site discussions, but also for meeting local people, policy makers, and technical experts in all five countries.

No regional meeting would take place in Israel until October 1999, near the end of Phase I,

Figure 34: Regional Consultation Meeting in Sede Boqer, Israel, in October 1999: Field Tour to the northeastern Negev. An Israeli farmer explains to representatives of the five partner countries the drip-irrigation system applying treated wastewater to fruit trees.

when 26 participants from the partner countries participated in an initial planning workshop on the Phase II program in Sede Boqer. In February 2000 a "roving workshop" of the five Regional Experts visited Israeli and Palestinian project sites, and this was the final and most successful fully-regional meeting of the Initiative within the region itself. The final meeting convened during Phase I was held in Jordan in May 2000, addressing the application of the *Socio-Economics and Policy* theme to Rangeland Management, and was attended by Israeli participants.

All subsequent regional meetings would be held in-doors and outside of the region. The first, held in Granada, Spain in October 2002, would serve as the model for the out-of-region Regional Thematic Workshops and Regional Capacity Building Workshops undertaken during the Extension Phase. Following up on the Granada discussions, the team leader of the Israeli Treated Wastewater and Biosolids Re-use program and the International Facilitator collaborated in preparing a Regional Concept Note for Standards in the Use of Treated Wastewater and Bio-solids. Although the Concept Note was the only attempt during the Initiative to provide guidelines for the use of treated wastewater at the regional level, it was a remarkable achievement, given the disparity in wastewater treatment levels between the participating countries. The Concept Note was an apt illustration of the potential of regional collaboration to promote strategic objectives in water resource management region-wide.

Three seminal meetings on program development for the Extension Phase took place in Europe in 2003 and were attended by representatives of all five parties. A Regional Consultation Meeting was held in Brussels in March 2003 to discuss the findings of the External Review of Phase II. The Meeting endorsed the reviewers' recommendation to extend the program, and this led to a Planning Workshop in Geneva the following month. Based on the external review recommendations, programmatic and managerial changes were introduced for the Extension Phase. The Geneva Workshop was a particularly useful exercise in participatory program development, and arrived at a consensus over the structure and financing of the Watershed Management and Treated Wastewater and Biosolids Reuse programs to be carried out under the Extension. Participants also came to an agreement over the budget allocation to each party. These arrangements were laid out in program document for the Extension Phase, presented and approved at the June 2003 Donor Consultation Meeting in Paris. The first Regional Thematic Workshop took place in Brussels in October 2003, illustrating the tight timeline along which program adaptations were prepared, agreed-upon, and implemented.

Regional Thematic Workshops were organized around the two thematic programs of the Dryland Initiative during its two-year Extension Phase: *Watershed Management* and *Treated Wastewater and Biosolids Re-use*. Virtually all regional exchange during the period would take place within these eight Regional Thematic Workshops. The three day Workshops were held in Europe, and were

fully attended (with one exception due to logistical problems) by all five partner countries. Country delegations generally consisted of three members: the National Coordinator, the team leader of the country's thematic program, and a socio-economy and policy expert. Prior to each Workshop, national teams submitted semi-annual reports to the Facilitation Unit in Cairo. The reports included a technical report on the achievement of milestone indicators by each activity, and an administrative report detailing financial monitoring. Based on these reports and presentations made by partner countries and external experts, workshop participants engaged in a technical dialogue that led to the peer review of technical field work (past results and future plans) within the Initiative. These peer review sessions became the most significant means of regional exchange and knowledge sharing to take place within the Regional Thematic Workshops, and indeed within the Extension Phase of the Initiative itself. The discussions were generally lively and substantive, ending with the delivery of critical reviews and recommendations for follow-up by the national teams (Figure 35).

The first round of Regional Thematic Workshops was hosted by the Royal Flemish Academy of Belgium for Science and the Arts. The rest were hosted by the Department of Soil Science in Reading University in the UK. The full proceedings of each Workshop were produced by the Facilitation Unit, posted on the Initiative electronic library, and published on paper and on CD.

Figure 35: A Regional Thematic Workshop, Reading, England, Extension of Phase II.

In hindsight, the Regional Thematic Workshops were the most successful venue for cooperation between Arab and Israeli counterparts to be developed under the Dryland Initiative. Much of the interaction within the Workshops was informal, and considerable socializing led to the establishment of the kinds of personal ties that had been so hopefully anticipated in the original planning of the Initiative A list of all these events are summarized in Table 1.

