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JORDAN NATIONAL AGRICULTURAL DEVELOPMENT PROJECT
(Project No. 278-0264):
INTERIM EVALUATION REPORT

Amman Jordan
November 16, 1989

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LIST OF ACRONYMS

AP	Action Plan
ACC	Agricultural Credit Corporation
ADC	Agricultural Development Council
ADF	Agricultural Development Fund
A&E	Architecture and Engineering
AMO	Agricultural Marketing Organization
ARTT	Agricultural Research and Technology Transfer
ASO	Agricultural Services Officer
B/C	Benefit/Cost ratio
BSc.	Bachelor of Science degree
CID	Consortium for International Development
CIP	Commodity Import Program
COP	Chief of Party
DPI	Development Procurement International
EIRR	Economic internal rate of return
EOPS	End of Project Status
FOA	Faculty of Agriculture, University of Jordan
FX	Foreign exchange
416	A U.S. program which grants surplus agricultural commodities to other governments
FSR	Farming System Research
GOJ	Government of Jordan
HADP	Highland Agricultural Development Project
HCST	Higher Council for Science and Technology
ICARDA	International Center for Agricultural Research in Dry Areas
JD	Jordanian Dinar
JCO	Jordan Cooperative Organization
JNADP	Jordan National Agricultural Development Project
JUST	Jordan University of Science and Technology
LOP	Life-of-Project
M&E	Monitoring and Evaluation
MSc	Master of Science degree
NCARTT	National Center for Agricultural Research and Technology Transfer
PACD	Project Assistance Completion Date
PIO/C	Project Implementation Order, Commodities
PIO/P	Project Implementation Order, Participant training
PIO/T	Project Implementation Order, Technical services
p/m	Person months
PP	Project Paper
ProAG	Project Agreement
PSA	Procurement Service Agent
RASC	Regional Agricultural Service Center
SCRAD	Systematic Commodity Resource Analysis & Development Process
SMS	Subject Matter Specialist
TA	Technical Assistance
UOJ	University of Jordan
USAID	United States Agency for International Development
WID	Women in Development
WSU	Washington State University

I INTRODUCTION, SUMMARY AND LESSONS LEARNED

A Introduction

This is the first of two interim evaluations of the Jordan National Agricultural Development Project (JNADP) provided for in the PP. The evaluation was conducted by a five man team in Jordan from October 20 through November 14, 1989. Members of the team included Dr. William A. Faught, agricultural planner and team leader; Dr. J. Ian Stewart, Agricultural Research/Extension Specialist; Dr. James Snell, Agricultural Economist, AID/Washington; Mr. Charles Uphaus, Agricultural Officer, AID/Washington; and Dr. Subhi Qasem, Professor, Faculty of Agriculture, University of Jordan.

The scope of work for the evaluation specified that the team should develop information on the progress and current status of the project which would enable USAID and GOJ to determining if the level of progress is appropriate for achiveving the project's purpose; whether the project is still relevant and appropriate; and what modifications, if any are needed.

In assessing progress in achieving project purpose, the evaluation would:

1. determine if inputs are being provided in sufficient amounts and timely manner to obtain desired outputs;
2. determine if outputs being achieved are contributing to ultimate achievement of project purpose; and
3. identify constraints and recommend measures for overcoming them.

In assessing relevancy and appropriateness of project design, the evaluation should:

1. determine the continued relevance of the project purpose in view of the changing project environment;
2. determine if planned inputs and outputs remain appropriate for achieving the project purpose; and
3. if needed, recommend modifications in project purpose, inputs or outputs.

The evaluation is based on reviews of project documents including the project paper, project agreement, PIOs, project amendments and all major contracts; reports on project activities including work plans for NCARTT, RASCs and ADF-supported projects; all available English language proceedings of project-supported workshops; quarterly, annual and special progress reports prepared by the major TA and training contractor; end-of-tour reports by long and short term consultants; and published reports prepared by contractors and NCARTT staff financed with project funds. The team also reviewed other documents prepared by the Jordanian Ministry of Planning and Department of Statistics, staff of the University of Jordan, USAID and the World Bank.

Print-outs from the project-developed NCARTT information system provided detailed information on staff training, on-farm demonstrations and field trials, contract technician and NCARTT staff, and the number, subject matter and attendance of all project sponsored workshops. The team met with the Minister and Secretary General of the Ministry of Agriculture, with the Director Generals of JCO and ACC, and with the current and past Deans of the Faculty of Agriculture of the University of Jordan. Interviews were conducted with all supervisory personnel in NCARTT at Baqa. The full team also visited four of the six regional centers in the NCARTT organization. Discussions with staff at each location included procedures for conducting demonstrations or on-farm trials, and status of preparation of reports. (A list of contacts is contained in Attachment A.)

B. Summary of Findings and Recommendations

Although the project is far behind schedule in terms of the original project implementation plan due to delay in negotiating the primary technical assistance (TA) and construction design and supervision contracts, the team found that significant progress had been made toward establishing the National Center for Agricultural Research and Technology Transfer (NCARTT) and the Regional Agricultural Service Centers (RASCs). At least modest progress has been made toward adoption of the farming systems research/extension (FSR) methodology. Collaboration among researchers and between researchers and extension workers has increased substantially, due in large part to the impetus given by the Agricultural Development Fund (ADF). On-farm trials and demonstrations have increased significantly in number.

Progress has been constrained by unsatisfactory organizational relations or structures, bureaucratic layering and cumbersome and unresponsive administrative systems. Training has not proceeded as rapidly as it should have because of the contract status of many of the otherwise eligible candidates, inadequate English language capability, and unexplained delays in the approval of candidates, especially for enrollment in U.S. institutions. However, this situation has improved. A number of staff have received short-term specialized training in-country or abroad. Also, a number of useful workshops have been held with large number of participants and generally favorable response.

One NCARTT staff member has received an MSc from the UOJ, and thirty are currently enrolled in advanced training programs there. One MSc and two PhD candidates are currently enrolled in the U.S. Unfortunately, the trainees are not well balanced among disciplines in terms of NCARTT's institutional strengthening needs. Additional training funds have been earmarked, and a better balance among disciplines may be arrived at in the future. Extension of the PACD will be required to permit completion of the required training program.

Continued short-term and on-the-job training and the return of current and expected future academic trainees will greatly strengthen the NCARTT staff and fill at least the most pressing needs for trained personnel if these personnel are assigned to NCARTT and if steps can be taken to check the siphoning off of trained, competent NCARTT staff. The solution to these problems will depend upon resolution of the organizational and administrative problems, increased financial incentives, and improvements in the research environment. Accomplishment of these corrective steps will require continued and increasing operational budgetary support by the GOJ.

The evaluation team has made a number of specific recommendations that we believe will facilitate achievement of project objectives. These are detailed in the section following this summary. They include recommendations for establishing NCARTT as a semi-autonomous organization within the MOA and for expanding and clarifying the role of its Board of Directors. Recommendations have been made for the reorientation and reorganization of the research/technology transfer program of NCARTT to make it more responsive to the changing needs of Jordan agriculture, and for better utilization and coordination of its resources with those of other institutions in Jordan and abroad.

Particular attention has been given to the need to establish and strengthen linkages among units within NCARTT and between these units and other units of the MOA--particularly field extension personnel. Particular attention has also been given to steps to improve operational procedures relating to activities supported by the ADF, which has been the primary motivating force for re-directing research and technology transfer planning and operations.

In view of the delays in getting implementation underway, the evaluation team recommends an extension of the Project Assistance Completion Date (PACD) for up to two years beyond the current date of September 30, 1992, but only if effective steps are taken to resolve the existing institutional and organizational issues. The evaluation team believes that priority attention should be given to the establishment of NCARTT as a semi-autonomous organization with a re-vitalized and strengthened board.

The team does not recommend provision of additional AID funding beyond the $27.5 million currently envisaged. Therefore, an extension of the project will require a reallocation of the remaining undisbursed funds. High priority must be given to joint discussions between USAID and the GOJ to consider reallocation of available USAID financial resources, since the uncommitted resources are inadequate to fully fund needed technical assistance, training, and ADF activities.

The evaluation team believes that training should receive first priority in use of remaining resources, the ADF second and technical assistance third. However, even if there is general agreement with the evaluation team's suggested ordering of priorities, specific allocation must be made to each. Within the training area, the evaluation team has recommended that highest priority be given to agrometeorology and agroclimatology, agricultural economics and range management/livestock production. Before decisions can be made on allocations to these or other training activities, the recommendation to develop a complete training plan, including workshops, short term and academic training, must be implemented.

C. Lessons Learned (for future AID project design)

1. Problem identification: The project was designed to accord with GOJ policy emphases on upland cereals production, and to address a series of perceived constraints to this production--farm fragmentation, inadequate mechanization, weak extension service. The economic analysis focused on production economics at the farm level using single commodity analysis. The analysis did not delve into the interrelationships of grain, forage and livestock systems, nor did it question the underlying macroeconomic policies and prevailing conditions. The fact is that farmers, in spite of stepped up research and extension efforts, are still not adopting the cereals package but rather are moving increasingly into irrigated production of high value cash crops, largely as a result of changes macroeconomic and policy environments. The lessons here are to more thoroughly test or question the macroeconomic validity and soundness of the "solutions" being proposed, and to look more carefully at the on-farm factor-product interrelationships. Macroeconomics and the policy environment can no longer be ignored in the design of production-oriented projects.

2. Institutional development vs. technology transfer: Based on the perception that the overriding problem in Jordan was one of technology transfer rather than integrated research/extension programming and management, institutional development was accorded a lower priority in project design. Fortunately, the institutional development objective has been pursued in implementation, which will facilitate the task of redirecting the research program to accord more with current economic realities. The lesson to be derived is that of the necessity of ensuring the soundness of the institutional base, so that necessary analyses and reprogramming can be undertaken in the event that the initial assumptions and production goals are in error or the macroeconomic conditions change.

