



USAID | **JORDAN**
FROM THE AMERICAN PEOPLE

**A Comprehensive Review
Of the Hashemite Kingdom of Jordan
National Center for Agricultural Research and
Technology Transfer
(NCARTT)**

And the

**Ministry of Agriculture-Extension
(MoA-Extension)**

July 9 – 31, 2005



REVIEW TEAM MEMBERSHIP

Ibrahim M. Shaqir	Team Leader	USDA-ARS, Beltsville, Maryland
James E. Ayars	Irrigation Engineer	USDA-ARS, Parlier, California
Joan R. Fulton	Agricultural Economist	Purdue University, West Lafayette, Indiana
James C. Hanson	Extension Economist	University of Maryland, College Park, MD
Stephen R. Kaffka	Extension Agronomist	University of California, Davis, California
Dennis D. Kopp	Entomologist	USDA-CSREES, Washington, DC
Craig A. Ledbetter	Research Geneticist	USDA-ARS, Parlier, California
David J. Nisbet	Animal Scientist	USDA-ARS, College Station, Texas



United States Department of Agriculture
Research, Education and Economics
Agricultural Research Service

DISCLAIMER

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

ACKNOWLEDGEMENTS

An U.S. Department of Agriculture, Agricultural Research Service Review Team working under an Inter-Agency Agreement (IAA) with USAID prepared this assessment report. The Review Team extends its thanks and gratitude to the Minister of Agriculture of Jordan, his Excellency Mr. Muzahim Muhaisin for his support and hospitality. The team members acknowledge, with thanks, the assistance of the National Center for Agricultural Research and Technology Transfer (NCARTT) staff and especially Dr. Abdel Nabi Fardous, Director General of NCARTT, for his devotion and dedication in ensuring the availability of all in-country resources needed to accomplish this review. Dr. Fardous was helpful by providing the review team total and transparent access to researchers, programs and staff throughout the entire NCARTT Institution. The review team also wishes to thank Mr. Khalil Jorun, Director of MoA-Extension Service, and his staff for their insights and assistance during the team visit. The review effort was overseen by an Advisory Council consisting of Dr. Mahmoud Al Dwairy (UJ Professor/Previous Minister of Ag.), Mr. Hassan Abul Soud (Grains Farmer, Private sector), Mr. Maher Dajani (Director of DAJANI, Agribusiness), Dr. Rida Shibli (Dean – Faculty of Agriculture, JUST), Dr. Mohamad Shatnawi (Professor, UJ), Dr. Nasri Haddad (Professor, UJ), Dr. Majid N. Fandi (D.G. Advisor, NCARTT), and Dr. Samir Khalifeh (Deputy Director General, NCARTT) all of whom are also acknowledged for their open input and wise council throughout the review. This group served as a resource, providing helpful guidance and information regarding agricultural research and production systems in Jordan, which made the review team's task more efficient and manageable.

The team members gratefully acknowledge the assistance of USAID Jordan Mission and especially Mr. James Franckiewicz, Ms. Setta Tutundjian (USAID/WRE), and Ms. Hala Khoury (USDA-FAS, U.S. Embassy, Amman), for their assistance, council and continued support throughout the process of the review.

The review team also wishes to thank the support staff at NCARTT for their hospitality and the help they provided throughout their stay in Jordan. Special thanks goes to Abu Ra'ad who served as team driver for the review team's site visit. He patiently waited at every stop, was always punctual, was on-call night and day, and provided safe passage always with a positive disposition and a friendly smile.

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Executive Summary

The Scientific Peer Panel selected for the Review Team was developed through a joint effort between USDA/ARS, CSREES and three State Land Grant Universities with the initial request for the review coming from and funded by USAID. This Institutional Review of NCARTT was planned, initiated and directed as a joint cooperative effort between the two USDA Agencies in a fashion consistent with the recommendations described in the document, “Interagency Effort to Strengthen and Enhance the Collaborative Relationship of the Agricultural Research Service and the Cooperative State Research, Education and Extension Service” developed by Dr. Bobby Phills in the spring of 2005.

The Scientific Peer Review Panel was charged with the task of reviewing NCARTT and the MoA-Extension and considering their past performance, challenges facing both institutions, and identifying potential opportunities for each to improve. Many external challenges face Jordanian agriculture, such as water and resource availability, a growing urban population, a changing agricultural market sector, and a growing need to address environmental, social and community issues. During the review team’s site visit a number of successful programs were identified and are presented briefly in this report as examples of positive engagement between agricultural research, extension education and technology transfer. These successful programs are currently providing substantial benefits for the citizens of Jordan. The review teams also identified and provided recommendations regarding opportunities to strengthen programs, improve the effectiveness, and otherwise contribute positively to the regional and international productivity of NCARTT.

In this report the review team recommends three major reorganization components which are believed to be essential for NCARTT to grow beyond its present bonds and become an internationally recognized research team making new and exciting discoveries and delivering them to Jordanian farmers to enhance their competitiveness. In this document the review team presents the following reorganization recommendations:

1. NCARTT needs to obtain autonomous status within the MoA, which would allow its administration to link research and outreach performance to promotion and salary level within a well-defined internal organizational career ladder. This could be modeled to mirror the academic ranking and promotion systems within Jordanian and U.S. leading Universities and many other national research organizations.
2. Programmatic restructuring and realignment of NCARTT, along Jordanian agroecological systems, into four Core Program Areas and five cross-cutting programs. The value of the realignment into a new configuration is that it would add to program stability, provide opportunities for new science synergism, enhance efficiency of staff usage and improve cooperation and engagement with major Jordanian agricultural production systems.
3. Focus the agricultural research and outreach to the needs of a specific target audience. NCARTT can work with the medium to large size producers within the Jordanian agricultural production system. MoA-Extension is better configured and staffed to work with small and limited-resource farmers; as the private consultants work mostly with the largest producer corporate farms. This division of market audience allows each organization to strongly engage with one segment. They can develop staff to address their

segments' primary needs and work on problems specific to that segment of Jordan's agricultural production system.

The review team identified that NCARTT needs to 1) clearly define its mission, 2) identify its core competencies, 3) develop and expand programs consistent with those core competencies, and 4) effectively market the successes of their organization. The review team views NCARTT's strongest core competencies to be first applied research and second strongest technology transfer. NCARTT's 5-year strategic plan should be updated around these core competencies with a new emphasis on technology transfer and outreach to the agricultural community. While research has been NCARTT's historic strength, a balanced shift is needed to place emphasis on the delivery of practical production information to its stakeholders through outreach education and technology transfer. It is also important for NCARTT to widely market and promote its accomplishments to assure stakeholder understanding, future support, and resources.

Leadership development within NCARTT and MoA-Extension would strengthen present programs and assure continuity of institutional leadership for both organizations. Current leadership should develop internal processes to recognize, promote, and offer leadership training to individuals who possess the innate talents necessary for the next succession of effective leadership. Sabbatical leaves, post-doctorate leaves, and staff "detail appointments" to other institutions are useful tools for leadership development and offer important capacity building opportunities.

Improving organizational effectiveness was a consideration of the review team throughout the entire review process. Salary inequities between MoA civil service, Jordanian universities and the private sector were an issue that arose time and again by NCARTT and MoA-Extension staff. The lack of salary parity between similarly educated and experienced NCARTT researchers and professional staff, when compared to faculty and staff in Jordanian universities and the private sector, is difficult to justify. This is a major issue of concern for all NCARTT personnel which appears to be continually eroding morale and drives the best and brightest NCARTT employees toward more financially lucrative career opportunities. The review team recognized the value of establishing NCARTT as an autonomous national institution within the MoA. Such autonomy would allow administrative management of budget allocation, staff configuration, performance rating within a ranking system, and staff salary adjustments related to staff performance. Such autonomy would ensure continued advancement of NCARTT in professional excellence and its ability to compete for international research funding. Moving beyond salaries, recommendations to improve organizational effectiveness are made regarding the development of position descriptions, modifications to hiring processes, revision of the sabbatical leave policy, implementing split appointments for staff containing both research and extension/outreach responsibilities, the development of a merit promotion system and establishing a professional career ladder within NCARTT.

This report recommends major programmatic restructuring for NCARTT into four Core Program Areas based upon Jordanian agroecological areas and five cross-cutting programs building upon NCARTT's existing staff strengths. The review team believes that such a programmatic reorganization would simplify administration, align researchers more logically and encourage broader engagement and cooperation among staff in cross-cutting programs.

The review team recommends that NCARTT and the MoA-Extension partition their target audiences throughout the rural sector along a logical division based on farm size. This would allow both institutions to build upon their evolved strengths with different audiences. Small holdings by limited-resource rural family farms have been best served by the MoA-Extension with program successes that address small farm production, rural poverty reduction, creation of home-based industries, improvement of family nutrition, and women-based programming. Medium and large size farms are commercial farms and the target audience that NCARTT can most effectively reach. Some large farms are heavily mechanized, highly dependent upon international markets and purchase information from private consultants. Of course there will be some overlap in educational needs and programming which will provide new opportunities for cooperation and coordination. Manpower adjustments and recruitment must be made to address the skill set needs of both groups. The use of Farm Advisory Boards should strengthen the inter-linking of all programs to the grass roots level needs.

Following are the review team's recommendations. These have been moved forward from the full review document. The review document has been developed in a consensus process by the review team and builds upon information obtained from the study material provided to the team in May 2005, from interviews and discussions during site reviews in July and October 2005 and from the team's post review deliberations and document rewrites. We have placed a copy of the review recommendations in the Executive Summary for easy access and consideration. The full report provides expanded dialogue and details the considerations upon which each of these recommendations are founded.

Review Recommendations:

The review team recommends that:

Mission

- R-1: NCARTT develop a strategic plan that clearly defines its mission, identifies its core competencies and develops a program direction consistent with those core competencies.
- R-2: NCARTT develop an internal group within the Communication and Outreach Support Program, whose responsibility is to effectively market and promote the successes of NCARTT to governmental administrators, international donors, affected end-users, all stakeholders, and the general public.