Regional Capacity Building Workshops, which paralleled the Regional Thematic Workshops during the final two-year Extension Phase, are best described in the larger context of capacity building under the Dryland Initiative.

Electronic Communication and Documentation

Electronic communication and documentation on the internet were thought to be a useful media for circumventing political constraints, but were seldom used during the life of the Initiative. While International Facilitators communicated regularly with Regional Experts and National Coordinators by email, other trans-boundary email communication was infrequent. Many thematic team members lacked any access to email, and among those who did have access, little evidence exists that the medium was used for technical exchange between countries.

The possibility of a dedicated Initiative web resource on which to post reports and documents for dissemination among the parties suggested itself as an effective non-email means of exchange, and the development of a state-of-the-art information management and communication tool adapted to

Table 1: Regional Meetings of the Dryland Initiative

Date	Subject	Location
July 1995	Program development	Amman, Jordan
February 1996	Coordination with UNCCD	Geneva, Switzerland
April 1996	Program development	Cairo, Egypt
May 1996	Rangeland Management	Amman, Jordan
June-October 1996	Initiation of Phase I	Tunis, Gabes, Tunisia
June 1996	Germplasm Thematic Workshop	Cairo, Egypt
October 1996	Marginal Water Thematic Workshop	Tunis, Gabes, Tunisia
February-March 1998	Training course	Sharja, UAE
September-October 1998	Fodder training course	Rabat, Morocco
March 1999	Biodiversity workshop	Marsa Matroukh, Egypt
May 1999	Workshop	Tunis, Tunisia
October 1999 - October 2003	Regional Consultation	Sede Boqer, Israel
January 2000	Regional traveling workshop	Sites in each country
February 2000	Regional traveling workshop	Several locations, Israel and PNA
February 2000	Program development	Sharm El Sheikh, Egypt
February-March 2000	Regional accountants' training	Cairo, Egypt
April 2000 - April 2003	Rangeland policy seminar	Amman, Jordan
May 2000	Rangeland policy seminar	Amman, Jordan
May 2000	Auditor's training course	Cairo, Egypt
September 2000	Phase II initiation	Hebron, PNA
September 2001	Ecological Data Management	Bonn, Germany
September 2001	Knowledge Management	Bonn, Germany
June 2002	Sustainable agriculture	West Texas A&M University, USA
October 2002	Regional Workshop	Granada, Spain
April 2003	Program development	Geneva, Switzerland
October 2003	Watershed Management Regional Thematic Workshop	Brussels, Belgium
October 2003	Treated Wastewater Regional Thematic Workshop	Brussels, Belgium
December 2003	ISNAR - Scientific Writing	The Hague, Netherlands
March 2004	Treated Wastewater Regional Thematic Workshop	Reading, UK
April 2004	Watershed Management Regional Thematic Workshop	Reading, UK
April 2004	Socioeconomic Surveys & Data Analysis	Reading, UK
October 2004	Watershed Management Regional Thematic Workshop	Reading, UK
October 2004	Treated Wastewater Regional Thematic Workshop	Reading, UK
December 2004	Cost-benefit analysis	Reading, UK
April 2005	Treated Wastewater Regional Thematic Workshop	Reading, UK
April 2005	Watershed Management Regional Thematic Workshop	Reading, UK

the requirements of the Initiative became the focus of extensive consultation and planning. Several focus meetings with all five partner countries addressed the matter, as did the *Knowledge Management Conceptual Design Workshop* in Bonn in September 2001. World Bank knowledge management experts drafted a prototype design and terms of reference for consulting services to develop an Initiative-specific web tool, and a number of capable service providers were identified and short-listed. But the tool was never created owing to the political constraints under which ICARDA, the implementing agency, operated. Instead, a downsized, restricted-access electronic library known as the Publications and Mail Administration Tool (PMAT) was set up in December 2003, well into the Extension Phase. The Tool however had limited functions and was not user-friendly, discouraging its use from the onset.

PMAT was managed by the Facilitation Unit. Initiative partners were able to access the library and download documents using a password. Documents included thematic reports of the Watershed Management and Treated Wastewater and Biosolids Re-use programs, *Initiative Update* bulletins, training materials, and reports of country programs, the External Reviews, World Bank supervision missions, and progress reports by the International Facilitator. There were plans to expand on the PMAT, to add a photo library, solicit documents from teams, and introduce a discussion area for the two thematic programs, but the limited use of the library by Initiative partners discouraged its further development.