3. Changing macroeconomic conditions and project design: The macroeconomic changes that took place after project implementation was underway could not have been anticipated. The result of these changes, however, was to change the relative profitability of farmers' production options in favor of higher-valued commodities. The project has gradually adjusted to meet the new needs of the sector. The lesson to be drawn is the need to design into projects sufficient flexibility to adapt to changed economic conditions without having to go through major revisions in project design and documentation.

4. Host Country Administrative Arrangements: The administrative arrangements agreed to by USAID and the GOJ for implementing the project, after the project agreement was signed, were significantly at variance with what was proposed in the project paper. The resulting administrative weaknesses and confusion have constrained implementation. An appropriate lesson to be drawn is the need to nail down solid, unambiguous administrative arrangements prior to initiating implementation.

5. Timing of inputs: The project was designed to provide technical assistance, training, and facilities and equipment to support the Jordanian agricultural research and technology transfer system. All these activities were to run concurrently, with the TA personnel working with trained Jordanian staff in the conduct of appropriate research and technology transfer and the use of the new equipment. For a variety of reasons both the training and construction elements were delayed in getting underway; certain TA resources were applied before conditions were ripe for their optimal utility. An important lesson here is to not schedule technical assistance in advance of the time that it can achieve its maximum effectiveness. It may be advisable to see the construction and training well underway before providing any resident, long-term TA, with priority TA needs in the interim being met by short-term personnel.

6. Pipeline and project implementation considerations: Pressures from AID/W to reduce a highly visible funding pipeline led to commodity procurement actions well in advance of the time that the commodities could be installed and used. The lesson here for a mission is to avoid too much forward funding, and for AID/W to avoid pressuring a mission into untimely contract actions simply to reduce a pipeline.

II CONCLUSIONS AND RECOMMENDATIONS

A. NCARTT Institutional Status

Finding: The present organizational status of NCARTT bears little resemblance to that planned in the PP. NCARTT's present status and the ambiguities regarding its direction and authority make it extremely difficult for it to effectively carry out its national ARTT mandate. Further, NCARTT's longer-term viability following the completion of the present project is questionable given its current weak and unresolved status.

Recommendations:

1. That NCARTT be extracted from the Projects Directorate of the Ministry of Agriculture; and
2. That the NCARTT Board of Directors be revitalized and given broader authorities.

Discussion: As noted in the body of the report, there is little rationale for including NCARTT under the Directorate of Projects when it is, in fact, not a project. The JNADP is a project, but with the purpose of assisting an established institution that already has an open-ended, nation-wide mandate; namely, as successor to the Division of Research and Extension, to plan and carry out the ARTT functions of the GOJ. Including NCARTT within the Projects Directorate imposes an unnecessary bureaucratic layer and takes effective authority for managing NCARTT away from the Director (or Director General), thus rendering this position unattractive to the type of nationally-respected figure needed.

The basis for an effective NCARTT Board of Directors has been laid out in the exchange of letters between the Minister of Agriculture and the Prime Minister of April and May, 1988. These letters establish a Board of Directors for NCARTT, specify its composition, and describe its functions including the relationship between NCARTT and the Higher Council for Science and Technology (HCST).

The duties of the NCARTT Board as agreed in these letters include:

- Developing and prioritizing short, medium and long-term agricultural research and transfer of technology plans and submitting these to the HCST for review and approval;
- Reviewing and approving the annual research and transfer of technology projects developed by NCARTT in the light of the plans and programs decided for it;
- Coordination among the various agencies concerned with agricultural research and technology transfer;
- Writing agreements and contracts for the implementation of agricultural research and transfer of technology and referring them to the HCST for approval; and
- Developing and putting into effect special regulations to pay incentives to NCARTT's staff.

To these we recommend adding:

- Authority to name a Director General for NCARTT and determine his/her terms and conditions of employment;
- Control over personnel actions of NCARTT, based on recommendations of the Director General, including establishment of positions, recruitment, transfer of personnel between the Ministry of Agriculture and NCARTT, and assignment of personnel within the NCARTT system; and
- Review and approval of annual NCARTT budgets presented by the Director General.

NCARTT would have "semi-autonomous" status under the Ministry of Agriculture, with the Minister as Chairman of the Board and the bulk of the NCARTT budget coming through the MOA as a dedicated line item. NCARTT would operate within the overall programs and priorities of the HCST; the Board would be responsible for insuring that this took place.

The composition of the Board would remain as present, with the addition of a representative of the Agricultural Marketing Organization.

B. Research and Technology Transfer

1. Basic Principles

There are five key elements which require first consideration in structuring an agricultural research program. These are listed below with appropriate notations:

WATER - As the most limiting factor in production, efficient water utilization should be the watchword, with the goal of full utilization of rainfall and surface waters, coupled with measured exploitation of groundwaters.

CLIMATE - Three climate considerations apply: First is rainfall, which is the source of water supply--directly for rainfed agriculture, and indirectly for irrigated agriculture; second are evaporative conditions of the atmosphere which govern water requirements of crops; third are factors such as temperature, light, humidity and wind which combine in various ways to establish growing conditions, both favorable and detrimental, for crops and livestock of interest.

SOIL - An irreplaceable basic resource, soils must be protected from losses to erosion and salination. Soil fertility and the soil physical conditions which govern water storage capacity, drainage and rooting environment should be constantly upgraded through enlightened management.

PESTS & DISEASES - The detrimental effects of pests and diseases affect all agricultural enterprises. Careful and detailed study of the causal factors is a necessity if losses are to be kept within acceptable ranges.

HUMAN/SOCIO-ECONOMIC CONSIDERATIONS - Crop and livestock selection and management practices should be aimed at maximizing economic returns while sustaining the soil/water resource base and observing cultural norms and imperatives.

CROPS/LIVESTOCK - Applied and adaptive research should be aimed at fitting each enterprise of interest into the framework established by the realities listed above.

It may be noted that even though Jordan is a relatively small country, the climate, like that of California for example, lends itself to production across a broad spectrum of crop and/or livestock enterprises. This translates into a need for very strong programs in the five framework research areas listed above, and also indicates a need for a wide scope of technology transfer activities. The Farming Systems Research approach is recommended in this context, both for identification of priority needs and for the research itself.

2. Findings and Recommendations

a. Framework research activities in the key areas of WATER and AGROCLIMATOLOGY are absent from the program. It is these areas of research which will give intelligent direction to programs to stem soil erosion and achieve efficient use of water in both rainfed and irrigated agriculture, thereby stopping land loss to salination and increasing the total irrigated area and yields per dunum. Additionally, water balance and water production function studies form the basis for economic analyses and programs for early warning and yield forecasting. In rainfed agriculture, new experimental designs, e.g. the "line source" design, allow integrative studies of the types mentioned above at reasonable cost of personnel, land and equipment. Also, new approaches to historical rainfall record analysis are developing both long term and seasonal rainfall forecasting capabilities for guiding strategic planning of water facilities and uses, as well as season by season "Response Farming" programs.

Recommendation: Create and staff a new research section in NCARTT for WATER/CLIMATOLOGY, or broaden the present SOIL/IRR activity to become the new SOIL/WATER/CLIMATE SECTION. Precedent for the latter exists at UC Davis in the amalgamated Land, Air & Water Resources Dept. New staff require training in agroclimatology and agrometerology.

b. Field research activities (RASCs & farms) require total mobility and flexibility in time; they cannot be done on a schedule which ends at home base at 2 pm. Neither can it be expected that researchers, extensionists and drivers or, particularly, cooperating researchers from other institutions under ADF funded projects remain in the field where they may be needed after 2 pm without lunch/overtime compensation.

Recommendation: Allow researchers/extensionists self-driving privileges, especially when after hours work is required. In the latter case, provide supplementary funds for lunch/overtime compensation. Make a particular point of covering lunch/overtime costs of collaborating researchers so they may be enabled to fully meet their commitments.

c. The SOIL/IRRIGATION SECTION has non-research obligations to the MOA which include, e.g., quality checking of all fertilizers imported into Jordan. These activities presently absorb upwards of 50 percent of the time and energies of the staff.

Recommendation: Non-research activities not directly related to furthering research/extension/farm relations--however essential to the overall wellbeing of Jordanian agriculture--should not be the function of what is to become a prestigious NationaL Research/TT Center. It is recommended these activities be transferred to another suitable department of MOA.

d. The PLANT PROTECTION SECTION has non-research obligations to the MOA which include, e.g., disease and pest screening of all imported tree/vine seedlings and potato seed. These activities absorb a major portion of the time and energies of the staff. Specialized personnel are required by this section, trained in virology, toxicology and insect taxonomy.

Recommendation: That non-research activities not directly related to furthering research/extension/farm relations be transferred to another suitable department of MOA, and that specialized personnel needs be addressed.

e. The MONITORING/EVALUATION SECTION presently has, as one of its functions, monitoring and evaluation of fellow researchers and extensionists in other sections and in ADF funded projects. This is not conducive to the fostering of close working relations with other sections, which are essential in incorporating the FSR approach into all field research and demonstration/extension activities (of particular value for identification of production constraints and setting of research priorities), and in validating all recommended practices in social and economic terms. The most pressing personnel needs are in word processing secretarial help and Arabic/English technical translation capability. Also, the section requires short term technical assistance to carry out training of personnel in other sections in computer uses.

Recommendation: Change the section name to SOCIO-ECONOMIC SECTION to better reflect its activities, transfer responsibility for monitoring and evaluation to the office of the Director of NCARTT, and address personnel needs.

f. FIELD CROPS SECTION: A full 90 percent of activities involve simple yield trials, seed multiplication and screening/breeding, mostly of wheat and barley. These are largely follow-on activities from years past, with little in the way of newness to commend them. On the other hand, it is precisely these activities which have been and continue to be most instrumental in establishing and maintaining relations between NCARTT researchers and others, both national and international, e.g. UOJ, JCO, JVA, ACC, ICARDA, ACSAD, UNDP, FAO, GTZ, Australian aid. When the new field of agrometeorology is established and new research designs are introduced, special new avenues of collaboration will open between the SOIL/WATER/CLIMATE and FIELD CROPS sections which can greatly stimulate this research to the betterment of rainfed agriculture.