Leadership

- R-3: NCARTT develop position descriptions for all administrative leadership positions that define the required core responsibilities, expected credentials, and desired previous academic or career experiences.
- R-4: NCARTT develop a transparent, competitive selection and hiring process. This would involve a screening committee which interviews, ranks and recommends a merit-ranked slate of acceptable candidates to NCARTT leaders. Depending on the position, NCARTT screening committee participants should include NCARTT leaders, researchers, and relevant outside stakeholders from academia and/or the private sector.

- R-5: NCARTT leadership identifies researchers with leadership potential and provides opportunities for them to participate in leadership training courses and programs offered through internationally recognized educational organizations and/or private companies.

Organizational Effectiveness

- R-6: NCARTT be granted financial and administrative autonomy. The review team concurs with the National Strategy for Agricultural Development's recommendation. This autonomy would ensure continued advancement of NCARTT as a research institute that could successfully compete for the highest level of excellence and professional talent, with other successful Jordanian research and academic institutions.
- R-7: NCARTT consider opportunities for positive staff morale building and benefits to offset the negative impact of the civil service pay scale inequities compared to that of university academic and private sector positions of comparable education, experience and productivity.
- R-8: NCARTT develop and implement a merit-based promotion and rank system comparable to those used by the University of Jordan and the Jordan University of Science and Technology. Such a system would recognize professional excellence, career achievements and professional prestige similar to university merit and adopt promotion and rank systems already recognized within Jordan. Salary parity should be established for NCARTT and MOA-Extension professionals with similarly educated and experienced researchers and professionals at comparable institutions.

Human Capacity

- R-9: NCARTT review and revise existing policies regarding the granting, duration and purpose of sabbatical leaves. New sabbatical leave policies should relate to opportunities that support and complement NCARTT's strategic goals and should provide for institutional strengthening activities related to new science, expanded research capacity and/or leadership development.
- R-10: NCARTT continue its strong commitment to the development of human capacity. This is a valuable institutional characteristic that the review team recommends be continued. The use of sabbatical leaves and the expansion of post-doctorate leaves, staff "detail appointments" to other institutions and grant writing courses will offer additional opportunities for human capacity building within NCARTT and to address needs related to the institution's strategic goals.

Reporting Impacts

- R-11: NCARTT adopt a formal annual report of progress. Each research program and Regional Center would develop and submit to the NCARTT Director a formal, annual report of progress. These reports would be in a format to allow easy editing and summarization in order to generate NCARTT's Annual Report of Research and Outreach, describing progress and measuring impacts of the institution's programs. Structured annual reports will provide NCARTT and its stakeholders with a comprehensive, measurable and comparable record of program direction, accomplishments and excellence. Communication and Outreach Support staff could develop from these reports

short professional pieces on program accomplishments for use by NCARTT leadership, news media, and or the government decision makers.

Program Reorganization

- R-12: NCARTT adopt a major programmatic restructuring into four Core Program Areas based upon Jordanian agroecological areas and five cross-cutting programs building upon existing staff strengths. The Core Program Areas are: (a) Irrigated Agriculture (b) Livestock, Rangeland and Dryland Crop Production, (c) Olive Production Program, and (d) Biodiversity and Genetic Resources. The five cross-cutting programs are: (1) Integrated Pest Management, (2) Agricultural Economics, (3) Rural Sociology, (4) Communication and Outreach Support, and (5) Water Management. The review team believes that such a programmatic reorganization would simplify administration, align researchers more logically and encourage broader engagement and cooperation among staff in cross-cutting programs.

NCARTT – University Cooperation

- R-13: NCARTT strengthen cooperation between itself, the University of Jordan, Jordan University of Science and Technology and other universities and agricultural research institutions wherever possible. Expanded cooperation will facilitate more efficient allocation of publicly-funded research and outreach services available to the Jordanian agricultural sector and could include shared field stations, cooperative distribution of research responsibilities along basic and applied lines, and institutionalization of joint work groups by all parties. Memoranda of understanding (MOUs) could be developed to formalize these arrangements.

Gender

- R-14: NCARTT expand its ongoing practice of supporting women to advance professionally within the organization. NCARTT should emphasize its successful initiatives with respect to enhancing the role of women and seek funding for such programming.
- R-15: NCARTT and the MoA-Extension continue to work with women to provide assistance through technology transfer. Both NCARTT and MoA-Extension should highlight the successes they are experiencing with respect to programming for women, measure and document the impact of these programs, and seek funding from outside donor agencies to continue this important work.

Defining Target Outreach Audiences

- R-16: NCARTT, and the MoA-Extension, build upon existing strengths and partition target audiences for the delivery of extension programming and outreach. A logical division of audience could be according to farm size of the targeted audience and would allow both institutions to build upon their strengths.

Staffing Adjustments

- R-17: NCARTT recruit and permanently transfer extension agents with relevant education and communication skills from MoA-Extension to NCARTT. A number of

MoA-Extension agents with facilitation skills and community connections will be needed to better engage NCARTT outreach to medium/large size farms throughout Jordan.

- R-18: MoA-Extension builds on and creates new strengths by recruiting and hiring new staff who are skilled in nutrition, women's issues, horticulture, and home-based industries, as opportunities for new hires become available. Such staffing would further enhance MoA-Extension's ability to work with limited-resource audiences, rural women's issues and small farmers.

Farmer Advisory Boards

- R-19: NCARTT and MoA-Extension create Farmer Advisory Boards at each of its Regional Centers and Stations, and MoA-Extension directorates. These boards should be comprised of 8 to 12 farmers reflective of the region's respective targeted audiences for extension/outreach programming and will be used to gather stakeholder input regarding community outreach needs and these engagements will demonstrate government's responsiveness to stakeholder needs. Farm advisory boards will improve communication with farm groups and if convinced of the program's value, will become an advocate for community outreach programming.

Increasing the Competence of Extension Educators

- R-20: Extension educators should be well trained in areas of production agriculture, new research technology, and in how to conduct effective educational programs.

Important Considerations for MoA-Extension

- R-21: To make the transition successful to serving limited resource farmers, MoA-Extension should a) ensure that all its employees value its new mission, b) conduct a needs assessment with assistance from its Farmer Advisory Boards, c) identify new partner institutions that provide needed skills, d) be supplied with an adequate operating budgets, e) develop a team of dedicated extension educators with the appropriate skills, and f) develop a career ladder within the MoA-Extension, that rewards and promotes performance excellence with increased responsibility and leadership opportunities.

I. Introduction

The Scientific Peer Panel selected for the Review Team was developed through a joint effort between USDA/ARS, CSREES, and three State Land Grant Universities and the initial request for the review came from and was funded by USAID. This Institutional Review of NCARTT was planned, initiated and directed as a joint cooperative effort between the two USDA Agencies in a fashion consistent with the recommendations described in the document, “Interagency Effort to Strengthen and Enhance the Collaborative Relationship of the Agricultural Research Service and the Cooperative State Research, Education and Extension Service” developed by Dr. Bobby Phills in the spring of 2005.

The Review Team was charged with the task of reviewing the Jordanian National Center for Agricultural Research and Technology Transfer (NCARTT) and the Jordanian Extension Service (MoA-Extension) to evaluate performance of their mission, their interactions and engagement with stakeholder groups. The review team considered challenges facing both institutions, their past performance, and identified potential opportunities for each to improve. The intent of this review is to provide both Institutions with a set of reasonable and practical recommendations that are descriptive of what needs to be done, but not be overly prescriptive. Each institution is expected to weigh the merit of the review team’s recommendation and determine the appropriate course regarding implementation. This is an important time to strengthen the infrastructure of Jordan’s agricultural research and extension capacity since Jordanian agriculture is faced with many impending challenges and changes. Challenges relate to water and resource availability, a changing agricultural market sector, and a growing need to address environmental, social and community issues.

In this report the review team recommends three major reorganization components which are believed to be essential for NCARTT to grow beyond its present bonds and become an internationally recognized research team making new and exciting discoveries and delivering them to Jordanian farmers to enhance their competitiveness. The review team believes that NCARTT today has the critical mass, foundation talent, desire and national commitment to move to this next level of performance and international recognition. Presently there are governmental, institutional and organizational barriers that will need to be overcome if NCARTT is to move to this next level of performance. In this document the review team presents the following reorganization recommendations:

1. NCARTT needs to obtain autonomous status within the MoA, which would allow its administration to link research and outreach performance to promotion and salary level within a well-defined internal organizational career ladder. This could be modeled to mirror the academic ranking and promotion systems within Jordanian and U.S. leading Universities and many other national research organizations. This recommendation is described in further detail on page 15 of this report.
2. Programmatic restructuring and realignment of NCARTT, along Jordanian agroecological systems, into four Core Program Areas across which five cross-cutting program areas engage. The value of the realignment into a new configuration is that it would add to program stability, provide opportunities for new science synergism, enhance efficiency of staff usage and improve cooperation and engagement with major Jordanian agricultural production systems. This recommendation is described in further detail on page 20 of this report.

3. Focus the agricultural research and outreach to the needs of a specific target audience. NCARTT can work with the medium to large size producers within the Jordanian agricultural production system. MoA-Extension is better configured and staffed to work with small and limited-resource farmers; as the private consultants work mostly with the largest producer corporate farms. This division of market audience allows each organization to strongly engage with one segment. They can develop staff to address their segment's primary needs and work on problems specific to that segment of Jordan's agricultural production system. This recommendation is described in further detail on page 27 of this report.

The review team realized reorganization recommendations number 2 and 3 are internal to NCARTT and could not be implemented without external engagement. Recommendation number 1 will require engagement at governmental levels beyond NCARTT, yet the review team believes is the most crucial to moving NCARTT to the next level of international recognition and competitiveness for international donor resources.

a. MoA-Extension Institutional History:

The Ministry of Agriculture (MoA) was established in 1939 and the MoA-Extension was established in 1954 to provide public extension service for the Jordanian farmers. In 1970, research and extension merged into one department, the Department of Scientific Research and Agricultural Extension within MoA, and extension service continued to be provided through NCARTT after it was established in 1985. In 1992, MoA-Extension separated from NCARTT to form what is currently the MoA-Department of Extension and Information. MoA-Extension is managed by the Director of Extension co-located with NCARTT headquarters at Baqa'a who reports to the Director of Extension and Special Projects who reports to the MoA Secretary General.