The Initiative partners and the Facilitation Unit produced many publications during the life of the Initiative, and these did serve the purpose of knowledge sharing and regional exchange. Documents and reports distributed at Initiative meetings and among concerned stakeholders were deposited at the ICARDA office in Cairo. Among the more important reports published under the auspices of the Initiative were *Demonstration of Sustainable Reuse of Blended Brackish Water and Treated Wastewater in Agriculture in the North Delta* (1998), *Germplasm of Natural Range Plants in the Sinai Peninsula, Egypt: Collection and Evaluation* (1997), *Wastewater Treatment and Reuse in the Middle East and North Africa Region* (2000), and the *Regional Concept Note for Standards in the Use of Treated Wastewater and Bio-solids* (2003).

Perhaps the most widely disseminated Initiative document was the monthly electronic bulletin *Initiative Update*, which was issued during the Extension Period. 30 issues were published by the Facilitation Unit beginning in September 2002, bridging the gap in regional exchange between the Regional Thematic Workshops. The *Update* was a two-page summary of Initiative activities and plans, supervision and review missions and other Initiative events, and provided timetables and instructions relevant to ongoing activities.

Yet the Extension Phase saw no real improvement in regional cooperation *between* regional meetings. National teams seldom if ever read the reports on each others' activities that were diligently produced by the Facilitation Unit for presentation at the workshops. Nor is there any indication that the electronic library assembled by the Facilitation Unit was ever used. The lack of communication and dissemination was moreover not at all limited to the Arab-Israeli dimension, for little or no such exchange took place between Arab teams either. Harmonization of terminology, standards, and methodologies between national teams working on the same topic matter was never accomplished.

What the Extension Phase did see was a normalization of interaction into regular, systematic meetings attended by colleagues who otherwise never would have come together. In those Regional Thematic Workshops and Regional Capacity

Building Workshops, direct personal interaction would lead to an atmosphere of collegiality and open communication that warrants merit, however far short of the original conception of regional cooperation it may have fallen.

B. Institutional Capacity Building

Building the capacity of participating national agricultural research systems and other technical institutions was a fundamental objective of the Dryland Initiative, particularly on the part of Palestinian participants whose representative government was just two years old when the Initiative itself was implemented. Palestinian national institutions required time to gain experience and to define and establish and divide roles and functions. The original program of the Initiative (Phase 1) explicitly recognized the priority that institutional capacity warranted in the Territories by assigning the Palestinian national team no Regional Support Program to lead. Palestinian National Support Activities were rather to concentrate overwhelmingly on capacity building, and in each of the four Regional Support Programmatic areas: the Egyptian-led *Germplasm for Arid Lands* program, the Israeli-led *Economic Forestry and Orchards* program, the Jordanian-led *Rangeland Management and Livestock* program, and the Tunisian-led *Marginal Waters and Saline Soils* program.

The *Regional Capacity Building Workshops* that paralleled the Regional Thematic Workshops during the Extension Phase of the Initiative were preceded by a number of meetings and seminars that related to capacity building. Financial management and monitoring varied widely by country and this raised concern over participants' ability to meet international accounting standards after the Initiative. The Facilitation Unit organized two capacity building workshops in Cairo in 2000 relating to the financial management of national program components. These were intended to promote regional exchange between administrative teams in the Initiative.

Another capacity building need which became apparent relatively early on during the life of the Initiative related to the quality of oral and written presentation by Initiative participants. This had been found wanting in a number of meetings, and planners recognized that the ability of research teams to engage in activities after the Initiative would depend heavily on their ability to compile proposals that could successfully compete for project funding. In Bonn in September 2001 the Cooperative Monitoring Center at Sandia National Laboratories sponsored workshops on *Ecological Data Management* and *Knowledge Management Conceptual Design*.

In June 2002 an International Workshop on Sustainable Agroecosystems was organized by the Dryland Agriculture Institute at West Texas A&M University, where participants were able to examine semi-arid farming in the southern United States and were briefed on a variety of prevailing practices, technologies, and problems.

The Regional Capacity Building Workshops continued along the lines of the September 2001 Bonn workshops, beginning with a workshop titled *Writing and Presentation* that was hosted by the International Service for National Agricultural Research (ISNAR) in The Hague in December 2003. In April 2004 a Regional Capacity Building Workshop on *Socioeconomic Surveys and Data Analysis* was conducted by the Statistical Services Centre of the Applied Statistics Department of the University of Reading in April 2004. The Workshop focused on the design and conduct of socioeconomic surveys, and the analysis and interpretation of survey results. Attendees were organized into groups with members from the different countries who described and discussed specific problems in their national

activities with each other and with trainers. They also had the opportunity to consult with trainers individually.