Recommendation: This program should be carefully reviewed with a view to expanding programs which are generating new information and providing interdisciplinary and valuable interagency working relations, and dropping unproductive programs. Studies should begin of new, more efficient research techniques in use elsewhere.

g. VEGETABLE/FRUIT SECTIONS: Farmers have forged ahead with planting and learning to manage these higher value crops as quickly as water sources have become available to irrigate them--in some instances with only supplementary irrigation or simply rainfed conditions. In some matters, the farmers are leading the researchers and extensionists rather than the other way around. Trained personnel with these specialties are in short supply in Jordan and are much needed.

Recommendation: Address the research/extension personnel needs of these sections as rapidly as possible.

h. RANGE/LIVESTOCK is a new section, established only in April, 1987. Its importance is rapidly growing because the majority of Jordan is rangeland, and because returns from livestock and joint crop/livestock enterprises are showing themselves to be superior to some traditional cropping systems, particularly in lower rainfall zones. As in the vegetable and fruit crop instance above, trained personnel in range management and livestock production are lacking in Jordan.

Recommendation: Address the research/extension personnel needs of this section as rapidly as possible.

i. The EXTENSION/AGRICULTURAL INFORMATION SECTION is critical in that it is responsible for assisting researchers in translating their findings into usable practices, and then conveying them to farmers in understandable forms. The heart of this system must be a highly trained and experienced cadre of technology transfer specialists (also termed subject matter specialists), fully conversant with research and its products, and with the needs of farmers at the field level. Additionally, the specialists must be supported by still more field-knowledgeable extension agents having daily contact with on-farm activities.

Problems at this time are: (i) a shortage of trained/experienced technology transfer specialists, and (ii) the fact that extension agents are required by MOA to perform certain regulatory and statistics-gathering functions which not only take time and energy from their technology transfer role, but which, in some instances, actually place them at odds with the farmers they need to influence. Agricultural information functions are centered at NCARTT but, like extension, presently must serve the needs of the entire MOA. Personnel deficiencies include a video cameraman and a film editor for creating agriculturally relevant filmed sequences for TV. Operational deficiencies include lack of specially designed workplaces including sound studios for radio/TV, a pressroom and storerooms. Pamphlets/leaflets are presently tendered out for printing, a time consuming and not very satisfactory process due to lack of close control.

Recommendation: Fill the need for technology transfer specialists as rapidly as possible. Separate technology transfer activities from regulatory and statistical gathering functions within the extension service. One means of achieving this would be by assigning agents with pure technology transfer duties to NCARTT while leaving those doing regulatory and statistics gathering functions in the MOA. For agricultural information services, design required workspaces, procure a press for in-house pamphlet/leaflet printing, and provide needed personnel for video takes.

C. Agricultural Development Fund

Finding: The approval and initiation of the twenty ADF proposals discussed in the body of the report is a commendable accomplishment. Although the reality of the apparent shift in research methodology must await confirmation by final reports, the shift toward the farming systems research approach as evidenced by proposals submitted is likewise commendable. However, the tasks of organizing a coordinated, farming systems research oriented program, and developing additional procedures to utilize both earmarked and other ADF funds more fully, still remain. Finally, the weaknesses revealed in the approval process for use of ADF need to be reviewed and corrective action taken.

Recommendations:

- That, in reorganizing and reorientating NCARTT's research program, measures be included to assure that outputs of traditional research developed by single-disciplinary teams be verified in on-farm trials and be subjected to further economic validation before being recommended to farmers;

- That increased collaboration between NCARTT staff and the two Faculties of Agriculture in the development and submission of proposals for ADF funding be actively promoted by all parties. In order to accomplish this, it is further recommended that a joint NCARTT/FOA multidisciplinary committee be appointed to first, develop guidelines for topics and research procedures to be included in proposals for ADF funding, and second, to review all proposals and make written recommendations within reasonable time frame to the Director of NCARTT for approval, revision or other disposition. This committee might consist of a small, multidisciplinary core with specialists added according to the topics being reviewed.

- That the likely demand of ADF funds for "specific" purposes--e.g., equipment loan guarantees--be reassessed and action taken to officially eliminate existing restrictions on the apportionment of the ADF for such purposes.

D. Project Duration and PACD Extension

Finding: Project implementation is behind schedule. Achievement of planned project outputs by the current 9/31/92 Project Assistance Completion Date (PACD) is doubtful. While there are a number of ramifications of the implementation delays, the most salient concern training, facilities completion and the Agricultural Development Fund.

In terms of training, it is unlikely that the projected amount of long-term (academic) training can be realized by the PACD. A student embarking on an MSc. program in the U.S. in 1990 would barely be able to complete by the PACD, and would have no opportunity for overlap with TA personnel. Students beginning advanced degree studies after September 1990 would most likely not complete their graduate work by the current PACD.

Regarding the ADF, the planned completion dates for several approved proposals are approaching the PACD. New proposals that would require U.S. funding for a period of more than two years will shorty be precluded.

Finally, the delay in construction means that the principal laboratories at Baqa will not be be completed and equipment installed until late 1991, allowing only a year at most for joint work in the facilities by NCARTT staff and TA personnel.

Recommendation: That the PACD be extended by up to two years, but only if effective steps are taken to resolve the organizational and management issues raised in Section V A.3. Since increased AID funding for this project is not likely (and is not recommended), the implication is that the remaining resources (especially TA) will have to be used at a slower rate to cover the period of an extension. Determination of how to prioritize and program the balance resources, in that event, will have to be jointly determined by USAID, the GOJ and contractor representatives.

E. Funding

Finding: Of the total AID funding of $27.5 million, $21.7 million has been obligated. However, only approximately $1.5 million remains uncommitted or earmarked when the estimated total cost of the amended TA contract is taken into consideration. Given the unlikelihood of additional AID funding (which is not recommended by the evaluation team), an extension of the PACD will require very frugal use of the remaining project financial resources.

Recommendation: That additional financial commitments be minimized pending a decision regarding a PACD extension, at which point a thorough financial assessment and reallocation of available resources be undertaken jointly by USAID and the GOJ.

F. Documentation

Finding: Through a series of relatively minor changes over the years, both in project environment and structure, the existing project documents (primarily the PP and the TA contract) no longer accurately reflect project implementation realities.

Recommendations:

- That USAID/Amman, in cooperation with the GOJ, CID and Washington State University, amend the PP and other relevant project documents to reflect the realities of the present economic environment, the GOJ organization of agricultural research and extension activities, the present direction of the commodity emphasis of the project, and the expanded (national) scope of the project.

- That the project documents be amended to omit references to specific agricultural commodities and, instead, refer to a farmer-involved process for establishing research and extension priorities.

- That the Mission think beyond the standard Logframe verifiable indicators and devise a set of feasible, internally consistent indicators of project impact.

G. Training

Recommendations:

- That criteria for measuring the impact of workshops on the performance of NCARTT staff be formulated. Once these criteria are applied, measures to correct weaknesses should be taken, especially any found in setting priorities of research or in new approaches to research and technology transfer.

- That a realistic plan of training be formulated to upgrade the capacity of most, if not all, qualified BSc graduates in NCARTT and the RASCs. Certainly, all SMS and research staff should receive advanced training. Advanced training may be to PhD, MSc or Diploma levels, in areas that accord with present and emerging priorities. To implement this, MSc and Diploma programs offered by UOJ, split MSc or PhD programs between UOJ and U.S. universities, and external training for PhDs in the U.S. may be utilized. If this training is to be financed under the present project, a reexamination and reallocation of available JNADP funds may be required.

- Additional workshops and short courses should be implemented to train NCARTT and RASC staff within the nest two years. Training should focus on research management issues--especially the identification, formulation and evaluation of research and technology transfer projects. Special emphasis should be given to improving the capacity of NCARTT staff in priority determination for research activities consistent with changing local conditions.

- A more balanced distribution of subject areas, including the expansion of training in fields like irrigation and water management, animal production, extension and agricultural economics should receive high priority consideration.

- The Ministry of Agriculture should make arrangements to facilitate the training of those who qualify for training at an early stage of their employment at NCARTT.

H. Facilities

Findings: With the completion and equipping of the physical facilities, Jordan will have adequate laboratories, staff offices, library space, meeting halls, administration and other support facilities for its needs well into the future. Between existing facilities presently used by NCARTT and the new buildings under construction, the Ministry of Agriculture by 1992 will have space for 81 laboratories (52 in Baqa and 29 in RASCs), 206 offices (136 in Baqa and 70 in RASCs), meeting halls, library and other support facilities (see Table C-5). These facilities can be further augmented by those available in the faculties of agriculture in the University of Jordan and the JUST.

However, there is no evidence that present and projected allocation of physical facilities to various disciplines or crop commodities is based on criteria that are consistent with national priorities or needs of research and technology transfer. Animal production and health, irrigation and water management, food technology, marketing and floriculture are areas that have not received the priority they may deserve in present allocation. Space reallocation should be possible to accord more closely with present and future national needs and priorities.

The delay in facilities construction may not be critical for the performance of activities of the RASCs, but may have serious negative repercussions for those of NCARTT headquarters.

The addition of about fifteen thousand square meters of main building and two thousand square meters of staff housing will more than triple present levels of operational costs of buildings and grounds of NCARTT within two years. It may be difficult to meet these new costs without decreasing other operational funds required for other activities of NCARTT/JNADP.

Recommendations:

- That the present Project Assistance Completion Date (PACD) be extended to at least one year beyond September 1992 to allow adequate time to bring the new facilities into full operation;

- That projections be made and steps taken to insure the availability of the additional operational costs in light of total operational costs allocated to all NCARTT/JNADP activities;

- That final allocation of space to various activities of research and technology transfer be carried out in the light of national priorities as identified by authorized bodies or institutions;

- That the new building next to NCARTT headquarters in Baqa designed for olive pest research and now nearing completion be used for some JNADP activities on an interim basis.

