

DEVELOPMENT OF A CENTRAL NATIONAL AGRICULTURAL RESEARCH AND EXTENSION CENTER: THE JORDAN EXPERIENCE

LEROY ROGERS (*)

The Hasemite Kingdom of Jordan, like many of its neighboring Arab countries, has an agricultural sector beset with a myriad of problems. A rapidly growing population, currently near 4% per annum, coupled with limited land and water resources, has resulted in a serious national problem.

As in other non-oil producing countries of the region, Jordan's agriculture is looked to not only as a source of food, but also as a potential earner of foreign exchange.

Although Jordan has been the recipient of extensive assistance from various international donors, the infrastructure, both public and private, to support agriculture was poorly developed and lacking in coordination in the 1980's.

As a consequence, the Government of Jordan (GOJ) created the National Center for Agricultural Research and Technology Transfer (NCARTT) in 1987.

The National Center has overall responsibility for the identification, testing and transfer of high potential technologies to farmers through its network of six Regional Agricultural Service Centers (RASCs).

The United States Agency for International Development (USAID) joined with the GOJ in 1987 to provide support for the institutional development of NCARTT and the associated RASCs.

This US \$ 62.3 million effort is currently referred to as the Jordan National Agricultural Development Project (JNADP).

The USAID contribution is represented by a US \$ 20.5 million grant and a US \$ 7.0 million loan.

The GOJ contribution of more than US \$ 30 million is represented by land, staffing, and operational expenses.

Creation and development of a single national center with responsibility for coordination of all agricultural research and technology transfer functions was a major undertaking.

The desirability of rationalizing the diverse, and sometimes duplicative, research and technology transfer functions was obvious.

This paper addresses the fundamental question of whether such a newly created government entity within the Ministry of Agriculture (MOA) was well suited to this major task. A review of the early history of this ambitious effort may be useful to other countries confronted with similar problems.

Abstract

Jordan initiated a process of consolidating its agricultural research and technology transfer functions into a single national center in 1987. Jordan's diverse agriculture generates a need for a broad spectrum of programs. This, coupled with few well-trained technical staff, a limited budget, and a rigid organizational structure presented a situation common to many developing countries. A USAID funded project (JNADP) was developed to assist the Ministry of Agriculture to simultaneously build institutional capacity and conduct research and technology transfer activities.

This large project (U.S. \$ 62 million over 5 years) is near mid point. A review of progress to date reveals some information of value to other developing countries contemplating administrative centralization of publicly supported agricultural research and extension. Although having done so would not have guaranteed success, failure to involve staff, particularly down through mid management, resulted in the encountering of substantive bureaucratic rigidities. This situation was further compounded by a failure to develop at the outset an agreed upon, clear and unambiguous mission for the newly established center. Failure to insulate the center from the full forces of everyday political pressures resulted in diversion of limited resources from already weakly defined objectives.

The formal linking of six regional agricultural service centers to the national center provided an effective means of expediting the transmittal of emerging regional issues to the more technologically sophisticated scientists at the national center. In a parallel vein, this structure facilitated both sharing among regional centers and the traditional flow of technology from researchers to local extension agents. The linkage between the national center and the regional offices greatly assisted in adoption of the Farming Systems Research/Extension methodology. As developed within JNADP, the farming systems approach formally incorporates farmer identified and prioritized problems into its planning process.

A concurrent, but separately funded JNADP competitive grant research program was instrumental in encouraging new, higher risk research endeavors. Additionally, it provided incentive for greater inter-institutional cooperation including the international research centers and universities.

Résumé

La Jordanie a commencé un processus en 1987 pour consolider la recherche agricole et la vulgarisation dans un seul centre national. Avec une production agricole diversifiée, la Jordanie a eu besoin d'une large gamme de programmes de recherche. Ce fait, la disponibilité limitée d'un cadre bien formé et un budget limité ont créé une situation qui se trouve souvent dans les pays en voie de développement. En conséquence l'AID a financé un projet (JNADP) pour soutenir le Ministère de l'Agriculture dans le but de renforcer sa capacité institutionnelle pour la mise en place d'un programme efficace de recherche agricole et de vulgarisation.