In December 2004 another socioeconomic workshop on *Cost-Benefit Analysis* was organized by Calibre Consultants in the UK, in association with the Statistical Services Centre of the University of Reading. The Workshop was inspired by the need for Initiative activities to assess the economic value and community benefits of alternative land and water use practices. It was conducted at the Statistical Services Centre's facilities at Reading.

National level capacity building events were also arranged for Initiative team members, some in response to a Regional Expert or National Coordinator noticing a need for capacity building in a particular area, or to orient staff on an issue that was going to be particularly prominent in a national program's agenda, for instance when countries were assigned Regional Support Programs in Phase I. A number of national level thematic workshops on dryland agriculture and natural resource management were held in 1998 and 1999 for attendance by Initiative teams in Egypt, Jordan, the Palestinian National Authority, and Tunisia. The Egyptian Watershed Management program arranged workshops on range and farmland management, and on the conservation and sustainable use of biodiversity. Similar workshops were held for Palestinian and Jordanian staff, in addition to a workshop on herbal and medicinal plant cultivation in Jordan. Tunisian staff attended a workshop on land degradation issues.

Between November 1998 and March 1999, each national team organized national planning workshops for its staff and other national stakeholders, as a first step towards planning Phase II. These workshops were conducted using GTZ's *Zielorientierte Projektplanung* (ZOPP) or "Objective Oriented Project Planning" approach developed by the GTZ, which was facilitated by a qualified moderator provided by the Facilitation Unit. A regional level ZOPP workshop was held in Sharm el Sheikh in February 2000 to undertake joint design of the Phase II program. The Sharm el Sheikh Workshop saw a high volume of interaction between national teams, and in this was itself a valuable instrument for capacity building.

Some national Initiative programs looked outside of the Initiative to develop capacity among staff members. A number of national Initiative programs sent individuals for short training courses at institutions abroad. A Tunisian team member attended a seminar on Regional Strategies of Agricultural Development in Oases and Irrigated Perimeters of the Mediterranean Region delivered by the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM) in Cairo in May 1997. A Palestinian team member was trained in plant taxonomy by NCARTT staff in Jordan in 2004, and a member of the same team was sent to the USA for training in plant water requirements at a US Department of Agriculture facility. Technical training events were also held for small groups. Five Jordanians attended a program on the development of an information system for resource management in Lebanon in 2002. Four Egyptian staff members participated in an eight-day geographic information systems training course run by the Remote Sensing and GIS Unit of the Agricultural Research Center in 2002.

Jordanian and Palestinian programs sent individuals to obtain advanced degrees from universities, an avenue which may have disrupted project work but which should have lasting impact beyond the life of the Initiative. Six Jordanian team members were enrolled in an Initiative-CIDA/Agrodev sponsored M.Sc. rangeland program at the University of Jordan. The Palestinian team sent seven team members to read for a Ph.D., and three others for M.Sc.

programs in environmental, agricultural, and natural resource management at the University of Lille and the University of Twente (Figure 36).

A small number of visits took place between Arab and Israeli Initiative teams, and were arranged through direct communication between the partners. Early on in Phase I, an Israeli team member traveled to Al Arroub in the West Bank and advised the Palestinian Marginal Water team on the design and operation of wastewater treatment using duckweed. The Israeli Regional Expert twice hosted the Jordanian Regional expert. The first visit involved a meeting with a farmer organization, the second visit a meeting with researchers at the Ben Gurion University of the Negev. The Jordanian Economic Forestry team leader and four Jordanian farmers visited the Blaustein Institutes for Desert Research (BIDR) at Ben Gurion University of the Negev, and a Jewish National Fund nursery in September 1999.

Some interaction took place among Arab participants to the exclusion of Israelis, including a number of visits exchanged with non-Initiative partners like Morocco and Syria. In June 1999, 15 Jordanian team members of the CIDA/Agrodev-supported Initiative project stayed for a month of workshops and study tours on Rangeland and Feed Resources in Tunisia. That same month, the Tunisians hosted a study tour of four Moroccan scientists, to which Jordanian experts active in the Initiative were also invited. Other interaction with Arab counterparts not participating in the Initiative included a visit by all four Arab Regional Experts to a rangeland management project in Morocco. Senior Ministry of Agriculture officers from the Arab Initiative countries visited the Arab Center for the Study of Arid Zones and Drylands and the Syrian Ministry of Agriculture in May 1999. In August 1999, officers from the ICARDA office in Tunisia visited Syria to observe work on medicinal plants.