I. Commodities

Finding: Commodity procurement was not satisfactorily coordinated with the construction and technical assistance elements of the project, with the result that most commodities are now on hand, but cannot be installed and utilized pending completion of the new facilities. Also, there is no record of an assessment being made of the additional operations and maintenance cost burden for NCARTT of the new equipment, especially the vehicles.

Recommendations:

- That improved storage facilities be quickly arranged for the commodities currently being stored in steel containers; and
- That an assessment be made of the recurrent costs of the commodities on hand or on order, to help ensure adequate future budget provision.

J. Personnel and Operations

Recommendations:

- The allocation of personnel to major areas (disciplines) should be reviewed in the light of present and emerging priorities that require ARTT output. Water resources, agro-climatology, economics, livestock and range, poultry production and horticulture should receive higher priority in the future allocation of technical human resources.

- Jordanian staff at the BSc level who appear to be available in sufficient numbers should receive advanced training to either Diploma or MSc level. Training at least 10 percent of the BSc personnel on board every two years may be feasible. A number of promising MSc holders should be trained to the PhD level. Finally, at least 2-3 PhD holders in each of the primary disciplines being covered in NCARTT work should receive further training within a reasonable period of time, perhaps over the next ten years.

- Staff assigned to the RASCs should be further strengthened to cover priority areas in each region and to improve their level of qualifications.

K. Other

- That the relationship between NCARTT as a national agricultural organization and AMO as a national marketing organization be strengthened to provide the linkages needed to supply farmers with the information necessary to operate profitably.

- That USAID monitor the socio-economic data collection and analysis being undertaken by NCARTT to ensure that the data will be available to assess project impact.

III CHANGES IN PROJECT ENVIRONMENT

A. Macroeconomic Developments in Jordan

The decline in Jordan's macroeconomic situation that began in the mid-1980's was a result of factors both internal and external. In particular, the difficulty resulted from the decreased flow of remittances from Jordanians working in Saudi Arabia and the Gulf--in turn, a result of the fall in world petroleum prices. Decreasing exports of Jordanian agricultural commodities (also a partial result of the decline in Gulf economies) exacerbated the Jordanian foreign exchange (FX) situation. Due to the declining FX earnings, the external debt became a problem. In 1989-89 the Government of Jordan (GOJ) initiated economic reforms to correct the situation. (See Attachment 1 for more detail.)

The project paper (PP) and other project documents, in general, have little discussion of the macroeconomic environment or the sectoral economic policy environment in which the project was developed. In large part, the impetus for the project seemed to come from a concern for a more equitable agricultural development for Highlands relative to the Jordan Valley, a significant wheat deficit, and a vegetable glut. Further, the PP focused on the generation and dissemination of technology, with scant direct attention paid to the economics of that technology. This lack of attention to the broader economic issues facing the nation and the agricultural sector led to a relatively limited commodity focus; namely, wheat, barley, lentils, chickpeas, hay and fruit, with limited regard to the economics or compatibility with other farm activities of the technology being proposed. The root causes of some of the technology adoption problems (overvalued exchanged rate, rising debt, inappropriate marketing policies and an inefficient marketing system) were not recognized in the PP, thus contributing to the realtively narrow technical commodity focus.

Due to the devaluation of the Jordanian dinar (JD) from JD 0.34 to approximately JD 0.68 per $1, the relative profitability of many of the agricultural commodities changed; i.e., gross revenue of exported fruits and vegetables doubled while agricultural commodities with artificially high domestic prices set through the GOJ's "incentive pricing" policy (wheat and barley in particular) lost in relative profitablity. The devaluation of the dinar, and the accompanying shifts in relative prices, created the incentive for farmers to continue to modify production patterns away from low value commodities for domestic use toward high value commodities for exports. On the negative side, the cost of production increased due to price increases of imported inputs and domestically-produced inputs with FX components.

The devaluation also placed an increasing focus on marketing. The change in the relative profitability of various agricultural commodities and the increasing attention to the international market for fruits and vegetables calls into question the original commodity focus, particularly on cereals, and the type of extension activities needed to assist the farmers in making rational production and marketing choices. It has also increased farmers' need for timely price and other market information.

The change in the exchange rate also called into question the GOJ's policy of food self-sufficiency; while the internal argument over food self-sufficiency (producing the food domestically) vs. self-reliance (export sufficient items to guarantee the country's ability to purchase food) continues, it now appears that the GOJ may be moving toward the latter. One indication that this shift in policy is occurring is by the increasing attention paid to the "need to produce according to economic comparative advantage" as stated in various documents and in conversations with GOJ officials.

While the equity considerations that partially drove the development of the Highlands Agricultural Development Project (HADP) remain valid (assistance to farmers involved in relatively small scale rainfed farms and "balanced agricultural development"), there is a need to modify the PP language to fit the realities of the present economic conditions and the actual direction the project has taken. The commodity focus of the project would thus be more toward irrigated vegetables, tree crops, cropping rotations that produce fodder, and range land management, and less on wheat and barley.

The data indicate that such a shift in emphasis is already taking place at the farm level, as the area planted to wheat has decreased in recent years while the resources devoted to vegetable and fruit production has increased.1/ The shift toward vegetables and tree crops will probably continue, with or without any modification in PP language; if a farmer-involved process is used to establish research and extension priorities, the shift of emphasis within the project toward high value crops will occur as a natural consequence of the changing economics of agricultural commodity production and the resulting switch in cropping patterns.

1. Shepley; Wheat Subsidy Policies in the Hashemite Kingdom of Jordan, an Economic analysis, USAID/Amman, Aug. 1988.

B. Institutional Changes

1. The Higher Council for Science and Technology(HCST): This was established in December 1987. Among its powers and responsibilities most relevant to the National Center for Agricultural Research and Technology Transfer (NCARTT) are:

- Ratification of science and technology policy in the country, including defining priorities, formulating plans arising from priorities, and monitoring their implementation and evaluation;
- Formulation of a strategy to develop scientific and technological capacity and the creation of a suitable environment for its performance; and
- Provision of support for scientific and technological institutions and funding research and development activities.

During the past two years, the HCST has sought to articulate and define its relationships with existing Jordanian scientific and technological institutions including NCARTT.

2. The Faculty of Agriculture in the Jordanian University of Science and Technology: The PP called for coordination between NCARTT and such other Jordanian institutions as the Faculties of Agriculture of the University of Jordan and Yarmouk University. In 1986, the Science and Technology Faculties of the University of Yarmouk were reorganized under a new university--the Jordan University of Science and Technology (JUST). The JUST Faculty of Agriculture started its teaching program in 1989 and is expected to expand its research activities in the coming years. Since JUST is located in the north of Jordan, cooperation and coordination of its activities with NCARTT in general, and with the RASC in the north in particular, should be reflected in NCARTT's working plans and programs.

3. Other Developments in the Region: Jordan is a founding member of the Arab Cooperation Council, which was established in 1988 and now includes Egypt, Iraq and North Yemen. Basically, this is a regional economic organization that aims, among other things, at removing or minimizing trade barriers among member countries. Perhaps the most significant development within the coming five years will be the creation of a larger market for Jordainiam produce beyond the traditional markets of the Gulf States, Syria and Lebanon. Also, in 1989, ICARDA established a regional office in Amman to coordinate its regional programs in livestock, legumes and barley improvement. This regional office can provide a vehicle to further strengthen existing relationships between ICARDA and NCARTT.

C. Logical Framework Revisions

The logical framework matrix (logframe), according to which NCARTT and the technical assistance contractor are carry out their implementation responsibilities, was modified somewhat as a result of the January, 1987 Project Implementation Workshop. This revised logframe was subsequently endorsed by USAID as a working document. (This Workshop also resulted in the substitution of the Farming Systems Research (FSR) methodology for research planning for the Systematic Commodity/Resource Analysis & Development process (SCRAD) methodology proposed in the PP.)

The primary difference between the revised and original logframes were in the purpose-level indicators, or End-of-Project Status (EOPS), the outputs (and their indicators), the presentation of the inputs, and the input-output and output-purpose "assumptions".

Both documents present the project as roughly the same: "To stimulate greater agricultural production through applied research, improved extension methodologies and various activities to enhance institutional capabilities" in the original, and, "To stimulate sustainable improvements in agricultural productivity, profitability and equitable distribution of farm incomes through a more effective system of Agricultural Research and Technology Transfer" (ARTT) in the revision.

The EOPS, however, are significantly different: The original logframe mentions strengthening the capabilities of NCARTT "to develop and diffuse technologies to reach 75 percent of highland farmers", while the revision cites "increased productivity/profitability per dunum in selected areas/systems, increased median income of farmers in target areas/systems, and increased demand for involvement in ARTT programs by farmers".

The outputs of the original logframe were:

1. improved institutional coordination and priority analysis;
2. establishment of NCARTT;
3. development of appropriate demonstration methodologies;
4. establishment of 4 Regional Agricultural Service Centers (RASCs);
5. improved knowledge of rangeland management and co-op organization; and
6. increased agricultural production.

The corresponding indicators for these outputs were:

1. formation of Agricultural Development Council (ADC) and a secretariat;
2. fully staffed and equipped NCARTT;
3. on-farm technology demonstrations;
4. fully staffed and equipped RASCs;
5. rangeland set aside and managed by a co-op; and
6. higher yields in project areas.

The revised logframe, on the other hand, specifies only two major outputs:

1. Selected improved technologies for enhancing performance in highland crop and livestock productions systems developed and/or tested, transferred and adopted by producers; and
2. National ARTT system(s) strengthened through establishment of NCARTT and RASCs, including facilities constructed, staff recruited and trained, improved ARTT management systems in place, and linkages established between organizations involved in agricultural research and technology transfer.