Ce grand projet (\$ 62 millions pendant 5 ans) est à mi-terme dans sa réalisation. Une évaluation du progrès achevée à ce jour peut donner des idées importantes pour les autres pays en voie de développement qui veulent centraliser l'administration des institutions publiques de recherche agricole et de vulgarisation. Par exemple, dans ce cas l'absence d'une participation active du personnel concerné à tous les niveaux dans la planification du projet a rendu difficile un changement bureaucratique et la mission du centre n'a pas été bien élaborée et clarifiée. En plus, le manque de protéger le centre contre la pression politique et le manque de bien clarifier des objectifs du projet ont facilité le divertissement des ressources limitées du projet.

La liaison formelle des six centres régionaux du service agricole au centre national a été efficace dans le but de transmettre les informations courants sur les problèmes régionaux de production agricole au niveau national aussi bien que aux laboratoires bien équipés avec un personnel bien formé. Ce processus a facilité la coordination parmi les centres régionaux et la vulgarisation de résultats de recherche au niveau régional. La liaison entre le centre national et les centres régionaux a facilité l'adoption de la méthode de recherche sur les systèmes de production agricole. Cette méthode de recherche tient en compte les problèmes du producteur dans la planification de programme de recherche.

Pendant ce temps, le projet a aussi établi un programme boursier compétitif afin de promouvoir la nouvelle recherche thématique au niveau du centre national. En plus, l'établissement d'un centre national a renforcé la coopération parmi les institutions jordaniennes et les centres internationaux de recherche agricole.

Jordan's agriculture

Jordan is a relatively small country. It has 9.25 million hectares of land area of which less than 7% is arable. Irrigated agriculture is concentrated in the Jordan Valley on approximately 30,000 hectares, producing high value fruits and vegetables. The rainfed highlands were traditionally devoted large-

ly to cereals. The higher rainfall areas have recently experienced a significant conversion from cereals to tree fruits, largely olives.

There is an important semi-nomadic livestock (largely sheep and goats) sector in the Kingdom. Jordan's agriculture ranges from very intensive high technology vegetable production in plastic houses to nomad-

(*) International development cooperation office, Washington State University, Pullman, Wa.

ic Bedouin sheep and goat herding. Thus, the country's research and extension needs are diverse, while the total agricultural industry is rather modest in size.

Constraints

The initial (1985) and current (1990) professional staffing at NCARTT reveals the deficiency of trained staff (**table 1**). The reduction in the percentage of staff holding graduate degrees results from the hiring of a large number of new B.Sc. graduates to work at the RASCs.

There was a 32% increase in the actual number of staff holding graduate degrees. Even following the return of some 30 plus staff currently pursuing advanced degrees, NCARTT will lack trained staff to conduct other than applied research and extension programs.

Governments need to recognize that building a well trained professional staff will require considerable time as well as financial commitment. The problem may be exacerbated at the onset by sending the best staff for M.Sc. and Ph.D. level training resulting in a short run depletion of available staff. The problem of a shortage of qualified technical and administrative staff has been compounded by at least two conditions. The first is a lack of clear focus as to the mission of NCARTT.

The competing demands of a diverse agriculture has resulted in a fractionating of efforts among commodity and regional interests. A second, but related complication, has been the proliferation of donor country projects that represent some blend of Jordan and donor country interests. These and other issues give rise to the need for greater coordination of agricultural research and extension, but at the same time have created a difficult context within which to initiate a national center.

Early planning efforts and subsequent Project evaluations have recognized this problem. Reference has often been made to the need for an element of independence (semi- autonomy) in management that will permit NCARTT to more efficiently determine and conduct high priority research and technology transfer programs (JHADP Publication #1, 1987 and USAID, 1990). Although NCARTT, «...is to coordinate and support national ARTT (agricultural research and technology transfer) activities as well as to carry-out such activities alone and in collaboration with other ARTT organizations and institutions within and outside of Jordan», the question remains whether it received the authority, funding and governmental support to accomplish these tasks (JHADP Publication #6).