Figure 36: Rectangular ("diamond-shaped") micro-catchments, Hebron Region, West Bank (PNA).

C. National Integration and Coordination

Most national components of the Initiative established some manner of linkage with related programs carried out by other organizations and institutions. These included programs and projects administered or supported by local non-governmental organizations, governments, international organizations, and bilateral agencies. The relationships varied from infrequent contacts and mutual awareness to intensive, systematic coordination. In fact, the Phase II Initiative program even required national activities to be anchored in larger national programs that addressed issues related to Initiative objectives.

Both the Egyptian Rangeland Management and Watershed Management programs were linked to the Matrouh Resource Management Project (MRMP), which provided a development project site for their work on the country's northwest coast (Figure 37). Greenhouses operated by the Egyptian Germplasm for Arid Lands program produced thousands of seeds that were provided to the MRMP. The Egyptian Watershed Management program interacted with the Egyptian government's Qasr Rural Development

Figure 37: Farmers participating in the Initiative's field work; Matrouh, Egypt.

Program, which was supported by the German *Gesellschaft für Technische Zusammenarbeit* (GTZ). Together with the program's close collaboration with the World Bank-supported Matrouh Resource Management Project, this connection led, among other things, to a *Range Strategy* that was subsequently implemented in Egypt's coastal northwest. (ICARDA and IPGRI were also involved in the development of the *Range Strategy* document.)

The Israelis anchored their Treated Wastewater program to an ongoing governmental monitoring project on agricultural uses of treated wastewater. The Jewish National Fund, to which the Israeli Economic Forestry and Watershed Management programs were both linked, is for all practical purposes a government-contracted afforestation and land management agency.

Members of the Jordanian Watershed Management team, in their capacities as Ministry of Agriculture and NCARTT researchers, drafted a proposal for a non-Initiative *Conservation of Medicinal and Herbal Plants* project that received a US$10 million grant from the Global Environment Facility. The subcomponent of Jordan's Germplasm for Arid Lands program that worked on the cultivation of medicinal and herbal plants was closely linked to the larger project. PNA national activities were linked to the UNDP/PAPP *Program for the Rehabilitation of the Eastern Slopes of the West Bank* during Phase I of the Initiative. Canadian bilateral support was particularly strong in Jordan. The Jordanian Rangeland Management and Watershed Management programs were both carried out in part through the CIDA/Agrodev-supported *Sustainable Rangeland Management Project*, which the government of Canada had contracted with the Jordanian Ministry of Agriculture and Royal Society for the Conservation of Nature. Joint project sites at Faysaliya, Buseira and Muaggar saw strong participation by local communities, and saw excellent dissemination of results to neighboring communities.

A number of Palestinian Initiative projects and activities were carried out in close collaboration with local non-governmental organizations, and similarly achieved high levels of local community participation. PNA Initiative teams worked with the Agricultural Workers Union and with the Palestinian Hydrology Group, sharing human and financial resources in community projects on cistern rehabilitation and forest and orchard plantations. The PNA *Jericho Botanical Garden Project* was assisted by a local non-governmental organization that worked extensively with the local community on the *Conservation of Vegetable Field Races Project*.

The Tunisians anchored their Watershed Management program to the government's *Commissariat Régionaux au Développement Agricole* (CRDA) program on land management in Menzel Habib. Like the Palestinians, the team also collaborated closely with local non-governmental organizations, including the *Association Tunisie Mediterranée Pour le Développement Durable* (ATUMED) and with *Les Jeunes de Zammour*. The Tunisian Treated Wastewater program was involved in the development of the *Office National De L'Assainissement* (ONAS) drinking water treatment station in the Gabès area. Both government programs were supported by Germany's *Deutsche Forschungsgemeinschaft* (DFG). A number of other

ongoing programs and projects to which Initiative national activities were linked were supported by international organizations and donor agencies.

The purpose of integrating the in-country programs of the Drylands Initiative with related national programs during Phase II was to increase the Initiative's influence over national policy making and research practices, and extend capacity building beyond Initiative participants themselves. This objective was rather more subtle than outreach and dissemination, and targeted changes in the working environments and cultures of the national institutions the Initiative collaborated with – changes that would endure beyond the life of the Initiative itself. Interaction with cooperating international and bilateral agencies were expected to complement this purpose, particularly perhaps with respect to the Initiative's and its partners' desire to improve policy making.