The indicators also changed significantly. For the first output they became:

1. constraints identified/verified;
2. on-farm trials demonstrating potential for increased yield/profit;
3. technologies being transferred through on-farm trials, demonstrations, agribusiness, Jordan Cooperative Organization (JCO), Agricultural Credit Corporation (ACC), etc.; and
4. increased rate of adoption of improved technologies/practices by target clientele.

For the second:

1. Facilities appropriate to ARTT program needs constructed, equipped and operating;
2. Personnel trained in appropriate disciplines or methodologies and assigned to ARTT programs at NCARTT, RASCs or other institutions;
3. ARTT policies and procedures in place and functioning; and
4. Active collaboration occurring between key ARTT organizations/institutions.

The revised logframe attempted to relate the inputs more directly to the two specific outputs, namely, the means of assessing the technology needs of highland production systems and the means of assessing the institutional requirements of meeting these needs, and cited the budget line items as indicators of inputs.

Important output-purposes assumptions included in the revision were continuation of pricing policies "at least as favorable as under current conditions", the provision of long-term support for the ARTT system by the GOJ, and continued GOJ support for equity and sustainability concerns as well as overall production increases.

Both of these matrices have some merits and some problems. A problem common to both is the lack of specificity regarding the purpose and output indicators. On balance, the revision, since it reflects the joint efforts of the GOJ, USAID and the contract team and has been utilized by the contract team as a working guide, will serve as the basis for the first interim evaluation.

D. Changes in Project Name and Scope

The name of the Project was officially changed in mid-1988 (three years into implementation) from the Highlands Agricultural Development Project, to the Jordan National Agricultural Development Project. The change reflects both the broadened geographic scope with the inclusion of the Deir Alla Station in the Jordan Valley (formerly assisted through AID's Jordan Valley Agricultural Services Project) under the overall auspices of NCARTT, and the broadened technical scope to include both irrigated as well as rainfed production. The Mission proposed the name change to AID/W, after clearing it with the GOJ, in May 1988. AID/W approved the change the following month. No additional documentation changes were made to reflect these changes apart form the name change.

IV INPUTS

A. Technical Assistance (TA)

The PP lists a total of 312 person/months (p/m) of AID-funded TA at a cost of $4.445 million. The TA listed in the original logframe and in the original and modified contracts is as follows:

	Project Paper (p/m)	Initial Contract (p/m)	Amended Contract (p/m)
Chief of Party (COP)	48	60	60
Extension Advisor	36	24	54
Administrative advisor	24	0	0
Unspecified TA	18	0	0
Livestock Production	0	0	24
Range Specialist	24	24	24
Farming System Research	0	18	54
Agribusiness	0	0	24
Tree Fruit Horticulture	0	0	18
Vegetable Horticulture	0	0	18
Agronomy	0	0	24
Entomology	0	0	18
Subtotal	150	126	318
Short-term assistance	90	90	91
On-campus backstopping	72	122	171
Total	312	338	586

The level of technical assistance for the JNADP was expanded significantly upward in 1989. The figures in the amended contract represent a 88 percent increase in the total project TA; 112 percent in the long-term TA and 138 percent in home office backstopping. In dollar terms, these changes reflect an increase of 105 percent in the funding for TA. These are significant changes in the level of effort and in the allocation of funds. The Evaluation Team has seen no documentation of the reasons for the change in the quantity of TA, but has been told that this change is a reflection of the growing recognization by Jordanian scientists of the need for greater inputs of technical assistance.

Other technical assistance (contracted outside the CID/WSU contract) to date has included the services of the procurement services agent (PSA), interim administrative assistance during the start-up phase of the project (prior to initiation of the CID/WSU contract), extension methodology assistance under the AID centrally-funded Communications for Technology Transfer in Agriculture (CTTA) Project, and assistance in undertaking management training for NCARTT staff. Obligations for this additional TA total roughly $860,000.

B. Agriculture Development Fund

The PP and project agreement provided for the establishment of an Agricultural Development Fund (ADF), the purpose of which was to provide a flexible pool of funds to supplement existing resources in implementing actions designed to promote agricultural development. The documents and subsequent correspondence confirmed that incremental contributions to the ADF by GOJ and USAID would total $6,7500,00 and $3,500,000 (in base year funds) respectively over the life of the project. The documents specify that the ADF may be used for both general and specific purposes as follows:

1. General:

   a. Projects to implement action plans developed through the SCARD process;
   b. Activities approved by the steering committee that are designed to identify, test and adopt new technology for possible introduction into Jordan; and
   c. Studies sanctioned by the steering committee.

2. Specific:

   a. Land consolidation;
   b. On-farm demonstration;
   c. Equipment loan guarantees; and
   d. Technical services (local and international).

The documents did not require that AID funds be kept distinct from those of the GOJ. However, it was specified that approximately 34 percent of the total funds must be used for the specific functions described above unless transfer to the general category was mutually agreed upon. A November 1986 letter from USAID to the Minister of Agriculture also stated that it was expected that of the 34 percent of the total to be used for specific purposes, 30 percent would be allocated to land consolidation, 15 percent to on-farm demonstrations, 10 percent to equipment loan guarantees and 45 percent to technical services.

The Agricultural Credit Cooperation (ACC) was designated as the fiduciary agent responsible for the cash custody, accounting and disbursing functions for the Fund. While it is specified that preference will be given to collaborative projects, support for other types of projects is not prohibited. The evaluation team made a special effort to obtain records of criteria or guidelines for project approval other than those in the November 1986 document, but none were found.

Contributions to the ADF as of October 10, 1989, were as follows:

Source	Receipts (JD)
Ministry of Planning	430,000
AID	135,000
Income from Project	454
	565,614

AID made an additional contribution of $418,000 on November 1, 1989, but the conversion and transfer were not complete by mid-November.

The first proposal for ADF funding was approved in October, 1987. Since then, nineteen other research/technical transfer projects plus one for building glass houses for research have been approved. ACC records show that a total of JD 499,990, or about 87 percent of the total funds available in the ACC account, had been allocated to these twenty-one projects, but only JD 55,370, or less than 10 percent, had disbursed by the end of October 1989. Four of the projects are being implemented by joint NCARTT/UOJ teams, twelve by NCARTT staff only, and four by UOJ staff only.

Approval procedures, at least for most projects submitted thus far, have been for the proposals to be prepared by individuals or groups either within or outside of NCARTT and then submitted through the organization with which they are affiliated to the Director of NCARTT. He then submits the proposal to reviewers of his choice. Reviewers' comments--oral or written--are returned to the originators. The proposal may be revised to reflect views of the reviewers and re-submitted to the Director of NCARTT. If he finds the revised version satisfactory, current procedures call for him to then submit it to a sub-committee, originally of the Steering Committee but now, apparently of the Board of Directors, for final approval and fund allocation. Notification of approval is sent to the ACC which allocated funds for disbursements in accordance with established procedures.

There are no records or reports of time limits set for completion of review or other steps in the clearance process. Nor was there any evidence of a systematic procedure for assuring involvement in the review process of individuals in all disciplines that might have a legitimate interest in participating in the project being proposed or have technical knowledge which could strengthen the project plan or procedures.

C. GOJ Personnel and Operations

Personnel: Widespread experience with project implementation has shown that inputs like land, physical facilities and equipment will be meaningless in the absence of a competent, well-qualified and dedicated human resources base to apply these other inputs in productive programs consistent with desired goals and objectives. While outside technical assistance can provide skills, expertise and on-the-job training in organizing and implementing project activities, especially in research and technology transfer, the continuity and productivity of programs will ultimately depend on the size and, more importantly, the quality of local staff. Jordanian personnel input to the JNADP through NCARTT and the RASCs over the last three years are briefly reviewed in the following paragraphs.

Although NCARTT was organized and the JNADP officially got underway in 1985, most project activities only started in 1987 with the initiation of the technical assistants. Personnel affiliated with NCARTT during the first two years consisted about a hundred technical or professional Jordanian staff, supported by about fifty laboratory and field technicians, administrative and logistic support staff. Because of the centralized administrative system of the Ministry of Agriculture, NCARTT and the JNADP received other administrative support from MOA headquarters. The total annual cost of such technical/professional plus support staff, although difficult to pin down, was approximately JD 350,000 in 1986 and 1987. The extension staff was at that time under the administration of the regional directorates of the MOA; including their salaries brings the cost of those involved with research and extension to an annual total roughly JD 440,000 for those two years.

Because extension agents working in the regions were not included in the staffing structure of NCARTT until 1988, an initial staff profile would have shown 60 percent of the technical staff at the BCc level, with 40 percent with qualifications higher than the BSc degree (see Table S-1 for details). The majority of the latter had MSc degrees.

The spectrum of areas covered in the qualifications of the research staff was limited to plant production, soils and irrigation. An extension core of four people plus one BSc holder in economics were supposed to form a unit to support the extension agents scattered through seven regions of the country.

Currently, Jordanian staff of NCARTT and the RASCs holding BSc degrees and above has increased by 150 percent over the level of 1987. The increase came from two sources: new appointments, and the inclusion in 1988 of extension staff (approximately 80) under the umbrella of NCARTT and the RASCs. In October 1989, NCARTT and the RASCs has a total technical staff of 255, all holding BSc degrees or above. This cadre is supported by a total of 137 support

adequate consideration. A commonly-accepted rule of thumb for allocation of ARTT budgets is 60 percent to salaries and 40 percent to operations. If the GOJ is spending about JD 800,000 in 1989 on salaries, operational funds should come to JD 530,000. However, the present allocations for operations in 1989 will come to only JD 255,000 after subtracting funds allocated to salaries of contract personnel.