Activities

The initial contractual agreement for the Jordan National Agricultural Project had a to-

tal budget of US \$ 62.3 million (**table 2**). The technical assistance portion of the contract was revised in August 1989. The revised contract provided for increased technical assistance, both long term and short term, and increased the funding for training. This was in partial recognition of the shortage of well qualified NCARTT staff. Con-

struction and commodity purchases were subject to the usual amount of difficulties, but represent Project components that have well-defined goals. Commodity purchases were concentrated at the beginning of the Project.

As a consequence, vehicles, farm equipment, and laboratory equipment have been

Table 1 Number of NCARTT Staff by Highest Degree.

Section/Unit	Ph.D		M.Sc.		Other	
	1985	1990	1985	1990	1985	1990
National Center						
Administrative (*)	1	2	2	1	2	0
Extension/Ag. Info.	1	2	1	2	0	8
Plant Protection	1	0	3	7	3	7
Soils & Irrigation	2	3	5	5	5	12
Fruit Trees	1	1	2	2	2	5
Vegetables	1	1	1	2	8	6
Field Crops	2	1	5	3	2	11
Monitoring & Eval	0	1	0	0	0	7
Livestock & Range	0	1	0	1	0	3
Subtotal	9	11	19	23	22	59
RASCs (*)	2	3	22	28	59	154
Other (°)	0	0	0	4	0	0
Total	11	14	41	55	81	213
Percent	8	5	31	20	61	75

(*) Excludes section heads and RASC management.

(°) The RASC numbers for the initial year are for 1988, the year the RASCs were integrated into NCARTT.

(°) This figure includes some Extension agents located at RASCs, but who are administratively responsible to Directorates of Agriculture, MOA.

Table 2 Initial Jordan National Agricultural Development Project Budget (million U.S. dollars).

Item	USAID	Govt. of Jordan
Technical Assistance	9.2	—
Construction (loan)	7.0	—
Commodities	6.2	0.5
Agricultural Development		
Fund	3.5	6.7
Training	0.3	—
Evaluation	0.1	—
Land and Facility		
Construction	—	1.0
Personnel & Operational		
Costs	—	14.1
Contingency	1.0	2.3
Inflation	0.1	10.1
Other Costs	0.1	—
	27.5	34.7

available to NCARTT since the early stages of the Project. However, approximately US \$ 1.5 million of scientific equipment remains in temporary storage awaiting completion of construction at the national or regional centers. Thus, coordination of construction and commodity purchases is an important element for major programs.

The long term technical assistance team was budgeted to increase to eight members during the last part of the Project. This provides long-term (18 months or longer) consultative support for virtually every section of NCARTT. The presence of an expatriate consultant also provides staffing for NCARTT during the degree training of indigenous staff.

The major portion of the initial long-term degree training was envisaged to take place at U.S. universities. However, NCARTT staff were deficient in the number of permanent staff with both academic preparation and English language capabilities. As a consequence, only six staff have been sent for degrees in the United States. Of these three are at the M.Sc. level in either agronomy or extension methods and three are pursuing a Ph.D. in either soils or weed science. Although an English language training program was initiated in Jordan as a part of the Project, inadequate English competency remains a major problem for gaining admission to U.S. universities.

NCARTT and JNADP developed an alternative to degree training at U.S. universities for staff having adequate subject matter qualifications but lacking English competency. An agreement was reached with the Faculty of Agriculture/University of Jordan (FOA/UOJ), to train eligible NCARTT staff at the M.Sc. and Diploma level. A total of 31 NCARTT staff have started graduate programs at the University of Jordan. As of July 1990, two have completed the M.Sc., five have completed the Diploma (one of whom continued on for the M.Sc.), 22 remain in programs (15 M.Sc. and 7 Diploma), and three have discontinued pursuit of an advanced degree. In addition to tuition and other university fees, JNADP provides up to U.S. \$ 2,250 per M.Sc. student in support of their master's thesis research. The arrangement with the University of Jordan has been cost effective in providing graduate degrees for NCARTT staff. A two-year M.Sc. program at the University of Jordan costs JNADP less than US \$ 5,000. A typical M.Sc. program at a U.S. university will have a budgeted cost in excess of U.S. \$ 50,000. There are no Ph.D. programs available in the Faculty of Agriculture at the University of Jordan.