There is, however, little tangible evidence that the Initiative had a significant impact on national policy-making and institutional programs. The reasons for this may be rooted in the stark contrast between the period when the Initiative was conceived and the period when it was implemented. The Initiative was conceived in a period of great expectations. Breakthroughs in the Arab-Israeli peace process created a sense of forward momentum, with mounting anticipation that further breakthroughs were imminent, and would open the region and its countries to new opportunities for economic development. The Initiative lost most of its potential as an instrument with which to influence national policy, let alone regional policy, when such hopes were not realized. Even had substantial national policy impacts been achieved, the integration of Initiative programs with ongoing national projects would have made those impacts difficult to discern. Attributing the source of policy and other changes to the Initiative itself would have been quite speculative, and hard to distinguish from changes attributable to other government and international programs.

Figure 38: Earthen dyke (or bank); Jordan.

D. Community Participation, Dissemination, and Outreach

The participation of local communities was not explicitly addressed in the Initiative's original program. As a result of this omission, there was neither reason to expect nor any subsequent evidence to suggest that elements of the Initiative's Phase I program were in any way demand driven. The Phase I program was rather conceived by government policy makers and shaped by the technical inclinations of its planners.

Although the participation of local communities was overlooked in the Initiative's original program, Initiative teams would commonly engage local communities in the conduct of projects and activities. The land used in Initiative projects was often owned by the community members the project engaged – providing ownership as well as participation, and deepening the sense with which participants can be referred to as 'stakeholders.' Initiative teams would select highly representative or suitable communities or land-owners (or communities or land-owners in highly representative or suitable areas) to be approached for permission

to carry out projects on their lands, and then seek formal agreement to do so. The Tunisian Rangeland Management and Watershed Management teams carried out rangeland rehabilitation using just such local agreements (Figure 39). The rangelands on which project activities were carried out were used cooperatively by several communities and the agreements were reached with a number of NGOs representing local farmers. The Israeli Treated Wastewater and Biosolids Re-use team gained the permission of local orchard and farm owners to irrigate their fields using treated wastewater. The owners of the farms and orchard of course took full part in monitoring results, and their support of the activities increased as results were observed.

Three types of inducements were used to encourage land owners and users to participate in Initiative activities. The first was to persuade land owners to set aside parts of their plots for experiments intended to demonstrate better practices or other uses, with the incentive of financial assistance in cultivating other parts of their plots. The Palestinian Watershed Management team used this approach to encourage farmers to allocate areas to field experiments using runoff harvesting structures, by providing the owners with seeds and saplings to be used in their non-experimental plots. The second approach was to employ land users as salaried field workers in local projects in order to provide them with first hand experience in the techniques being introduced, a practice used by the Tunisian *Range Rehabilitation* program. The third approach was to persuade land users to refrain from activities that earn short-term income but cause long-term degradation, using Initiative funds to compensate them for forgone income. The approach was used extensively in rangeland conservation and rehabilitation programs in Jordan and Tunisia, where sheds constructed for flocks and provision of barley seed to replace free range fodders were introduced to remove grazing pressure. Gas-operated cookers were similarly introduced as a replacement for fuelwood collected from areas set aside for rehabilitation.

Figure 39: Farmers participating in the Initiative's field work in Tunisia.

Co-financing and cost-sharing arrangements were the most successful methods used to encourage sustainable practices among local land users. Egyptian programs used Initiative funds to purchase agricultural inputs like fertilizer, seeds, seedlings, and irrigation equipment co-financed by local farmers to improve soil fertility and water-use efficiency. In Jordan range improvement activities co-financed labor and material inputs in the cultivation of herbal and medicinal plants, including the provision of seeds and machinery. A Palestinian team cooperated with the local NGO *Agricultural Workers Union* to rehabilitate cisterns and plant forage seedlings, equally sharing labor and material costs. All of these generally one-off arrangements enabled land users to evaluate the results of new practices and to compare them to traditional practices.