As of July 2005, the MoA-Extension staff totaled 117, comprised of 82 extension agents and 35 administrators and support staff. The extension agents are distributed at 27 directorates and Amman headquarters covering most of Jordan. MoA-Extension is mandated to: Adapt and transfer technology from agricultural research institutions through field-days, and workshops and farm visits; increase women participation in agriculture development; improve capacity of farmers and agricultural workers to participate in the socioeconomic development of rural areas; inclusion of the private sector in agricultural development; contribute to protecting the natural and agricultural resources.

b. NCARTT Institutional History:

NCARTT was established in 1985 as a result of the reorganization of the Ministry of Agriculture with support from the United States Agency for International Development (USAID). NCARTT operates according to special by-laws as a semi-autonomous institution governed by a council composed of the Minister of Agriculture as chairman, NCARTT Director General as Vice Chairman, MoA Secretary General, and representatives from the Ministries of Planning and Water –Irrigation, the Higher Council for Science and Technology, Deans of Faculties from University of Jordan and Jordan University of Science and Technology, and one member from the private sector. It has semiautonomous administrative and financial associations with the

Ministry of Agriculture. NCARTT consists of a main headquarters located at Al-Hussein, the Agricultural Experiment Station at Baqa'a. Additionally, there are six Regional Centers in Deir Alla, Ramtha, Khaldieh, Mushaqar, Rabba, and Shoubak. It operates 12 research stations representing the different agro-ecological conditions in Jordan.

NCARTT is mandated to conduct applied agricultural research and transfer of technology by identifying, testing, and transferring, and adoption of improved agricultural technologies. Presently, NCARTT implements research and transfer technology through the following programs: Rain-fed and Irrigated Agriculture Production, Integrated Livestock Production, Water Management and the Environment, Genetic Resources and Low Rainfall Agriculture Production. Currently, NCARTT (July 2005) has around 44 researchers with PhDs, 82 with Masters, 120 BS, 56 technicians, and 173 administrative support staff. In addition, there are 250 temporary employees (daily employees), 14 PhD Scholarships, and 8 Masters of Science Scholarships. NCARTT's annual budget has been constant for the past 5 years with only a minor increase. NCARTT's 2005 main budget was around JD 1.5 Million, and funding from grants from outside donors and cooperators at about JD 4 Million in support of several multi-year projects (NCARTT 2005).

The review team wishes to thank the leadership and staff of NCARTT and the MoA-Extension for their gracious hospitality, flexibility and openness toward the review team prior to and during the site visit. Both Institution's openness and willingness to address all topics and inquiries during the site visit allowed the team to have a window into both institutions. It is the hope of each team member and the intent of our efforts that this final review report will prove to be a useful document of maximum value for both institutions.

c. Review Team's Charge:

Written charges and recommendations as to what the Review Team was expected to accomplish were provided by USAID and the leadership of both NCARTT and MoA-Extension. The review team studied all the charges provided, combined similar elements and believe their interpretation below is consistent with the intent of all parties. The review team's interpretations of the charges for this review are:

- The review team was charged to review NCARTT and MoA-Extension to evaluate:
 - The performance of mission by both institutions, and
 - The amount and effectiveness of both institutions' interaction and engagement with their respective stakeholder groups.
- The review team was specifically asked if they would:
 - Identify program strengths and weaknesses of NCARTT and the MoA-Extension,
 - Evaluate relationships that both Institutions have with Jordanian universities, non-government organizations (NGOs) and the private sector,
 - When appropriate, provide constructive comments regarding programs and direction,
 - Identify opportunities to strengthen program excellence in NCARTT,
 - Recommend effective extension program changes, and

- Where appropriate, recommend institutional changes, modifications or realignment that could enhance organizational efficiency, program delivery and mission effectiveness.

d. Review Methodology and Review Team Process:

This review was made possible by a grant from USAID to the USDA Agricultural Research Service. The development of the methodology used in this review was a coordinated effort between ARS and CSREES and the processes followed by the review team were jointly guided through the process by representatives from the two USDA Agencies. This was a dynamic process, team decisions were made by consensus, and the review was a positive professional experience for each of the review team members.

- *Review Team Selection:* (March-May, 2005) The team coordinator, Ibrahim Shaqir (USDA/ARS), in consultation with the process coordinator, Dennis Kopp (USDA/CSREES), identified and prioritized a list of potential team members with discipline backgrounds and experiences related to NCARTT and MoA-Extension strengths. This involved scientists with experience in research, extension, academia, private industry and Federal service. The team coordinator contacted and put together the team starting at the top of the prioritized list.
- *Review Team Preparation:* (May-July, 2005) The review team was asked to become familiar with the study materials supplied by NCARTT and MoA-Extension as well as materials available on these institutions' websites.
- *Team Activities On-Site:* (July 9-11, 2005) The review team partitioned responsibilities according to team expertise and proceeded as described below:
 - The team worked in various configurations and at times worked and met as a single group, but also in sub-groups or as individuals visiting facilities and sites, meeting with programmatic staff, and participating in interviews with the leadership of both institutions;
 - The team met each evening as a group for a debriefing, sharing, and discussion of the day's meetings. At these evening meetings there would be team discussion of observations, impressions, discussion of further questions to be asked, ideas for the next step of the process, and writing assignments would be agreed upon;
 - In the second week of the site-visit the team completed their site visits, began the process of developing an outline and the framework of the final report, identified over-arching issues, outlined points to be covered in the exit interview, and initially partitioned writing assignments for the final report;
 - In the third week of the site-visit the team completed the exit interview presentation, developed concurrence on the over-arching issues of the review, and completed the initial draft of each of the sections of the final report.
- *Team Activities Post-Review (August, September, and October 2005):* The team returned home to many distractions but made working on the final report a priority. During this time the team reviewed, rewrote, expanded and cleaned-up each successive draft of the Review Report for NCARTT and the MoA-Extension. The self-imposed deadline for the process was agreed to be October 1, 2005. The team returned to Jordan in October for final interviews and a presentation of the Review Report.

II. Program Strengths and Success Stories

During the site visit, the review team identified a number of programs or activities that are definite success stories in both NCARTT and MoA-Extension. These programs demonstrated successes in agricultural research and/or technology transfer for the benefit of the citizens of Jordan. The following examples were observed by the review team and represent important work of NCARTT and MoA-Extension. The review team realizes that due to the shortage of time in Jordan, many successful programs were not seen and that this listing is by no means a full accounting or listing of all of the successful programs of NCARTT and MoA-Extension.

Success in Obtaining External Funding: NCARTT has effectively attracted external funding from international donors. These resources have allowed the organization to invest in specialized laboratory equipment, hire staff and researchers and conduct, in certain disciplines, basic cutting-edge research studies. These successes have allowed NCARTT and some of its scientists and programs to gain both regional and international recognition.

Olive Program: The olive program represents an example of important partnerships and cooperative efforts between regional olive research associations, MoA-Extension, NCARTT, Jordanian agricultural universities and private firms. Olives are the largest acreage crop in Jordan and NCARTT research and outreach has contributed to every aspect of olive production, processing, marketing and promotion.

Biodiversity and Genetic Resources Program: NCARTT's Biodiversity and Genetic Resources program is recognized beyond the borders of Jordan for its scientific capability. This program has been most effective in attracting external funding and conducting basic research, which enhances the image and scientific reputation of NCARTT.

Al-Rajiff Cooperative: This program is an excellent example of NCARTT linking with the right farmers to (1) identify the needs of their group and community, (2) undertake appropriate applied research, and (3) transfer new technologies, which contribute to increasing incomes of people within the village.

Irrigated Agriculture Program: The irrigated agriculture program has introduced improved vegetable varieties for export, identified virus-resistant tomato landraces, and developed fertigation techniques that more effectively utilize fertilizer and water.

Cut Flowers and Ornamental Plants: Cut flower and ornamental plants have major economic importance to agriculture in Jordan. This program is an excellent example of NCARTT scientists working with Jordanian farmers to produce important export crops for European markets that utilize recycled wastewater. They have demonstrated that high quality roses and carnations can be grown without fertilizer using a poor quality treated wastewater. With exports of cut flowers increasing by 60% from 1997 to 2003, this represents a significant opportunity for Jordanian farmers to produce a crop with the potential for a good economic return while using a water supply that is not wanted in other sectors of the economy.

MoA-Extension: MoA-Extension has distinguished itself by developing and delivering effective extension outreach programs to small and limited-resource farmers, women's group, family nutrition, children's health, and home horticulture.

Water Management and Environment Program: This program has been successful in developing and participating in a regional Irrigation Management Information System (IMIS) with both Israel and the Palestinian National Authority.

Livestock and Rangeland Program: The Livestock and Rangeland program is an example of a successful NCARTT program that emphasizes technology transfer as an integral part of the overall applied research and outreach program. It has been successful because it has been based on extensive contact with livestock producers and a clear assessment of their needs. Various applied research programs have been developed based on that assessment including supplemental feeding with the use of feed blocks for livestock intensification, estrous synchronization, changes in lambing practices and the introduction of more productive animals. These techniques have been transferred to progressive farmers and through farmer's co-ops other farmers have adopted these technologies, creating a market for the feed blocks that is supporting the development of a new private sector industry that now produces feed blocks. One of the successful adopters of the Livestock and Range programs improved management techniques has been the Al-Rajiff Cooperative described above. The Badia Benchmark Project (Vallerani Project -Part of the Badia Development Project), builds on the outcomes of earlier rangeland improvement and water harvesting projects, and integrates these efforts with the livestock improvement program already described. This growth of program and multidisciplinary integration of effort, based on core livestock programs is an excellent example for programs at NCARTT in the future. The review team notes these successes because they are based on needs assessment from users groups, have effective applied research that is being adopted, and have led to expanded multidisciplinary efforts within NCARTT and with related institutions.

Other Successful Programs: The review team recognizes that there are other successful programs of NCARTT and the MoA-Extension which they were unable to visit and learn about, due to time constraints. The review team stresses the importance of NCARTT continuously publicizing the outcomes and impacts of its programs. This requires constant monitoring for NCARTT, but having stakeholders and the general public aware of successful programs is an excellent public relations aspect for NCARTT.