Following establishment of the National Center (NCARTT), a total of six regional agricultural service centers (RASCs) have been incorporated into the system. This was partially in response to a need to address the concerns of farmers in the different regions of Jordan. The six RASCs and associated stations provide NCARTT with research and demonstration sites representative of the

major soil, climate and hydrologic conditions of Jordan. The geographic dispersion of RASCs, coupled with an explicit farming systems approach helps assure local input into the research and technology transfer programs at NCARTT.

In recognition of the relatively small scale of its agricultural research capabilities, Jordan has developed close relationships with relevant international and regional centers. Of particular relevance to Jordan have been those with ICARDA and ACSAD. Cooperative endeavors with these centers have provided germ plasm and technical expertise unavailable within the Kingdom. ICARDA opened an office in Jordan in 1988 to provide increased support for their in-country research. Selected NCARTT staff, sometimes including expatriate JNADP scientists, are commonly involved in research and training activities under the sponsorship of ICARDA. The Arabic language capabilities of a significant number of ICARDA staff, and all of the ACSAD staff, has greatly facilitated close working relationships between scientists from these institutions and those from NCARTT.

Traditionally the direction of agricultural research at NCARTT and predecessor MOA units has been determined internally by the administrative leadership with no formal mechanism for input from external sources. The technical assistance contract between USAID and the Government of Jordan explicitly called for farmer involvement in establishing the research and technology transfer programs of NCARTT. The procedures ultimately followed were a variant of Farming Systems Research/Extension (FSR/E) methodology.

FSR/E training sessions were held for NCARTT and MOA Extension staff in January 1987 and August 1989 (Gaudreau et al. 1989 and Galt & Al-Kadi, 1989). The second training session included systematic involvement with farmers in each of the six RASCs.

Participants in the training session were required to seek out individual farmers. Two hundred thirty eight (238) participating farmers were asked to identify problems and to suggest methods to overcome these problems. Farmer identified problems were prioritized on the basis of a simple summation of the number of farmers mentioning a particular problem. These responses were summarized by problems of particular relevance to each section (discipline) within NCARTT. The results were provided to the sections for consideration in development of their 1990 workplans. Examination of an English version of the 1990 workplan evidenced no apparent change from traditional programming and no actual incorporation of farmer priorities into the planning process of NCARTT.

As an early step in preparing 1991 workplans, each RASC invited local farmers to meetings at the RASC offices. Section heads or representatives from all disciplines were invited to participate in the regional meetings. Attendance by disciplines varied in ap-

parent relationship to their interest in the process of farmer involvement in planning and the importance to their discipline of the dominant agriculture of the region. Farmer participation was limited, ranging from a low of two to a high of 19 at individual RASCs.

Participants in the 1990 RASC meetings were asked to review the earlier (1989) developed lists of farmer identified problems, then to suggest additional problems or recommend deletion of any earlier identified problems that were no longer relevant. Subsequently, participants were asked to specify, in order, the three most important problems on the list. The results of their balloting were immediately entered into a software program (Decision Pad) using a laptop computer that provided a prioritized list for review and discussion among NCARTT scientists and local farmers. This allowed clarification of the issues and examination of potential approaches to the highest priority problems.

Concomitant with the later stages of this process of securing farmer evaluations of priority problems, NCARTT held a strategic planning workshop (Mann, 1990). One product of this workshop was a set of criteria for prioritizing proposed research projects. One of the agreed upon criteria for both research and extension activities was the importance accorded the issue by farmers. Planning procedures for the 1991 workplan provided for direct inclusion of the summary scores provided by participants in the six RASC planning sessions. Thus, at least a dimension of farmer identified and prioritized problems has been operationally integrated into the National Center's planning.