Evidence of the impacts of participatory activities in and around project sites suggests that local awareness of them in nearby communities was sometimes substantial. Water harvesting techniques demonstrated by Initiative activities made a particularly strong impression. The introduction of water harvesting techniques on demonstration farms in Egypt, Jordan, and the Palestinian Territories

prompted wide interest among neighboring communities, who often requested that similar techniques be made available to them. Water harvesting experiments and demonstrations by the PNA national program influenced a large number of farmers in the vicinity to rehabilitate terraces on their land, plant fruit trees, and fence their plantations to reduce overgrazing. The Jordanian team noted steadily increasing adoption of its demonstrated cultivation of medicinal plants in both rainfed and irrigated areas, until by the end of the Initiative these had replaced traditional crops (chiefly barley and lentils) on some 243 hectares, earning measurably higher earnings among the cultivators. Having observed the results of the Tunisian team in rehabilitating degraded sandy rangelands, herders and farmers in nearby areas agreed to refrain from grazing and firewood collection in order to prevent local rangelands from again turning into shifting sand dunes.

Longer term, more widespread impacts of Initiative projects and activities beyond participating communities and their neighbors cannot yet be evaluated. Field level technical work undertaken during the Initiative carries the potential for considerable impact if adopted on a sufficient scale. Farming and land use practices developed by the Egyptian teams can significantly increase the income of farmers who adopt them times more than the cost of the necessary investment – this assuming a sufficiently wide pattern of adoption. The Jordanian programs' work on entrepreneurship development to encourage more advanced and efficient production and effective marketing of modern crop varieties, livestock, and dairy products has considerable potential for expansive adoption, which if achieved would be likely to significantly reduce rural poverty in Jordan. Scaling up rangeland rehabilitation and conservation methods developed by the Tunisian Initiative program has the potential to quadruple rangeland productivity, again assuming extensive adoption by Tunisian rangeland users. Palestinian public awareness activities and Israeli demonstration activities publicizing the social and environmental value of afforestation and other methods of watershed management may very well increase demand for and adoption of such methods.

The impact of activities undertaken under the Initiative was of course not intended to remain confined to areas and populations in the immediate vicinity of active projects. Dissemination, and training and outreach were an essential part of the Initiative's overall program. Initiative outreach activities employed a variety of methods to disseminate information among a variety of audiences, including demonstration sites and facilities, training courses, and extension services (Figure 40).

Demonstration was the most direct form of dissemination, and demonstration sites were widely

Figure 40: Farmers discussing crops at Initiative nursery; Egypt.

used throughout the life of the Initiative. In Egypt, sites established on 12 privately-owned farms demonstrated improved farming practices in arid areas, while the Palestinian program established botanic gardens and a herbarium to increase public awareness of the value and importance of biological diversity. The Jordanian team working on the cultivation of medicinal plants in semi-arid areas established demonstration plots on 118 farms across 34 villages.

Training programs were another prominent facet of information dissemination under the Initiative, and were designed for a variety of audiences, including farmers, extension officers, and policy makers. Some specifically targeted women audiences. Jordanian training programs were devoted to forage improvement, the cultivation and processing of herbal and medicinal plants, and rangeland improvement by planting indigenous and exotic plants. They were attended by farmers, extension officers, and representatives of NGOs and government agencies throughout the country. 13 Jordanian seminars on rangeland improvement specifically targeted women and were carried out in local schools. The Egyptian program organized a one-week training course in Cairo on water harvesting, irrigation, fertilizers, and other subjects relating to dryland management for extension officers. Another one-week training course for a mixed audience of Egyptian extension officers and community leaders was conducted at a local research station, providing instruction on seedling production and planting methods.

The Egyptian Marginal Water and Treated Wastewater and Biosolids programs coordinated training courses with *field days*, including programs on the reuse of treated wastewater for irrigation, and the use of biosolids in composting and biogas production. Other such field days were arranged around improved tillage practices designed to increase efficiency in the use of irrigation water and reduce salinization risks. Egyptian teams working under the Initiative promoted farmer attendance in these training programs in a series of some 70 meetings with farm leaders. The Tunisian Marginal Water and Treated Wastewater and Biosolids teams organized similar extension and field day programs in close cooperation with CRDA, ARI, CITET, and the Ministry of the Environment.

The generation of written material for consumption by land users and a variety of other audiences was another means of dissemination under the Initiative. Leaflets and booklets produced for land users could be highly tailored around local conditions and concerns, using photographs and other illustrations to make instructions and topic matter more explicit. In Jordan, leaflets providing instruction on ditch construction and range seeding methods made use of such photographs taken within local communities and demonstration sites, and were widely disseminated. Jordanian teams also produced pamphlets on methods of ryegrass cultivation and fertilizer application.