III. Opportunities for Improvement in the Operation of NCARTT

The review team views the following sections as specific areas that if addressed, would strengthen, improve the effectiveness, enhance professional competitiveness for attracting donor funds and/or contribute positively to the regional and international image of NCARTT.

a. Defining the Mission of NCARTT:

The review team believes that NCARTT needs to 1) clearly define its mission, 2) identify its core competencies, 3) develop programs consistent with those core competencies, and 4) then effectively market the successes of their organization.

The review team recognizes that NCARTT has a mission statement, but it was not as well known as it needs to be. The review team believes that NCARTT's strongest core competencies have been first in applied research and secondly in technology transfer. The review team encourages NCARTT to develop its next 5 year strategic plan around these core competencies with a new emphasis on technology transfer and outreach to the agricultural producers. While research has been an historic strength for NCARTT and should continue to be an important area of focus, a greater emphasis needs to be placed on technology transfer by NCARTT researchers to have a practical and positive impact on Jordanian producers. Building on research successes is important for NCARTT's effective long-term success as new emphasis is placed on the delivery of practical production information to Jordan producers.

The effective marketing of accomplishments, impacts, and outcomes of NCARTT programs to the general public, Ministry of Agriculture, political representatives, producer organizations, and international donor organizations is essential for long-term success and support. Effective marketing comes at all levels and by all members of the organization. It is important for NCARTT to describe and define its mission and the boundaries of that mission. Then it is necessary to market the mission, by communicating exactly, what NCARTT does do (and what NCARTT does not do) to the outside world. It is important to specifically define what NCARTT can do for its stakeholders so there is not the expectation that it can do everything for everyone. Effective marketing in a positive manner should be the daily mindset and job of all NCARTT researchers and leaders.

Recommendation:

The review team recommends that:

- R-1: NCARTT develop a strategic plan that clearly defines its mission, identifies its core competencies, and develops a program direction consistent with its core competencies.
- R-2: NCARTT develop an internal group within the Communication and Outreach Support Program, whose responsibility is to effectively market and promote the successes of NCARTT to governmental administrators, international donors, affected end-users, all stakeholders and the general public.

b. Strengthening NCARTT's Leadership:

Strength and continuity of leadership contribute powerfully to organizational efficiency and effectiveness. Strengthening, training and developing the present leadership and the next generation of leadership need to be an institutionalized component of NCARTT's future. Strong leadership is essential in enabling NCARTT to effectively transition and prospers through times of change, challenge and/or growth. Effective leaders unite followers to a shared vision and mission that leads to transforming values, integrity, and trust. Effective leaders possess a combination of innate talents and learned skills. The current leadership of NCARTT needs to recognize, promote, and offer further leadership training to individuals throughout all levels of its ranks who possess the innate talents necessary for the next succession of effective leadership. Some notable characteristics of effective leadership include:

- Providing inspiration, communicating and demonstrating to all employees their expectation of excellence and high performance,

- Insisting on professional excellence and providing for all subordinates, equitable treatment and access to opportunities for both employees and stakeholder groups,
- Providing their employees with a vision and sense of the mission of the institution, and
- Envisioning a professional career ladder within the organization which provides opportunity, education and advancement of the most effective staff.

NCARTT would benefit by the development of an internal process to identify individuals with leadership skills and provide these selected few with leadership training opportunities to cultivate and advance the next succession of leadership. Institutional continuity and sustainability of operation could be strengthened in NCARTT by the development of a conscious and continuous internal leadership development program. Such a leadership development program would provide a career ladder for promotion of the best and brightest within the institutional ranks of NCARTT. Then, as leadership positions open in NCARTT, new leaders would be ready and able to step up to the challenge.

Recommendations:

The review team recommends that:

- R-3: NCARTT develop position descriptions for all administrative leadership positions that define the required core responsibilities, expected credentials and desired previous academic or career experience.
- R-4: NCARTT develop a transparent, competitive selection and hiring process. This would involve a screening committee which interviews, ranks and recommends a merit-ranked slate of acceptable candidates to NCARTT leaders. Depending on the position, NCARTT screening committee participants should include NCARTT leaders, researchers, and relevant outside stakeholders from academia and/or the private sector.
- R-5: NCARTT leadership identifies researchers with leadership potential and provides opportunities for them to participate in leadership training courses and programs offered through internationally recognized educational organizations and/or private companies.

c. Improving Organizational Effectiveness:

i. Institutional Autonomy and Salary Competitiveness

The review team recognized that any change to the NCARTT salary structure will require governmental approval and action at levels beyond the purview of NCARTT. Yet salary equity of pay when compared to Jordanian universities and the private sector was such an overriding and festering issue with all NCARTT and MoA staff, the review team felt that ignoring it as a major issue would detract from the credibility of this report. The lack of salary parity between similarly educated and experienced NCARTT researchers and professional staff, when compared to faculty and staff in Jordanian universities and the private sector, is difficult to justify. This is a major issue of concern for all NCARTT personnel which appears to be continually eroding morale and drives the best and brightest NCARTT employees toward more financially lucrative career opportunities. For NCARTT to build a regional and internationally competitive research organization that is fully and effectively engaged with Jordanian agricultural universities, it must offer competitive salaries. The MoA, which recognizes and expounds the importance and value of Jordanian agricultural research, needs to commit to a process which will allow NCARTT the

flexibility to develop an internal performance-based ranking and promotion system to adjust researchers salaries over the next few years to a parity with comparable Jordanian scientific organizations competing for the nation's most talented scientists. Without reasonable salary parity between NCARTT and other Jordanian scientific organizations, the end result will be perpetual mediocrity of NCARTT. Presently this is an institutional barrier and challenge beyond the reach of NCARTT implementation, which likely has resulted from equating the hiring of highly educated, motivated and entrepreneurial science talent to that of hiring of staff for civil service jobs.

To address the salary inequity issue, the review team recognized the value of establishing NCARTT as an autonomous National Institution of the MoA. Such autonomy would allow administrative management of budget allocation, staff configuration, performance rating within a ranking system and salary adjustments related to staff performance. NCARTT's autonomy within the MoA is clearly expressed and described in the "National Strategy for Agricultural Development (NSAD) of Jordan VII- Enabling Environment and Support Services 2002-2010." The NSAD report states that, "NCARTT could not retain highly qualified scientists with advanced degrees due to the lack of financial rewards and benefits which contributes to NCARTT's inability to attain its research objectives and technology transfer aims." The NSAD recommends the issuance of a special law granting NCARTT financial and administrative autonomy to be able to address these inequities. The review team concurs with the National Strategy for Agricultural Development's report recommendation in its belief that NCARTT can only be a productive and effective organization if it is granted financial and administrative autonomy within the MoA. Such autonomy would ensure continued advancement of NCARTT in professional excellence and its ability to compete for international research funding.

If the status quo is maintained, NCARTT will be limited in its quest to implement many of the other recommendations presented in this report, specifically on the issues of maintaining workforce morale, successfully competing to hire the best and brightest scientists on the market, advancing employees along a career ladder, competing for and maintaining a strong leadership core as well as ensuring that NCARTT becomes a center for research and outreach excellence. As a research institute that must successfully compete for the highest level of excellence and professional talent, NCARTT should be granted similar financial governing status and administrative autonomy as other successful Jordanian research and academic institutions, such as the University of Jordan, Jordanian University of Science and Technology and the Higher Council for Science and Technology (HCST). Such changes would give NCARTT's research scientists and support staff a major morale boost as well as enable NCARTT administrators the capability of competing in recruiting and maintaining a highly qualified, effective and competent workforce.

ii. Promotion and Retention of Staff

Presently there appears to be no defined career ladder or financial incentives that allow individuals, with superior skills, to be upwardly mobile within the MoA and NCARTT employee system. The current system lacks the ability to recognize and promote excellence and the review team views this as a barrier that contributes negatively to NCARTT becoming a national center of excellence. NCARTT needs to develop and adopt an internal professional career ladder that will allow the promotion and advancement of the best and the brightest of its employees. The promotion and advancement system used by the United States Department of Agriculture

(USDA) Agricultural Research Service is one example of a system designed to evaluate and increase the level of excellence and professionalism within a research organization. Another widely used example is the evaluation, ranking, and promotion system used for academic faculty and staff advancement in both international and Jordanian universities. Academic staffs are promoted through instructor, assistant, associate and professor ranks, based upon carefully measured and documented performance criteria. These criteria are reviewed and verified anonymously by a qualified panel composed of members from both inside and outside the institution (the intent is to enhance credibility of the process and reduce potential bias and patronage). Merit promotion systems, as described above are already adapted throughout both international institutions of higher education and governmental scientific organizations and each offers monetary rewards and academic prestige for those individuals who excel.

iii. Position Description and Hiring Practices

Presently both NCARTT and MoA-Extension are civil service institutions governed by laws with specific directives of operation. These directives state that candidates for an open position are selected from qualified applicants by an outside-unbiased panel of experts. Selected candidates then must write an exam and the 3 most qualified individuals are chosen based upon the scores on the exam. These 3 applicants are then evaluated in face-to-face interviews with the NCARTT hiring committee and the most qualified individual, based upon a number of factors, is offered the position. Faithful implementation of these hiring practices will contribute positively to the selection and staffing of NCARTT with the most qualified applicants.

Recommendation:

The review team recommends that:

- R-6: NCARTT be granted financial and administrative autonomy. The review team concurs with the National Strategy for Agricultural Development's recommendation. The autonomy would ensure continued advancement of NCARTT as a research institute that could successfully compete for the highest level of excellence and professional talent, with other successful Jordanian research and academic institutions.
- R-7: NCARTT consider opportunities for positive staff morale building and benefits to offset the negative impact of the civil service pay scale inequities compared to that of university academic and private sector positions of comparable education, experience and productivity.
- R-8: NCARTT develop and implement a merit-based promotion and rank system comparable to those used by the University of Jordan and the Jordan University of Science and Technology. Such a system would recognize professional excellence, career achievements and professional prestige similar to university merit and adopt promotion and rank systems already recognized within Jordan. Salary parity should be established for NCARTT and MOA-Extension professionals with similarly educated and experienced researchers and professionals at comparable institutions.

d. Developing Human Capacity:

i. Sabbatical Experiences for Capacity Building

Sabbatical leaves are a proven means to help increase the professionalism, academic knowledge, and skills of faculty and staff within universities and research organizations. However, the current sabbatical policy and practice within NCARTT may actually be detrimental to both the short and long term research goals of the organization. Whereas capacity building should benefit both the individual taking the leave as well as NCARTT through making progress towards the organization's goals the current strategy is not effective. Currently, individuals can leave NCARTT positions on sabbatical experiences for up to 7 years and are guaranteed their positions upon returning. This constant loss of research and leadership talent, for prolonged periods, can lead to a disruption in the institutional achievement of long term research goals, efforts and accomplishments.