Early activities of the technical assistance team focused on extension programming. Direct involvement of technical assistance team members in research increased through the life of JNADP. Expatriate team members were required to establish their workplans in conformity with those of their section and in active collaboration with their Jordanian counterparts. An intent was to conduct an element of on-the-job training for counterparts, but more fundamentally, to put in place research programs that can be continued after departure of the expatriate consultants.

Several groups, both internal and external to Jordan, have been critical of NCARTT for its tendency to repeat programs conducted the previous year. As a consequence, those responsible for JNADP wanted to provide an incentive for innovation in approaches to and subject matter coverage of agricultural research and technology transfer programs. A competitive grant type program was initiated under the title, Agricultural Development Fund (ADF). The original JNADP budget included a USAID grant of U.S. \$ 3.5 million and an approximate 2 for 1 match from the Government of Jordan. Scientists from NCARTT and elsewhere in Jordan are eligible to compete for these funds.

Although there are guidelines for proposals, about the only major programmatic constraint is that these funds may not be used to replace or substitute for the normal operating budget of NCARTT. Preference is given to projects involving collaborative efforts between scientists of different institutions, e.g. NCARTT, University of Jordan, ICARDA, etc. As of September 1990, grants totalling approximately U.S. \$ 450,000 have been awarded and some U.S. \$ 70,000 expended.

The initial discussions regarding JNADP made reference to providing autonomy for NCARTT in order to partially insulate it from political pressures and bureaucratic procedures. At the same time, and with a somewhat contradictory effect, three conditions were imposed on NCARTT. First, NCARTT/JNADP was placed under the Office of the Director of Projects. This constituted putting an additional administrative layer between the Director of NCARTT and the office of the Minister of Agriculture. Approximately three years into JNADP, the MOA transferred the Director of Projects to another position and did not refill the position. For the present, this has eliminated an extra layer of bureaucratic structure. Secondly, a Board of Directors and Steering Committee were established for NCARTT. The duties of which have not been well understood and which have met only rarely and then commonly with inadequate attendance to constitute a quorum. Thirdly, as a part of the ADF program, a Steering Committee was established to provide guidance to this effort. It, as well, has neither met on a regular basis nor established efficient operational procedures to facilitate work on ADF projects. There is little evidence that NCARTT has either more or less autonomy with respect to personnel or financial matters than other units within the Ministry of Agriculture.

Evaluation and lessons learned

Perhaps the most fundamental issue is whether the creation of NCARTT with the accompanying assistance of the USAID project has been successful. Following from this is the question, if successful, should other developing countries adopt a similar strategy of creating a single agricultural research and technology transfer institution. As one might expect, performance to date has been mixed. Some of the problems encountered were the result of exogenous circumstances associated with a serious national economic crisis. A major devaluation of the Jordanian dinar occurred approximately two years into the Project. A consequence of this was a general reduction in the government's ability to fund all activities, including agricultural research and technology transfer. Sixteen months later, August 1990, Jordan's already difficult financial situation was further devastated by econom-

ic sanctions and trade disruptions associated with the events following Iraq's invasion of Kuwait. Regardless of these events, some lessons may be learned from JNADP and the attempt to create a single center that coordinates all public agricultural research and technology transfer.

An attempt to bring together and/or coordinate all agricultural research and technology transfer under one institution requires clear agreement on the unit's mission and objectives. Such a unit must also have authority commensurate with its responsibilities. Additionally, the administrative structure must facilitate and support a decision making process consistent with efficient accomplishment of agreed upon objectives. These conditions were not well met at the inception of NCARTT with consequent difficulties early in project life. Upper level ministry officials, USAID mission staff, and expatriate administrators held at least two major workshops dealing with organizational structure and policy. A consequence of non-involvement of NCARTT staff at mid management level and below was an apparent lack of «buy-in» by these people. Although initial discussions spoke of autonomy or semi-autonomy of NCARTT, the Center remained subject to very tight administrative control by the Ministry of Agriculture. The situation was further compounded by an additional layer of administration between NCARTT and the Ministry and the creation of a Board of Directors without a clear mandate as to their responsibilities.