D. Training

The overall goal of the training program may be viewed as a comprehensive effort to produce a qualitative change in the approaches and management procedures and capabilities of NCARTT and the RASCs in order to better ensure the achievement of JNADP and NCARTT overall objectives. Its specific objectives may be summarized as follows:

- To improve the capacity of NCARTT senior staff in research and technology transfer management, and in the planning of NCARTT activities in a manner consistent with the resource base of the country and the general program and mandate of NCARTT;

- To strengthen the capacity of NCARTT staff in areas such as agricultural economics, extension and other fields related directly to JNADP objectives through advanced academic programs (PhD, MSc or Diploma levels);

- To improve the capacity of about sixteen Subject Matter Specialists (SMS) in areas related to technology transfer activities in order to strengthen the linkages between research output on one hand, and the application of research results in farmers' fields on the other, through short term external and internal training courses;

- To prepare a core staff for NCARTT with a strong base in farming system approaches, interdisciplinary team research activities and advanced level of knowledge in disciplines relating to NCARTT activities, with emphasis on fields currently underrepresented in NCARTT, through external training of up to twelve persons for MSc or PhD degrees;

- To enable the Agricultural Service Officers (ASO) of the RASCs to gather, apply and transfer information using the farming systems approach, through a series of FSR workshops;

- To expedite the transfer of technology appropriate for Jordan through a series of regional seminars; and

- To improve the English language proficiency of candidates for long and short term training programs to a level that will enable participants to qualify for acceptance in degree programs in U.S. universities.

A total of $1,593,000 has been committed or earmarked to date for all types of training of NCARTT personnel, including that in the modified contract between USAID and CID which became effective in October 1988. The original TA contract calling for the implementation of training by CID became effective in January 1987, and included a total allocation of $60,000 for this purpose.

The original CID/WSU contract called for the preparation of a training plan to be submitted to USAID by July 1987 that would outline the way CID proposed to implement the training activities. The evaluation team was not able to locate any such overall plan. However, the contractor has prepared yearly plans for 1989 and 1990. In November 1988 a short-term consultant prepared an elaborate manpower development plan, timetable and methodology that extends until the year 2000. This plan went far beyond the scope and objectives of the training program called for in the JNADP contract.

In an effort to achieve training goals and objectives, the Contractor, in collaboration with institutions inside and outside Jordan, has implemented a variety of activities over the period 1987-89 but mainly in 1988 and 1989.

Workshops and Seminars: About 33 workshops and seminars have been held with an average duration of about eight days and an average number of participants of forty for each (see Table T-1 for details). The most important workshops were those that dealt with FSR methodologies, management of research programs and the technology transfer activities. Because these workshops, and notably the one in farming systems, have been implemented in recent months, it is difficult to measure their impact on the capacity of NCARTT staff in the formulation of research projects and in technology transfer. However, comments by staff, particularly at the RASCs, were all favorable, with very enthusiastic comments on the recently completed Farming Systems Research Workshop.

Degree Training Inside and Outside Jordan: A total of 33 trainees are presently enrolled in graduate programs at UOJ or WSU leading to PhD, MSc or Diploma (see Table T-2 for details). Two additional trainees graduated from the UOJ in 1989. The majority of those now in training are expected to graduate by 1991 and join NCARTT and the RASCs. Six additional PhD and MSc candidates to be trained in U.S., as called for in the contract, are yet to be identified and enrolled. Once this happens, their studies are expected to run through 1993 and 1994.

About 60 BSc graduates have been appointed to NCARTT on contract during the last twelve months. However, current MOA scholarship regulations prevent this group from benefitting from degree training opportunities that may be made available either from JNADP funds or other sources.

staff. The total salaries of both professional and support staff is expected to total JD 794,843 in 1989. The distribution of ARTT staff holding BSc degrees and above by level of qualification, area of work and location is shown in Tables S-2, S-3, and S-4.

With the influx of new appointees and the extension agents into the personnel structure of NCARTT and the RASCs, the overall percentage of those having advanced academic training decreased to 30 percent of the total. This ratio of advanced to BSc degrees is lower than is normally found for research and technology transfer institutions worldwide. While there is no general concensus on what such a ratio should be, most experts agree on a minimum qualification of an MSc for all staff doing applied research, and an MSc or special advanced training for staff carrying out specialized technology transfer. By 1992, about 32 of the trainees now studying for advanced degrees will join NCARTT and the RASCs, which will bring the ratio of those with advanced training to about 40 percent.

At present, 70 percent of the total MOA ARTT professional staff has been allocated to the RASCs. However, only Deir Alla has a good share of staff with advanced training (20 percent of the total). In recent months several MSC holders have been transferred from the RASCs, mainly Deir Alla, to NCARTT headquarters.

Operations: Except for JD 230,000 allocated to the ADF by the Ministry of Planning (MOP), all GOJ contributions to operational funds of JNADP in 1986 and 1987 came through the budget of the MOA, with no distinct line item for NCARTT. Therefore, it is difficult to determine the actual amount of operational funds allocated to all JNADP activities for these two years. In 1988 and 1989, however, most operational funds for JNADP came from the budget of the MOP. These totaled JD 477,000 in 1988, but declined to JD 375,000 in 1989. (Negotiations were underway at the time of this evaluation for a supplement of between JD 500 and 625 thousand for 1989, but no resolution of this issue had been reached by mid-November.)

Operational costs for ARTT activities usually include: expendable materials (chemicals, glassware, seeds, pesticides, stationery); maintenance (building, machinery, vehicles); fuel for vehicles and machinery; utilities of buildings; media and publications; and incidental labor or assistance hired on a temporary basis. Annual journal subscriptions and book purchases that recur every year should be an additional item in operational costs. Operational funds provided by the GOJ to the JNADP also include salaries of personnel that have been appointed to NCARTT by contract. The sum for this item (contract personnel) came to about JD 30,000 in 1988, and may reach JD 120,000 in 1989.

The adequacy of the net sums allocated to all other operational funds in 1989 is questionable. As NCARTT facilities and activities expand in the coming year, additional funds will be required to sustain reasonable performance--a fact that may not be receiving

There is no doubt, once the approximately forty trainees join the other staff of NCARTT and RASCs, that they will add quantitative and qualitative strength to the human resource base. However, the degree training program has not been free from certain gaps and biases in the disciplines being pursued. Plant production and protection, for example account for 76 percent of the total number of those in academic training, reflecting a carry-over in academic degree orientation from pre-JNADP days.

Short Term Training Courses: Eight senior staff of NCARTT have received short term training courses in the U.S. ranging from one to four months duration. Information management, extension, farming systems, research management and strategy planning were the topics covered in these courses. However, the training of some sixteen SMS and ASO is yet to be implemented. There was a proposal to train this group in a specially tailored program to be implemented collaboratively between NCARTT TA personnel and the Faculty of Agriculture of the UOJ; however, this program has not yet materialized. The option is still attractive and feasible, and should be followed up.

English Language Training: A large number of NCARTT and RASC staff have received English language training. The training courses were carried out in 1987 and 1988 in the Language Center of Muta University in Karak, Yarmouk University in Irbid and the Yarmouk Institute in Amman. The training courses were terminated in 1989, but are now to be resumed through the amended CID/WSU contract for the sixty or so BSc graduates who were appointed in NCARTT and RASCs late in 1988 and early 1989.

E. Commodities

The project paper allocated a total of $6.2 million in base year costs for commodities, to be used primarily for furnishing and equipping the NCARTT and RASC facilities--laboratories and offices--and providing support to the technology transfer activities. Additional commodities mentioned in the PP were farm equipment for the RASCs and vehicles to support the applied research and extension activities. The initial equipment list in the PP was not well developed, with the understanding that detailed commodity specifications would be developed jointly by NCARTT staff and the technical assistance team.

Due to the overall volume of commodities envisaged, the PP proposed the use of a Procurement Services Agent (PSA) under a host country contract to handle the bulk of the commodity procurement. The initial implementation plan called for the PSA contract to be in place by mid-1986.

A direct AID contract was ultimately decided upon, rather than a host country contract, in the belief that this would facilitate negotiation and award of the contract; a two-year contract with Development Procurement International (DPI) was signed June 1, 1987, or one year later than originally planned. Meanwhile, the Mission has proceeded with a series of direct local procurements. The DPI contract was not renewed on its expiration on May 31, 1989. However, by that time the bulk of the commodity procurement action had been completed or was far along.

As of the date of this evaluation, commitments for commodities total $3.7 million, with another $2.4 million in process for laboratory casework. This will almost totally exhaust the $6.2 million in current obligations, which corresponds to the PP base year amount.

F. Land and Physical Facilities:

Facilities as proposed in the PP: One of the major inputs of JNADP is the construction of physical facilities at five locations in the highlands representing major agricultural regions outside the Jordan Valley and Southern Ghors. The facilities were planned to provide offices and laboratories for research activities, diagnostic and soil analysis services for farmers, a base from which demonstration and on farm trials will be launched, and a meeting place between farmers and technical staff of NCARTT and the RASCs. Also included were farm equipment sheds, stores, and housing for a limited number of staff (mainly at the RASCs that are located far from major towns.)

The planned facilities were as follows:

- NCARTT headquarters building in Baqa near Amman;
- RASC facilities in or near each of these towns: Ramtha in the north, Mushagar in the middle, Rabba in the middle south and Shubak in the far south of the country.

The PP envisaged the construction of the facilities as early as possible in the life of project. NCARTT headquarters was, therefore, expected to be completed after 28 months, and RASC facilities within 40 months of the date of the ProAg, which was signed in July 1985. The total cost of the design, supervision and construction of all physical facilities was estimated in the PP to come to about $6.8 million, which was to be financed through a loan provided to the Jordanian Government by USAID. The Project Agreement stipulated that the Ministry of Agriculture would have the overall responsibility for the construction of the facilities and, once completed, would assume total responsibility for them.

Construction Implementation: The change in the scope of the project from a Highland Agricultural Development Project to a National Project was reflected in a major change in the NCARTT headquarters building in Baqa. Instead of supplementing existing buildings

previously occupied by the Research and Extension Department of the MOA (NCARTT's institutional predecessor) with additional office and laboratory facilities, it was apparently decided to construct a much larger building that would provide space for present and future needs of agricultural research and technology transfer for Jordan as a whole. Few changes were made in the size and type of facilities envisaged for the RASCs.