However, it is important that the sabbatical leave be used to enhance employee skills in support of NCARTT's strategic goals. NCARTT has made effective use of its sabbatical policy in allowing researchers to advance their education and obtain MS and Ph.D. degrees. The review team recognized that NCARTT has made a strong commitment to and places a high priority on the development of human capacity.

The review team also encourages NCARTT scientists to seek out and take advantage of post-doctoral fellowships as another approach to capacity building. Post-doctorate fellowship leaves provide many advantages for scientific skill development. Post-doctoral fellowships are often shorter in duration than the leaves taken to complete academic degrees, resulting in less disruption of NCARTT research programs. In addition, a post-doctoral leave can provide a researcher with an opportunity to obtain and bring back to NCARTT new research skills and professional contacts in areas of cutting edge science. Finally, post-doctoral leaves can be effectively used to retool mature researchers who can benefit from acquiring and bringing back to NCARTT new skills developed since completing their academic programs.

ii. Grant Writing

Improved grant writing skills that then result in more successful grant proposals will have a positive impact on NCARTT researchers by enhancing their program's prestige as well as that of the institution. While the review team applauds NCARTT for its ability to attract outside donor funding for research, the team believes that additional skills need to be developed in this area. In particular, it is important to provide new researchers the opportunity for grant writing training early in their career to advance their competitiveness from the beginning. From the publication record of the study documents provided by NCARTT, the review team notes that many established researchers would also benefit from refresher training programs in grant writing throughout their careers.

iii. Inter-Organizational Work Assignments

Finally, the review team observed that NCARTT has a significant amount of activity with other institutions, both with other Ministries within the government of Jordan as well as with international donor organizations. NCARTT should be proactive in improving inter-organizational communication. One way to achieve this outcome is for NCARTT to provide "work detail" opportunities for their researchers to other institutions. There is much to be gained

by encouraging NCARTT researchers to work in another institution for periods of up to 6 months. During this time the NCARTT researcher would learn how that organization operates, what the priorities are, and develop a “first name” working relationship with many of the key individuals and decision-makers within that organization. Upon returning to NCARTT the researcher could serve as a liaison and enhance NCARTT’s ability to communicate and engage with the other institution.

Recommendation:

The review team recommends that:

- R-9: NCARTT review and revise existing policies regarding the granting, duration and purpose of sabbatical leaves. New sabbatical leave policies should relate to opportunities that support and complement NCARTT’s strategic goals and should provide for institutional strengthening activities related to new science, expanded research capacity and/or leadership development.
- R-10: NCARTT continue its strong commitment to the development of human capacity. This is a valuable institutional characteristic that the review team recommends be continued. The use of sabbatical leaves and the expansion of post-doctorate leaves, staff “detail appointments” to other institutions and grant writing courses will offer additional opportunities for human capacity building within NCARTT and to address needs related to the institution’s strategic goals.

e. Reporting Impacts:

A formal annual accounting of progress in each research project is necessary to measure the impact, or potential impact, of the outlined research. Structured annual reports will provide input to NCARTT administrators and the Scientific Committee on whether or not the conducted research is clearly associated with the National Agricultural Strategy. Annual reports also provide concise summaries of current research accomplishments and a vehicle to report summaries of NCARTT research to MoA-Extension and others for delivery to stakeholders. In this manner, MoA-Extension personnel and private consultants would, on an annual basis, be refreshed with new research findings from NCARTT researchers, and therefore be better prepared to transfer pertinent technology to their target audiences.

Table 1 provides an outline of the components for annual reports that NCARTT could have all of its divisions complete each year. The purpose of this reporting is to define research focus and assess research impact. Project leaders would complete each of the components noted in Table 1 by answering the listed questions to justify their research, demonstrate progress and demonstrate the excellence of their projects. The components include identifying problems for Jordanian agriculture relative to NCARTT’s mission, defining goals and objectives to address these problems, and developing and implementing research and extension programs to address these problems. Finally, it is important to identify, report, and evaluate the impact of the research and extension programming.

Table 1: Suggested Format for Annual Reports

1.	What major problem or issue is being resolved and how are you resolving it (summarize project aims and objectives)? Justify the use of public funds allocated to this research objective.
2.	How does the ongoing research relate to the NCARTT's mission, NCARTT's Strategic Goals and Jordan's National Agricultural Strategy?
3.	List the research objectives within the research project that were scheduled to be addressed during the reporting year.
4.	Describe the progress made or completion of each research objective listed above and, for any objectives not achieved or addressed, justify why.
5.	List the research objectives that are planned for the next year.
6.	Identify and describe the single most significant accomplishment of the research project during the reporting year. State impact or potential impact of this accomplishment.
7.	List any other significant accomplishments and their impact or potential impact.
8.	What technologies have been transferred from this project and identify the target audience? When is the technology likely to become available to the end-user (industry, farmer, and other scientists)? What might be the constraints to end-user adoption and durability of the technology or products?
9.	List your most important publications in the popular press, brochures & pamphlets, mass media interviews, presentations to organizations or articles written about your work during this reporting period.
10.	List training experiences, workshops or conferences attended by you or your staff during the reporting year.
11.	List your published, peer reviewed scientific research during the past year.

Annual reports, structured in this manner, ensure that researchers focus their efforts on reportable goals and activities. Annual reporting would provide NCARTT with a measure of success and progress for each project. Furthermore, reporting as listed above allows NCARTT to chart and describe its institutional progress according to its strategic goals and modify its organizational structure or research programs to adjust to the changing need of its stakeholders.

Recommendation:

The review team recommends that:

- R-11: NCARTT adopt a formal annual report of progress. Each research program and Regional Center would develop and submit to the NCARTT Director a formal, annual report of progress. These reports would be in a format to allow easy editing and summarization in order to generate NCARTT's Annual Report of Research and Outreach, describing progress and measuring impacts of the institution's programs. Structured annual reports will provide NCARTT and its stakeholders with a comprehensive, measurable and comparable record of program direction, accomplishments and excellence. Communication and Outreach Support staff could develop from these reports short professional pieces on program accomplishments for use by NCARTT leadership, news media, and or the government decision makers.

f. Program Reorganization:

Currently, there are 8 programs in NCARTT including olive production, marketing and use; biodiversity, genetic resources, and medicinal plants; IPM; socioeconomic and monitoring; livestock and rangeland; water, irrigation, and environment; rainfed agricultural research; and irrigated agricultural research.

The review team recommends restructuring NCARTT into four Core Programs as represented by the upright columns in Figure 1. The core programs would be based on the agroecological systems NCARTT presently serves which are: (a) Irrigated Agriculture, (b) Livestock, Rangeland and Dryland Crop Production, (c) Olive Production Program, and (d) Biodiversity. The new Irrigated Agriculture division could include crop production systems involving irrigated agricultural research and programs addressing the environment. The Livestock, Rangeland and Dryland Crop Production program could include rangeland research and management, livestock and ruminants programs, and rainfed agricultural research. The Olive Production, Marketing and Use program can stand-alone and could be linked to the other two agriculture programs where appropriate. The Biodiversity program, which includes genetic resources and medicinal plants, could stand-alone but the close link between landscape preservation, ecological restoration, and livestock grazing and range management suggests a close practical link and would complement each other in the Livestock, Rangeland and Dryland Crop Production program.

In addition there would be five Cross-Cutting Programs, depicted as horizontal bars on Figure 1, each of which contributes to a number or all of the Core Program Areas. The Cross-Cutting Programs are: (1) Integrated Pest Management, (2) Agricultural Economics, (3) Rural Sociology, (4) Communication and Outreach Support, and (5) Water Management. Scientists presently working in Integrated Pest Management will be associated with the program that most appropriately fits their primary expertise, research and extension/outreach capabilities, but IPM specialists would be expected to work across Core Programs addressing pest management problems related to their discipline specialty. Since economic and sociological/anthropological analyses span all of NCARTT's Core Programs, it is recommended that the Economics and Rural Sociology group be two separate cross-cutting programs. The review team recommends that NCARTT reconsider the mission and scope of activity, including defining the boundaries of activities, for the socio-economics program. NCARTT should allow the economists to do economics work and not work solely as a service organization doing surveys for the rest of NCARTT. If sociological/anthropological research is desired in NCARTT, then scientists with that appropriate professional background need to be recruited and hired, rather than expecting economists to work in the area of sociology/anthropology which is outside of the expertise of the economists presently at NCARTT.

The Communication and Outreach Support program would provide service to each of the Core Program Areas working in coordination with research staff to develop the outreach/communication components that would facilitate the development and packaging of extension programming for grower programs. Specifically, this program would help the researchers/technology transfer professionals utilize improved communication techniques with farmers and develop materials that improve educational programs.