A lesson to be learned is that fledgling institutions that are charged to coordinate across several existing agencies must have a clear and unambiguous mission and commensurate authority and support from responsible higher levels of government. The issue of clarity of mission has an additional dimension of particular importance to small countries with limited staff numbers and capabilities. It is important that a mechanism for determining priorities be established and that the institution have an element of insulation from external pressure. Such a research institution needs to be responsive to clientele needs, but not subjected to short run political pressures that divert resources from a well conceived long range program. It is particularly important for an institution with a limited staff and operations budget to focus on a limited agenda of research topics. A critical mass of resources is necessary to provide a reasonable prospect of success.

As in many countries, the civil service of Jordan has limited flexibility to financially reward staff for productivity. A bureaucratic structure with a proclivity towards centralized decision-making provides little incentive for staff initiative. Coupling this with an organizational perspective that rewards traditional behavior, creates an environment in which it has been difficult for NCARTT to effectively coordinate and conduct an effective and efficient agricultural research and technology transfer program.

The staffing of extension provides another illustration of problems resulting from the structure of an organization. The extension agents are assigned to regional directorates. These agents report to the administrative head of the directorate who in turn reports to the Ministry of Agriculture through administrative channels independent of NCARTT. Although programmatically associated with NCARTT, and often officed in RASCs, there is not a commensurate administrative linkage. The sought after advantages of close linkage between research and extension are not fully captured.

The initial emphasis on a farming systems approach resulted in NCARTT staff having to interact more closely with farmers. The regionalization of NCARTT with six RASCs further sensitized the institution to regional concerns. The explicit recognition of regional problems has been effective in providing local support for ministry initiatives in research and extension.

The flexibility to use in-country degree training opportunities can be a very cost effective mechanism for upgrading the technical capacity of staff. This is particularly true in those countries where competency in the English language among potential trainees is a problem.

The appropriate trade-off between degree training, regardless of location, and expatriate consultancies depends upon a myriad of issues existing in a country. There appears to be merit in having flexibility to shift resources among various budget categories in order to adjust to an evolving environment.

In summary, the NCARTT/JNADP experiment has been successful. The Government of Jordan, Jordanian farmers, and the donor participants have gained knowledge during the initial phases of the Project and made adjustments in recognition of events. Two of the most important lessons learned are the need to develop and obtain acceptance by the staff of a focused and unambiguous set of objectives and to provide the newly developed institution with commensurate authority and support to achieve these objectives. ●

References

- Galt D.L. and Al-Kadi A.F. (1989): Policy Report: Common Farmer Problems in the Hashemite Kingdom of Jordan, *MOA/NCARTT/Monitoring and Evaluation Unit Report No. 0189*.
- Gaudreau M. E., Khraisat E. and Galt D.L. (Eds.) (1989): *Proceedings of the Jordanian Farming Systems Research and Extension Training Workshop*, MOA/NCARTT/JNADP, Jordan. 1989.
- JHADP (1987): *Proceedings of Strategic Planning Workshop for Agricultural Research and Technology Transfer*, *HADP Publ. No. 1*.
- JHADP (1988): Working Paper on Policies and Procedures for Agricultural Research and Technology Transfer in Jordan. Report of the Policies and Priorities Committee to the Board of Directors/Steering Committee for ARTT, *JHADP Publ. No. 6*, Jordan.
- Mann, Clarence (1990): Facilitators Report on NCARTT Strategic Planning/Implementation Workshop, *JNADP Publ. No. 11*, Jordan.
- USAID (1990): *Audit of Jordan National Agricultural Development Project No. 278-0264*. Audit Report No. 3-278-10.