The total area of facilities as envisaged in the PP and as being actually constructed for NCARTT and the RASCs is given in Table C-1 and is summarized below:

Type of facility	Area planned in m2 per per PP (A)	Area under construction in m2 (B)	Percent change in B from A
- Main building, NCARTT	1850	10008	+450
- Main building in each of the RASC's	1140	1213	+6
- Farm buildings	6495	3240	-50
- Staff and workers housing	1760	1968	+12

The new building at Baga, when completed, will house the research staff, research laboratories and the main administration of NCARTT. It will have 86 technical staff offices, 35 laboratories and a complete wing for administration composed of about eight offices, meeting halls and administrative support facilities. Details on the laboratories and offices for the projected research staff as well as the administration are summarized in Table C-2.

It is planned that the existing building, which has a gross usable area of 2,300 square meters, will house extension staff, the information unit, library, and the seed testing facilities. The projected number of professional staff to be housed in the old and new buildings of NCARTT headquarters is 79 researchers, 23 extension and other services officers, and 24 administrative support staff. No separate facilities are being provided for technicians and research assistants.

Facilities in the four RASCs are under construction. Main buildings are little changed from those proposed in the PP, but other farm buildings vary significantly. Each RASC will have five laboratories for research and services, a small library, a meeting hall for farmers, and 13 offices for professional and support staff (Table C-1). Farm equipment buildings, housing and stores are also under construction (see Table C-1 for areas and details).

Long delays have taken place in the design and starting date of construction of all physical facilities (see Table C-2). Physical facilities at all RASCs are expected to be completed by the fall of 1990 (one year later than planned), while NCARTT headquarters building is, according to some reports, expected to be finished in February 1991--four years after the October 1987 date envisaged in the PP.

Land Allocation for the JNADP: The Ministry of Agriculture has provided land on which the NCARTT headquarters at Baqa and the four RASCs are being constructed. Further, the Ministry has allocated land for research and demonstration purposes in ten of the experiment stations distributed throughout Jordan, including the RASC locations. The total land area allocated for such purposes comes to about ten thousand dunums (1,000 hectares). The location, area and some features of the experiment stations affiliated with JNADP/NCARTT are given in Table C-4.

G. Overall Financial Status

The overall project financial status (in $ 000) as of 9/30/89 stood as follows:

	AID			GOJ	
	Obligated	Committed	PP Amt.(1)	Committed	PP Amts.
Technical Assistance (includes CID & PSA)	7,090	6,562	5,920	-	-
Training	257	204	916	(2)	59
Commodities	6,300	3,731	7,865	(2)	500
Evaluation	71	64	176	-	-
Agr. Dev. Fund	900	600	5,623	645	6,750
Construction, including design & supervision (3)	6,900	6,900	7,000	500	1,000
Personnel & Operations (4)	0	-	-	4,728	14,148
	21,700	18,100	27,500	5,873	22,457

(1) Figures from PP Financial Table 2, which include apportionment of contingencies and inflation.
(2) Not available.
(3) GOJ contribution represents land value only, from PP.
(4) Committed JD 3,152,000 converted at current (11/89) exchange rate.

The primary technical assistance contract amount now stands at $11.245 million with the latest (August 30, 1989) amendment. Funding provided to date totals $6.1 million, for an outstanding balance of $5.145 million. This figure is not reflected in the obligations or commitments to date. Thus, fully funding this contract (and reflecting this figure in the obligations column) will consume the major share of the remaining unobligated AID funding.

The gap between obligations and commitments in the commodities line item is largely accounted for by a $2.4 million order for laboratory furnishings ("casework") now in process. Completion of this order will bring the total commodities commitments to $6.1 million, versus the $6.3 million obligated.

The above financial summary table does underestimate the actual funding levels for training. The amount for training has been increased over the PP amount, from $916,000 to $1,540,000; the bulk of this, however, has been included in the revised TA contract so that the total training funding doesn't appear in the separate training line item.

The ADF has been funded at less than 20 percent of the PP level. In essence, in view of the limited demands on the ADF to date, the AID budget for the ADF has been used to fund the additional TA. Given present and projected financial commitments for TA, AID's total ADF funding could not exceed a total of $2 million compared to the PP level of $5.6 million (including a proportionate share of the contingency and inflation allowances). The GOJ has thus far more than met its obligation to match AID funding for the ADF.

The bottom line is that, of AID's authorized level of funding of $27.5 million, all but about $1.5 million is tentatively or actually committed. If a project extension is envisaged, there will be little left from the present authorized LOP amount to fund such an extension.

V PROGRESS RELATIVE TO PLANNED OUTPUTS

A. NCARTT

1. Introduction

The revised logframe specifies two primary outputs for the JNADP: "a national ARTT system strengthened through establishment of NCARTT and the RASCs . . .", and "selected improved technologies for enhancing performance in . . . production systems." However, success in the latter is directly dependent on the degree of success in the former. Therefore, in discussing progress relative to these outputs, primary emphasis will be placed on the development of the "national ARTT system", with discussion of improved technologies resulting from this system as appropriate.

NCARTT was officially established as the GOJ's national agricultural research and technology transfer institution (as successor to the MOA's Directorate of Research and Extension) in 1985, with headquarters in the former directorate facilities in Baqa. NCARTT staff totals 47 professionals out of a total of 255 MOA personnel now involved in the national ARTT effort through NCARTT, the RASCs or the local extension services. Sixty-seven of these (26 percent) have post-BSc academic training, including 13 PhDs. A total of 33 personnel are currently pursuing advanced degrees.

Presently, NCARTT's budget comes totally through the MOA; however, from fiscal year 1990, NCARTT will have a separate line item within the overall MOA budget. At Baqa, a management information system now monitors research progress, including ADF projects, all ARTT personnel and an inventory of equipment.

2. Present Research Organization, Staffing & Action Plans

NCARTT has a Research Division with six sections engaged primarily in research activities plus some service functions, and an Extension Division with an information section as well as a small extension group. A third division is responsible for the six RASCs. There is a monitoring and evaluation unit attached to the Director's Office (often referred to as the socioeconomic section), that performs the only economic analysis in the organization. Also, there is an administrative division with several sections. The list of research and extension organizations follow with relevant notations.

SOIL/IRRIGATION SECTION: This is one of three sections which are addressing framework issues (issues which affect all crop and livestock enterprises) in Jordanian agriculture. It is the best staffed of the three in terms of trained manpower, with three PhDs and nine MScs. Additional researchers include one Diploma (post-BSc) and fourteen BSc holders. One PhD student and one MSc student are presently receiving training in the U.S. Hence, no technical assistance is planned for this section.

The 1989/90 Action Plan indicates strong concentration (approximately 75 percent of all activity) on fertilization experiments, both on stations and private farms. Nitrogen, phosphorus and trace minerals are studied in various combinations on wheat, barley, watermelon, tomato, olive, grape, apple and pistachio, with a small number of additional experiments on composting and use of organics including cow manure and olive cake. A single experiment is underway on soil erosion and conservation; one other experiment concerns leaching of salines through tile drains.

Three experiments look at drip irrigation effects on crop production and salt distribution in the soil, while others study effects of saline water/soil on vegetables, irrigation programming for peas and green peppers, and irrigation methods for establishing grape seedlings. Four experiments study soil water depletion from cropped versus fallow fields, while one looks at water supply augmentation through water harvesting. With six irrigation specialists holding MSc degrees now on staff, it is hoped that more attention will now be turned to management of Jordan's very scarce water resources, in order to maximize the efficiency of their use.

PLANT PROTECTION SECTION: Also addressing framework issues, this section deals with pests and diseases on all types of crops produced in Jordan. Staffing is relatively strong with eight MSc degrees (no PhD, but a highly experienced section head), plus one diploma and fourteen BSc holders. Additionally, six MSc and three Diploma students are in training at UOJ. An entomologist is currently being recruited by WSU to provide technical assistance over an 18-month period.

Insect pests receive the greatest attention, but categories treated include nematodes, bacteria, fungi/molds, viruses and weeds according to crops and local conditions. Most of the work is on pests of fruits (olive, apple, stone fruits, grape, banana) and vegetables (cucumber, squash, sweetmelon, onion, potato, pepper, bean), and weed control in wheat. Pests receiving particular attention because they threaten many commodities are white fly, codling moth, Mediterranean fruit fly, termite and powdery mildew.

MONITORING & EVALUATION UNIT: This third framework organization addresses social and economic issues affecting all agricultural enterprises in Jordan, and trains researchers in the crop and livestock production sections on Farming Systems Research methodologies, working with them on studies of production costs and on assessments of benefit/cost relationships developed in on-farm demonstrations of new technologies believed ready for adoption.

From Baqa and all RASCs, the section mounts a major Farm Management Development Project which gives direction to and promotes on-farm record keeping. Staffing of this key section is extremely weak. While headed by a well trained and experienced PhD, there are no staff at the MSc level, one Diploma and seven BSc holders, with the

latter categories relatively inexperienced. A WSU Farming Systems Research specialist has been with this section since February, 1987, and the incumbent is expected to remain through August, 1991.

FIELD CROPS SECTION: Staffing of this section is reasonably good. It is headed by a highly experienced Diploma holder, with staff consisting of one PhD, three MScs, two Diploma holders and seventeen BScs. Additionally, two PhD candidates are being trained abroad, while seven MScs and four Diploma students are receiving training at UOJ. WSU is presently appointing (already approved) an agronomist to provide 24 months of technical assistance to the work of the section. Major emphasis is given to rainfed production of wheat and barley; other crops receiving attention include lentil, chickpea, tobacco and sorghum, plus forages such as medics, vetch and latherus. Rotations of cereals with fallow or forage legumes are also being studied. Variety screening/breeding, yield trials and seed multiplication of the listed crops account for nearly 90 percent of the work of this section.