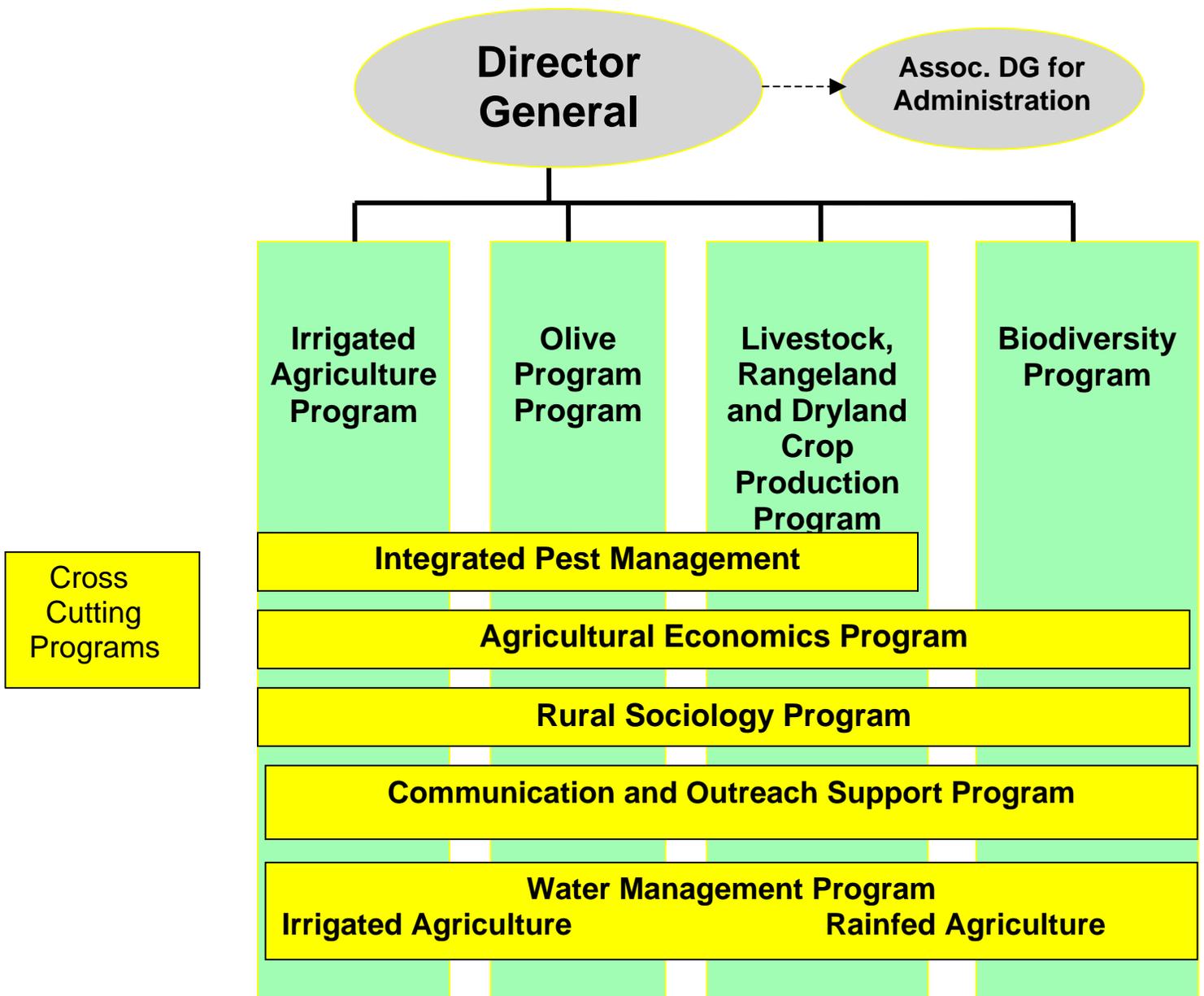


Figure 1: Proposed Organization Structure for NCARTT

The Water Management Cross-Cutting Program would provide the foundation expertise of irrigation and rainfed agricultural systems through improvements in irrigation technology, water harvesting, water quality, usage reclamation and conservation.

This new configuration is believed to provide program stability, opportunities for new science synergisms, enhance efficiencies in staff usage, and improve cooperation and engagement with Jordanian agricultural production systems. An organizational structure designed around agroecological systems could enhance NCARTT's ability to effectively assess the needs for

research and technology transfer programming, since scientific staff would be organized around a systems approach.

The review team notes that the major advantage of restructuring NCARTT according to a systems approach is associated with needs identification and program development and delivery. With NCARTT organized according to agroecological systems all scientists with interest and expertise in irrigated agriculture, for example, are working together. They can effectively identify the needs of Jordanian agriculture; develop plans to undertake appropriate research which involves different disciplines and deliver extension programming to fulfill the technology transfer mission.

All NCARTT scientists should have combined research and extension/outreach appointments reflective of the balance of the professional roles they provide to their program. The discovery of new information, through agricultural research, should be viewed as one part of the continuum of NCARTT's mission to the people of Jordan, with the delivery of those discoveries to the end-user as another important part of the same continuum. With that as the vision of NCARTT's mission, the appointment of each scientist should involve both a research and extension component or split appointments to the function of research and to the function of technology transfer, extension or outreach. It is important to re-emphasize that the Communication and Outreach Support program supports researchers in their extension efforts, they do not replace them. This paradigm of a detached cadre of extension or outreach officers separate from researchers has been the failed status quo of the past. The review team recommends a totally new paradigm, which is that the researcher who developed the new agricultural knowledge is also an important component of the technology transfer, extension or outreach delivery activity.

Just as it is important for those individuals with primary research appointments to have an integral role in extension education it is vital for those individuals with primary extension appointments to be part of the research team that designs, establishes and participates in the data gathering from field plots as a working part of NCARTT research teams. This would involve the development of new job descriptions for both NCARTT based researchers and extension and outreach officers, which would now have split appointments involving both research and extension/outreach. All would be NCARTT employees, each would have split appointments, which would demonstrate that everyone in NCARTT shares in the responsibility of new information development and technology transfer (extension). Some NCARTT based employees might be mostly researchers (80%) with only small part of their time allocated to extension (20%). Other employees might have an appointment that is mostly extension educators (75%) with only a little portion as research (25%). A working example of split appointments is demonstrated by their broad usage in the academic community. Split appointments between research and resident teaching are not uncommon in either Jordanian or US academic institutions with some splits weighted heavier toward research, others weighted heavier toward technology transfer or extension/outreach and others heavier toward resident teaching. Split appointments ensure that a strong connection, understanding and a direct feedback loop exists between the needs of the farmer community and NCARTT researchers as well as the "one-team development" which should occur between NCARTT research and extension/outreach staff.

While the proposed restructuring of NCARTT programs according to agroecological areas could enhance the program stability and efficiency of NCARTT, there are challenges that arise. The

review team would like to point out that programs are found to be more successful when the following elements, noted in Table 2, are in place. Stable baseline funding for each area allows scientists to develop programs that serve the long-term needs of Jordanian agriculture. Grant funding can then be used to enhance the programs once the long term and central needs are served by base funding. Regular reporting and peer review processes provide the information flow for NCARTT leadership to reward those scientists and programs that are doing the best job of delivering on NCARTT’s objectives and fulfilling the NCARTT mission.

Table 2: Important Elements for Effective Program Delivery

•	Each program has a sufficient, stable and balanced amount of baseline funding for a period of five years
•	Programs are required to produce annual reports of activities, accomplishments and publications. Program productivity is reviewed annually and programs that have demonstrated excellence are appropriately rewarded
•	Programs undergo a peer review every five years where scientists with international recognition in the respective area review the programs and provide an evaluation of how the respective program is making progress toward objectives
•	Following the 5 year program review, each program researchers and staff review and update their strategic plan and goals to reflect response to new stakeholder needs

In summary, NCARTT should adopt an organizational structure with the following characteristics:

- Organized according to agro-ecological systems in Jordan of Irrigated Agriculture and Livestock, Rangeland and Dryland Crop Production.
- Organization according to agro-ecological system brings scientists from different disciplines together into a common effort to focus on a common program. Working together in a team setting the scientists can use a multi-disciplinary approach to solve the problems facing Jordanian agriculture.
- The Olive program and Biodiversity programs would remain separate but scientists would be encouraged to cooperate with scientists in one of the two major programs as appropriate.
- The Integrated Pest Management, Agricultural Economics, Rural Sociology, Communication and Outreach Support, and Water Management programs are cross-cutting programs that address issues across programs. Scientists from these programs will work with scientists from the different programs as the projects call for skills.
- The NCARTT reorganization will involve scientists with responsibilities in the areas of both research and extension. The appointment of each scientist will vary depending on the needs for the program area as well as the strengths of the individual scientists. When scientists have specific extension responsibilities, as identified by their appointment and job description, the expectation for them to transfer the technology from their research via extension programming is explicit and technology transfer is more effective.

Recommendation:

The review team recommends that:

- R-12: NCARTT adopt a major programmatic restructuring into four Core Program Areas based upon Jordanian agroecological areas and five cross-cutting programs building upon existing staff strengths. The Core Program Areas are: (a) Irrigated Agriculture (b) Livestock, Rangeland and Dryland Crop Production, (c) Olive Production Program, and (d) Biodiversity and Genetic Resources. The five cross-cutting programs are: (1) Integrated Pest Management, (2) Agricultural Economics, (3) Rural Sociology, (4) Communication and Outreach Support, and (5) Water Management. The review team believes that such a programmatic reorganization would simplify administration, align researchers more logically and encourage broader engagement and cooperation among staff in cross-cutting programs.

g. Strengthening NCARTT-University Cooperation:

NCARTT and MoA research and extension outreach could benefit by strengthening professional ties and interactions with other sectors of the Jordanian agricultural research and education community. Current efforts to increase collaboration between Jordanian universities and NCARTT are timely, since by so doing, it would increase the effective use of limited resources for agriculture from national sources and from outside donors. The relationship between NCARTT, MoA-Extension and the agricultural science faculties at University of Jordan (UJ) and Jordan University of Science and Technology (JUST) are at a point where well-structured collaboration among the four institutions, could lead to mutual mission support, judicious use of public resources, gains in efficiency and quality at each institution, and better service to all stakeholders. Many of NCARTT employees have received their graduate training at Jordanian Universities, allowing many opportunities to build strong professional ties upon mentoring relationships and respected friendships. The opportunity appears to exist for many cooperative scientific relationships, shared laboratory and field sites and outreach-education opportunities with shared stakeholder groups.