Egyptian and Israeli Treated Wastewater teams prepared a range of Arabic and Hebrew language extension materials which were translated into English in the spirit of regional exchange (Figure 41). The Israeli material included a series of four "extension pages" on *Water Sampling*, *Boron in*

Figure 41: Extension brochures, produced by the Egyptian Initiative team.

Wastewater, *Nitrogen in Wastewater*, and *Heavy Metals in Treated Wastewater*, detailing problems that farmers should anticipate and recommended solutions. Palestinian and Tunisian Watershed Management teams produced a field guide and booklet on herbal, medicinal and other high value plants that stressed the importance of conserving biodiversity.

Plant biodiversity was the most prominent theme of Palestinian public awareness raising activities on environmental issues, and popular lecture series and seminars targeting school children and their parents stressed the significance of biodiversity conservation for rangeland management and for combating desertification. The PNA Initiative team also mobilized youths in the Hebron and Bethlehem areas to participate in tree planting campaigns. Palestinian public awareness campaigns also took up the matter of the public acceptability of wastewater reuse, and these too targeted young audiences. Some 1,500 school children and youths in the district of Hebron took part in guided tours of the Palestinian Treated Wastewater and Biosolids Reuse program's water treatment facility at the Al-Arroub Farm Complex. The message conveyed was to regard wastewater, properly treated, as a valuable productive resource rather than as an unsanitary nuisance or threat to public health.

The production of documentary and instructional videos attracted considerable interest within the Initiative. During Phase I, the Israeli and Tunisian teams recorded a series of short videos of their national programs. In 2004, the Initiative produced a longer promotional video of genuinely regional scope. Entitled *Establishing a Bridge of Confidence*, the video presented personal accounts of the individuals involved in the Dryland Initiative during the Extension Phase, and solicited their impressions of regional collaboration and recommendations for its future.

The dissemination of knowledge generated within the Initiative to the academic community took place principally through conference presentations. A member of the Egyptian Initiative team attended the *National Symposium on Problems of Land Degradation in Egypt and Africa: Causes, Environmental Hazards and Conservation Methods* in March 2002, and presented a paper titled "Preliminary Guidelines for Yield Response to Salinity and Sodicity of Irrigation under North Delta Conditions." A member of the Jordanian Watershed Management team persuaded managers at Balqa University for Applied Sciences in Jordan to include curricula on medicinal plants, and another team member assisted in the curriculum's development. Outside the MENA region, Initiative researchers took part in numerous international fora and professional conferences, including the International Rangeland Congress in Townsville, Australia, July 1999, and the meeting of the International Water Association in Xi'an, China, in May 2005. The latter was attended by an Egyptian and an Israeli researcher who each presented a paper reporting on Initiative research results in their respective countries: "Agronomic Aspects and Environmental Impact of Reusing Marginal Water in Irrigation: A Case Study from Egypt," and "Linking Environmental and Economic Sustainability in Establishing Standards for Treated Wastewater in Israel." Finally the Israeli National Coordinator, who also served as the Israeli focal point for the UNCCD, presented results of technical work undertaken within the Initiative at several UNCCD.

If Arab-Israeli cooperation was the driver behind the Dryland Initiative, outreach and dissemination with impacts on local communities, rural livelihoods, and environmental sustainability were the technical objectives of the Initiative's work. The regional meetings and workshops in which the weight of regional interaction took place were devised to plan and report on national program activities which

were almost entirely local in scale. Engagement with local communities and land users was something much deeper than adherence to the principle of participation. Community participation in the Initiative's applied and adaptive research was a vital and necessary aspect of Initiative activities, most of which took place on their lands. Without access to their land, and with it their active involvement and participation, much of the research and development that took place under the Initiative would have been confined to research stations, government or private greenhouses or gardens, or laboratories conducting upstream research. Participating communities, farmers, and herders were therefore Initiative stakeholders in a very meaningful way. Their perception of the value of innovations and new practices made them the principal agents on which the impacts of those innovations and practices would rely – they were the first line of prospective adopters. Much of the dissemination of knowledge generated under the Initiative was therefore quite natural, as neighboring communities and land users observed or heard by word of mouth the results of recently introduced practices. This means of dissemination preceded the training and outreach programs introduced under the Initiative, but some significant part of the demand by local farmers and land users to participate in Initiative training may well have been the product of that original awareness.

Figure 42: Treated wastewater reuse in Gabès; Tunisia.