Recommendation:

The review team recommends that:

- R-13: NCARTT strengthen cooperation between itself, the University of Jordan, Jordan University of Science and Technology and other universities and agricultural research institutions wherever possible. Expanded cooperation will facilitate more efficient allocation of publicly funded research and outreach services available to the Jordanian agricultural sector and could include shared field stations, cooperative distribution of research responsibilities along basic and applied lines, and institutionalization of joint work groups by all parties. Memoranda of understanding (MOU) could be developed to formalize these arrangements.

h. Gender:

The review team observed the presence of many professional and highly competent women scientists at NCARTT. The team applauds the administration of NCARTT for creating a work

environment that has allowed these women to be successful professionals. Many donor institutions are stressing the role of equality with respect to gender. NCARTT can have an important comparative advantage with respect to obtaining funds from outside organizations if it continues and expands on this practice of supporting women to grow and advance professionally within the NCARTT system.

The role of women in the economy is increasing in magnitude throughout the world and organizations worldwide are emphasizing the importance of women. The review team notes that NCARTT has a good understanding of the significance of the work that women do in agriculture, including direct involvement in agricultural production, in Jordan. The socio-economics group completed a study that carefully documented the role of women in agricultural production and, in addition, NCARTT scientists have observed the valuable contributions by women during their interactions in the field.

The review team identified effective extension programming, by both NCARTT and MoA-Extension, for women. NCARTT is also working with women clients in the area of technology transfer as reported by the researcher at Ramtha Research Station. The review team also observed that the MoA-Extension personnel were effectively delivering programs to women in the areas of home-based businesses, home horticulture, and family and nutrition issues. This work in outreach or extension education includes work that in the US system would be called Consumer and Family Sciences (safe preserving of produce for home use, budgeting, assistance with production issues, etc).

The review team notes that this work with women is important and furthermore expects that the value of this work will increase in the future as many donor organizations are realizing the significant role that women are playing in development. Two examples of organizations that are placing increasing importance on gender are USAID and the U.S. State Department recently formed Middle East Partnership Initiative (MEPI). <http://mepi.state.gov/mepi/>. The goal of MEPI is to enhance economic, political and educational systems where women enjoy full and equal opportunities. Through MEPI's women's empowerment pillar, it works to reduce cultural, legal, regulatory, economic and political barriers to women's full participation in society. USAID has also recognized the importance of women and views.

Recommendation:

The review team recommends that:

- R-14: NCARTT expand its ongoing practice of supporting women to advance professionally within the organization. NCARTT should emphasize its successful initiatives with respect to enhancing the role of women and seek funding for such programming.
- R-15: NCARTT and the MoA-Extension continue to work with women and provide assistance through technology transfer as they have been doing. Both NCARTT and MoA-Extension should highlight the successes they are experiencing with respect to programming for women, measure and document the impact of these programs, and seek funding from outside donor agencies to continue this important work.

IV. Improving NCARTT Technology Transfer and Ministry of Agriculture MoA-Extension

The members of the review team encountered a very mixed and confused situation as they attempted to develop an understanding of the mission successes of NCARTT and the MoA-Extension. It appeared that in some program areas, NCARTT is working well with farmers and providing technology transfer through educational programs, yet in other programs areas the direct connection with farmers is not as strong. The MoA-Extension demonstrated programmatic successes in working with small landholders, limited-resource families, and with women in rural settings in developing home-based businesses and with home horticulture, family and nutrition issues. However, in traditional extension programs with commercial farmers, MoA-Extension was not successful. It was demonstrated to the review team that MoA-Extension agents faced many challenges in their program delivery. Specifically identified or observed were a lack of resources for educational programs, difficulty in arranging or lack of vehicles for on-farm work visits, personnel with inadequate expertise in subject matter, lack of personnel trained in agricultural production, a disconnect with medium to large producers, and in certain directorates, minimal motivation of MoA-Extension personnel to work with farmers.

The review team believes that to achieve success, the mission of NCARTT and the MoA-Extension must be concisely defined, understood and committed to by all employees and the leadership of each institution. NCARTT and MoA-Extension will need to work together to meet the agricultural information discovery and extension educational programming needs of target audiences in rural Jordan. Currently, both MoA-Extension and NCARTT claim to be serving all farmers in Jordan, which is not only not the case but also an unrealistic objective. In addition, both NCARTT and MoA-Extension need to develop an active process to discover and better understand the research and extension needs of their targeted audiences. NCARTT and MoA-Extension should modify their organizational structure in order to make a complementary and mutually supportive approach to addressing the needs of all the rural audiences of Jordan. This would involve each organization realistically defining their target audiences, building upon their present strengths, and staffing with people who have the proper skill sets to develop the new knowledge and effective educational programs supportive of the needs of all Jordanian farmers and rural residents.

The review team noted that the University of Jordan, Jordan University of Science and Technology, and private agribusiness groups are also working in the area of technology transfer or extension education. NCARTT scientists should also take the lead in organizing cooperative research and extension programming to include the talents of scientists from Jordanian universities with agricultural programs. The review team sees this as an opportunity for NCARTT to reach out and partner with the University of Jordan, Jordan University of Science and Technology, and private consultants through adjunct efforts to deliver a coordinated message to a broader audience and make the most effective use of limited resources. Similarly, NCARTT scientists should also reach out to other external research organizations such as ICARDA, to Jordanian NGOs and industry groups soliciting and using their expertise and resources in addressing and solving shared stakeholder problems.

a. Defining Target Outreach Audiences:

The following illustration (Figure 2) shows a proposed partitioning of target audiences for outreach and education for MoA-Extension, NCARTT and private consultants. The illustration depicts types of farms by “size of operation,” not by the number of farmers in each classification, which would be the target outreach groups. It is important to note that this diagram only characterizes (illustrates) the situation in Jordan because the definitions for large, and medium sized farms, for example, are not provided. Small farms are defined to include smallholdings by limited resource rural families (generally less than 5 dunums). The MoA-Extension’s educational programs appear to best target this size of operation and MoA-Extension has demonstrated program success addressing poverty reduction, creation of home-based industries, improvement of family nutrition, and women-based programming. Medium and large size farms are commercial farms and compose the target audience that NCARTT can be most effective in reaching. Some of the very large farms are heavily mechanized, highly dependent upon international markets and purchase information services from private consultants. A configuration of audience partitioning such as is suggested here will allow each institution to strongly engage with their farm groups, asking the right questions and directing their educational programs and research efforts to specific size-related problems. There will be a degree of overlapping of educational needs and programs between the different sized farms, which may provide the opportunities for positive cooperation between NCARTT outreach and the MoA-Extension and the private consultants.

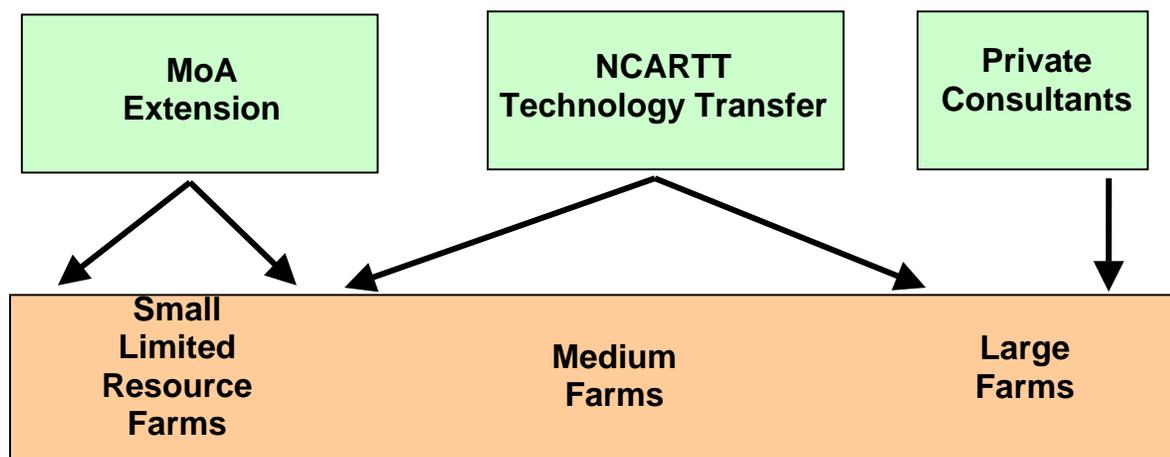


Figure 2. Audience Partitioning for Extension/Outreach Activities of the MoA-Extension, NCARTT, and Private Consultants Based on Farm Size.

In the recent past, Cooperative Extension in the United States has configured its sharing of target audience with private consultants in a similar fashion to the above configuration. The largest farms and corporate farming operations in the United States are less interested in education but require a level of service and decision making that can be provided almost exclusively by private consultants. Twenty thousand acre vegetable farms in California, 3,000 dairy cow farms in the arid West and 10,000 acre crop farms in the Corn Belt seldom look toward County Extension staff for expertise; agricultural production systems of that size hire private consultants to provide daily monitoring and advise regarding all major production decisions. The US Cooperative

Extension System targets its educational programming and finds its primary audiences among the small to medium sized farmers, much like MoA-Extension and NCARTT.

Similarly, in the US there is a group of universities that received their land grant status in 1890. These '1890' universities and all other land-grant universities have special grants from the United States Department of Agriculture to work with limited resource, poor farmers. In addition, many land grant universities have Food Stamp Nutrition Education programs (FSNE) and Expanded Food and Nutrition Education Program (EFNEP). These universities receive grants to work with poor families, often single mothers, to increase their knowledge of how to provide good nutrition for their children. Recently, FSNE recipients (like the University of Maryland) started using some of their funds to hire educators to teach these people how to grow vegetable gardens so as to increase the availability of good food for their families. These activities target audiences very similar to the Jordanian extension/outreach audiences to which the review team is recommending the MoA-Extension direct its programming.

Recommendations:

The review team recommends that:

- R-16: NCARTT and the MoA-Extension build upon existing strengths and partition target audiences for the delivery of extension programming and outreach. A logical division of audience could be according to farm size of the targeted audience and would allow both institutions to build upon their strengths.

b. Staffing adjustments between NCARTT and the MoA-Extension:

To enhance NCARTT's ability to connect with medium to large size farms, the community connection and communication capabilities of a certain number of MoA Extension agents will be needed. The review team recommends that NCARTT recruit from and permanently transfer effective extension educators and communicators from MoA-Extension to address these needs. This may appear to be a radical recommendation, yet if both organizations solidly define their target audiences and mission through strategic planning and commit themselves to build upon their strengths, this could be a most judicious way of right-sizing both organizations.

In addition, the MoA Extension would also need to consider staffing and, as opportunity permits, recruit individuals skilled in nutrition, women's issues, horticulture, and home-based industries. Such staffing would further enhance MoA-Extension's ability to work with limited-resource audiences, rural women's issues and small size farmers.

Recommendations:

The review team recommends that:

- R-17: NCARTT recruit and permanently transfer extension agents with relevant education and communication skills from MoA-Extension to NCARTT. A number of MoA-Extension agents with facilitation skills and community connections will be needed to better engage NCARTT outreach to medium/large size farms throughout Jordan.

- R-18: MoA-Extension builds on and creates new strengths by recruiting and hiring new staff who are skilled in nutrition, women’s issues, horticulture, and home-based industries as opportunities for new hires become available. Such staffing would further enhance MoA-Extension’s ability to work with limited-resource audiences, rural women’s issues and small farmers.

c. Farmer Advisory Boards:

It is essential that both NCARTT and MoA-Extension improve communications with their primary outreach audiences enabling each institution to fully engage with the changing needs of these communities. The review team recommends the creation of Farmer Advisory Boards at NCARTT Regional Centers and Stations, and in MoA-Extension directorates as a positive step in enhancing communication at the “grass roots” level and would result in better engagement with the primary stakeholders of each institution. These advisory boards should be composed of 8 to 12 farmers who reflect the respective targeted audiences for outreach and extension programming. In the situation where NCARTT and MoA-Extension are co-located they will likely have different targeted audiences (as described above) and therefore need separate Farmer Advisory Boards. This recommendation is not an entirely new idea, since some NCARTT regional centers or research stations already are working with farmer associations, cooperatives, and local community organizations (i.e., Al Rajif Cooperative or Anakeed Alkhair Association) to identify needs and adapt research and technology transfer programs accordingly. While it is envisioned that these Farmer Advisory Boards will be the principal partners of NCARTT and MoA-Extension, new partners should be continually sought. NCARTT would benefit from a greater engagement with the private sector and grower groups, and MoA-Extension would benefit from partnering with NGOs that work with the rural poor such as the Queen Rania and Queen Nour Foundations.

The base organizational unit for Cooperative Extension in the United States is the county jurisdiction. Each county has a set of extension educators who work locally but report their activities to the state university. To make sure that the county is working on issues of importance to the local communities, Extension Advisory Committees (EAC) are organized. The local extension educators work with the EAC to identify important needs that guide local extension programming and research priorities at the state university. Extension Advisory Boards are very similar in function and organization to the Farmer Advisory Boards being recommended for Jordan.

Recommendations:

The review team recommends that:

- R-19: NCARTT and MoA-Extension create Farmer Advisory Boards at each of its Regional Centers and Stations, and MoA-Extension directorates. These boards should be comprised of 8 to 12 farmers reflective of the region’s respective targeted audiences for extension/outreach programming and will be used to gather stakeholder input regarding community outreach needs and these engagements will demonstrate government’s responsiveness to stakeholder needs. Farm advisory boards will improve communication with farm groups and if convinced of the program’s value, will become an advocate for community outreach programming.

d. Increasing the Competence of Extension Educators:

Extension educators, whether they work at NCARTT or MoA-Extension, need to be professionally competent in their work with farmers. There are three types of training that are essential to achieving this competence:

1. In the past, most people grew up on a farm or lived in an agricultural setting. They knew how to grow crops or take care of livestock. Today, most people do not come from that type of rural setting. This is true for many of the extension educators hired by these two organizations. While they may have received some practical agricultural training in the university, that usually is not sufficient. When they go to talk with farmers, farmers quickly sense that they do not understand production agriculture and consequently close their minds to any recommendations offered by the extension worker. These new workers need training in practical agriculture. Activities that can help achieve this goal include a) internships where extension professionals work on farm for a several month period, b) applied research projects where extension educators work with a farmer on his/her farm to answer a question, c) farm visits where the extension worker sets a goal of visiting 10 farms per week for a several month period to learn about agriculture in their region, d) attending training conferences by professionals who are expert in practical agriculture, and e) finally increased interaction with the Farmer Advisory Board to understand problems and issues of importance to the local community.
2. Once a practical understanding of agriculture is achieved, and then extension educators can attend training sessions by agricultural researchers in which new research knowledge is taught. Because the extension educators now understand production agriculture, they have a better understanding of how this new technology can be adopted.
3. Extension educators need to be trained in how to communicate with farmers. Most farmers like visual educational demonstrations conducted in a practical setting as opposed to lectures given in a classroom. Farmers like to visit other farms and see how their neighbors are solving problems. Farmers like to learn by doing. Extension educators should understand the array of educational techniques that work well with farm audiences and how they can employ them in the service of their agricultural community.

The above examples of training were provided using the typical agricultural model in which NCARTT operates. These training techniques also can be applied to teaching MoA-Extension agents how to work with limited-resource, small farms regarding home horticulture, nutrition, and rural based industries.

Recommendations:

The review team recommends that:

- R-20: Extension educators should be well trained in areas of production agriculture, new research technology, and in how to conduct effective educational programs.

e. Important Considerations for MoA-Extension:

This report recommends major changes in the operation of MoA-Extension. As a result, this section has been included to help MoA-Extension in the transition. The following are important issues that must be addressed to make this transition successful:

1. It must be clear to all employees of MoA-Extension that the focus of their educational mission and services will be to audiences described as small limited-resource farmers and addressing programming to home horticulture, women's issues, family nutrition, and rural/home based industries. MoA-Extension staff with the appropriate training that value such programmatic opportunities and are excited by serving limited-resource farmers will find a rewarding career with MoA-Extension.
2. MoA-Extension staff, working in conjunction with their Farm Advisory Boards, should conduct a 'needs assessment' within each directorate. While a 'needs assessment' is also critical to NCARTT's research and outreach operation, it is particularly critical in connecting the MoA-Extension programming with the specific needs, traditional talents/skills, and local opportunities as identified and described by the people in their directorate.
3. MoA-Extension should identify additional partners with which to work. While NCARTT has expertise in home horticulture that will be useful to MoA-Extension staff, it is unlikely to have parallel strengths in women's issues, family nutrition, and rural and home-based industries. MoA-Extension should identify other organizations and institutes with strengths in those areas to partner with in order to find the expertise needed to develop valued extension educational programming.
4. To effectively deliver educational programming MoA-Extension will require adequate operating funds to develop educational materials and dedicated staff transportation in order to rapidly respond to stakeholder needs and to conduct their educational programs in a timely fashion. Without an appropriate operating budget that allows Extension staff immediate responsiveness to their clientele's needs in an emergency, it will not be possible for MoA-Extension to successfully carry out its mission.
5. As future staffing opportunities arise, MoA-Extension should hire individuals that possess the appropriate skills and have a passion for helping their clientele achieve. This will assure that the MoA-Extension in each directorate has the capability to offer successful educational programs to limited-resource farmers. To maintain the excitement and enthusiasm in staff, MoA-Extension needs to create a career path that provides rewards for staff performance and programmatic excellence. Such a career path in MoA-Extension would allow opportunities for increased responsibilities, leadership and promotion to the best employees; and also train and promote the next generations of leaders for the MoA-Extension System.

Recommendation:

The review team recommends that:

- R-21: To make the transition successful to serving limited resource farmers, MoA-Extension should a) ensure that all its employees value its new mission, b) conduct a needs assessment with the assistance from its Farmer Advisory Boards, c) identify new partner institutions that provide needed skills, d) be supplied with an adequate operating budgets, e) develop a team of dedicated extension educators with the appropriate skills, and f) develop a career ladder within the MoA-Extension, that rewards and promotes performance excellence with increased responsibility and leadership opportunities.

V. Acronyms and Abbreviations used in this Document

ACSAD	Arab Center for the Studies of Arid Zones and Dry Lands
ACSAD	Arab Center for the Study of Arid Zones and Dry lands
AFSESD	Arab Fund for Economic and Social Development
AOAD	Arab Organization for Agricultural Development
ARS	Agricultural Research Service/USDA
BGR&MP	Biodiversity, Genetic Resources & Medicinal Plants Program
BS	A researcher holding a Bachelors of Science degree
CGIAR	Consultative Group on International Agricultural Research
CIMMYT	International Maize and Wheat Improvement Center
CSREES	Cooperative State Research, Education and Extension Service/USDA
CV	Curriculum vitae
EU	European Union
FAO	Food and Agricultural Organization
GEF	Global Environment Facility
GIS	Geographic Information System
GPS	Global Positioning System
HCST	Higher Council for Science and Technology
ICARDA	International Center for Agricultural Research in the Dry Areas
ICBA	International Center for Biosaline Agriculture
ICRISAT	International Crops Research Institute for the Semi-Tropic Areas
IMAZ-CIHEAM	Centre International des Hautes Etudes Agronomiques
IMIS	Irrigation Management Information System
IPGRI	International Plant Genetic Research Institute
IPM	Integrated Pest Management
IRDC	International Development Research Center
JD	Jordanian Dinar
JUST	Jordan University of Science and Technology
JVA	Jordan Valley Authority
LTD	Limited
MABDE	Mapping Adaptation of Barley to Dry Environments
MEPI	Middle East Partnership Initiative
MERC	Middle East Regional Cooperation Program
MMP	Masherq-Maghreb Project
MoA	Ministry of Agriculture
MoA-Extension	Ministry of Agriculture Extension
MoP	Ministry of Planning
MOU	Memorandum of Understanding
MS	A researcher holding a Master of Science degree
NSAD	National Strategy for Agricultural Development
NCARTT	National Center for Agricultural Research and Technology Transfer
ORP	Olive Research Program
PhD	A researcher holding a PhD degree
PPB	Participatory Plant Breeding
Research Assistant	A staff person working with a researcher
Researcher	NCARTT staff with a degree at the level of B.S., M.S. or Ph.D.

Site Visit	The visit by the Review Team to NCARTT
The Review Team	The USDA team that conducted the review
UJ	University of Jordan
UNDC	United Nations Development Corporation
UNDP	United Nations Development Program
USAID	US Agency for International Development
USDA	United States Department of Agriculture
Veterinarian	A practitioner of medicine for animals