VEGETABLE CROPS SECTION: Staffing of this section is presently weak. The highly experienced head of the section (an MSc-holder) is apparently being transferred to another position in the MOA and may no longer be available. Other staff include one PhD, two MScs, one Diploma and eight BSc holders. Three MSc students are in training at UOJ. Additionally, the section is assisted by a returned FAO vegetable crop expert (Jordanian, PhD) working on a six month contract, and a WSU vegetable specialist through July, 1990, who will then be succeeded for a further period of eight months.

Approximately 60 percent of the activity of the section consists of comparative evaluation of varieties of many vegetables including tomato, cucumber, squash, muskmelon, cauliflower, cabbage, onion, garlic, potato, eggplant, pepper, sweetcorn, bean, pea, okra, artichoke, asparagus, fennel, and other new vegetable types as well as medical/aromatic plants and even sugarbeet. About 10 percent of the effort goes to seed production of okra, snake cucumber, garlic and onion, and the remaining 30 percent to cultural practices trials such as date of planting, plant spacing, training up of vines and hormone application.

FRUIT CROPS SECTION: This section is reasonably staffed, being headed by a PhD, with one other PhD, four MScs, one Diploma holder and six BScs. Additionally, four MSc students are being trained at UOJ. WSU is presently recruiting a fruit specialist to provide assistance to the section for an 18 month period. Approximately 50 percent of the activity consists of comparative evaluation of varieties of many types of fruit trees and vines, including apple, peach, olive, citrus, guava, fig, date, banana and grape. Another 25 percent is studying means of pruning and propagating the various fruits. Remaining studies are of several types, with one of the more interesting being a study of passion fruit tree performance in different climatic conditions.

RANGE/LIVESTOCK SECTION: The overall staffing of this new section is in need of additional professionals and additional training for its new, inexperienced recruits. It is headed by a well trained PhD with considerable experience. There are two MScs and three BScs, with no one now in training. Program development has been very strong, with 24-months of WSU technical assistance in range management, now to be followed up by 24-months of livestock production assistance, plus intermittent short term consultancies by the range management specialist. Activities are limited to work with sheep and goats, largely under two ADF-funded projects.

The first of these is a resource inventory of the eighteen GOJ range reserves. Because there is no overall plan for planting or grazing the reserves, the initial step is, in collaboration with the Forestry Department, MOA, which controls the reserves, to characterize each one separately (map and describe its resources). This process is underway on 6 of the 18 reserves, with information collected on natural vegetation, planted vegetation and soils.

The second project is characterization of sheep (and goat) production in Jordan. The major breed is the fat-tail "Awassi", used for meat, milk and wool. The three main activities are questionaires for nomadic herders (85 completed, more being done), year-round monitoring of 10 flocks (3 presently being monitored) and production measurement and economic evaluation of the utilization of crop residues for summer forage versus water conservation benefits from fallow. Other activities of this section have to do largely with establishment and comparison of several atriplex species in the reserves and on the open range.

EXTENSION/AGRICULTURAL INFORMATION DIVISION: This is the technology transfer section, responsible for informing farmers and livestock owners of beneficial technologies. Like the framework research sections, this section must deal with all of the different types of agricultural enterprises in the country. If this section is not successful in its mission, the results of research will languish on shelves and in file cabinets, unused and of benefit to no one.

Staffing of this section is weak when one considers the need for highly qualified "Subject Matter Specialists" who can forge effective linkages between the researchers and the extension agents working at the farm level or, in the absence of the latter, the farmers and livestock owners themselves. The JNADP called for training of about sixteen such specialists. It is hoped that this training will be implemented as soon as possible in order to establish a strong nucleus of technology transfer specialists who can effectively bridge the gap between research and the field.

The current head of extension is a highly trained and experienced PhD, while the head of agricultural information is also highly trained and experienced at the MSc level. The staff also includes one other PhD, four MScs, two Diplomas and 47 BScs. None are in training, and the UOJ has no suitable training program. WSU has provided an extension methodologies specialist for 24-months, and will provide an additional 30-months.

In the 1987/88 season, a total of 58 on-farm demonstrations were planned and carried out by the researchers of the field and vegetable crop sections. In the 1988/89 season, the extensionists participated in these activities, and the number of on-farm verification trials and demonstrations, now including also fruit crops, grew to a total of 333. Field days (on station) conducted by the crops sections with the aid of extension were 5 and 19, respectively in the two seasons.

Agricultural information is also conveyed to the farmers by open meetings, radio and TV programs, pamphlets and posters. The 1989/90 action plans call for 15 open meetings, 93 daily and 42 weekly radio programs, 12 TV shows, 27 pamphlets and 5 posters, plus one major agricultural exhibition and 13 field studies of extension techniques.

3. Problems

a. Institutional Structure and linkages

Among the "assumptions" in the PP logframe was the reorganization of the Ministry of Agriculture, abolishing the former Directorate of Research and Extension and creating NCARTT with "broader functions and jurisdiction" including establishment and direction of a group of RASCs to undertake local applied research, inter-institutional coordination, and provision of technical guidance to field technology transfer agents. NCARTT would be brought out of direct line MOA jurisdiction and given a degree of autonomy in order to pursue its functions.

A Condition Precedent to initial disbursement called for creation of an Agricultural Development Council (ADC) to serve as the governing board for NCARTT, specifically:

> Evidence that (1) an ADC or equivalent has been duly established as a high-level body having representation from the Ministry of Agriculture and various autonomous agencies and the private sector, (2) a secretariat has been formed and (3) a Secretary General has been appointed to implement decisions made by the Council.

NCARTT was to function under the ADC, with the director of NCARTT responsible operationally to the Minister of Agriculture through the Secretary General of the ADC. A covenant to the grant agreement provided that:

> . . . the Ministry of Agriculture, having established NCARTT as a separate entity within the MOA organization, will appoint a technically qualified, full-time Director to effectively interact with Project and donor agency expatriate staff and keep abreast of technological development in the field of agriculture. The Director shall be granted full authority to manage and administer the NCARTT, reporting directly to the Secretary General/Minister of Agriculture.

As a "semi-autonomous" body, NCARTT would "hopefully" be provided with a designated line item in the Ministry (or other GOJ) budget.

When it came to implementation, a number of changes took place which contradict the provisions of the PP. Instead of a separate Agricultural Development Council and a semi-autonomous NCARTT, the GOJ proposed, and the Mission agreed to, creation of a separate Directorate of Projects within the Ministry of Agriculture. This Directorate would be responsible for the JNADP (and, by extension, NCARTT) plus several other donor-assisted projects. A Steering Committee was set up to oversee and coordinate these projects, with the authority to approve contracts (donor-funded as well as GOJ). The membership of the Steering Committee was virtually the same as that originally proposed for the Agricultural Development Council.

A separate Board of Directors for NCARTT (with virtually the same composition as the Steering Committee) was authorized by the Prime Minister in May, 1988, with the overall responsibility for planning and overseeing ARTT activities. However, this NCARTT Board has met no more than three times to date, most recently in December, 1988.

Meanwhile, in early 1988 the GOJ established the above-mentioned Higher Council for Science and Technology with the right to establish research and technology transfer institutions. In May, 1988, the HCST formally designated NCARTT as one of the national institutions under its overall aegis. According to a fall, 1988 JNADP Working Paper, "The most recent communications confirm that the NCARTT comes under the overall umbrella of the HCST, yet remains a part of the MOA. These recent communications outline the following:

> NCARTT has the responsibility for planning and conducting ARTT in Jordan and coordinating that conducted by others. It will work closely with public and private sector organizations in Jordan and elsewhere to carry out activities to achieve its purpose. . . The HCST has the overall responsibility to establish research and technology policy in Jordan and reviews and approves ARTT policy suggested by the NCARTT Board."

The status of NCARTT is clearly not what was envisaged in the PP. NCARTT has operated under two Acting Directors; it has not been possible to identify and confirm a full Director. Also, there has been, to date, no separate line budget for NCARTT.

Instead of one governing/coordinating body there are two (the Projects Directorate Steering Committee and the NCARTT Board of Directors) plus, now, apparently, the HCST. Instead of a semi-autonomous NCARTT, NCARTT now exists under a Projects Directorate of the MOA, with no direct link to the Minister or Secretary General of the Ministry. The Acting Director of NCARTT is not on the Steering Committee, and has very limited authority to plan and implement the program of NCARTT.

The ambiguous status of NCARTT and the lack of real authority for the Director are undoubtedly reasons for the fact that the Directorship of NCARTT is still unfilled.

The NCARTT structure, including an active Board of Directors, should be able to:

- Integrate research and the effective transfer of agricultural technologies throughout the country;
- Coordinate all related efforts in the country and utilize all available public and private sector resources;
- Manage its own operations, including the authority to adopt and implement plans, rules and regulations, plan and administer a budget, and receive outside funding;
- Appoint a Director General with full powers to administer NCARTT under the Board's supervision; and
- Control NCARTT personnel, including assignments, transfers, appointments.

There are several options for realizing these operational objectives. However, it will be impossible to get on with the real task of developing a sustainable research and technology transfer institution as long as these ambiguities regarding status, governance and responsibilities persist.

In terms of inter-institutional collaboration, the original logframe had among its outputs, "improved institutional coordination and priority analysis". The revised logframe specifies, ". . linkages established between organizations involved in agricultural research and technology transfer." The primary means planned for accomplishing this was through the NCARTT Board of Directors (originally the ADC) which, as noted, above, has not been active.

A memorandum of understanding dealing with NCARTT/FOA collaboration was prepared and approved by the UOJ, but has not been finally endorsed by NCARTT and the MOA. Some collaboration between the two institutions has been taking place under the ADF component of the project. Four of the approved proposals do have joint NCARTT/FOA teams. However, this has been the effective limit of inter-institutional coordination under the project.

b. NCARTT Internal Organization and Procedures

The internal organization and functions of NCARTT continue to largely reflect a carry-over from the pre-JNADP days rather than the commodity approach to program planning and implementation proposed in the PP, or the FSR approach subsequently endorsed by the Implementation Start-Up Workshop. While there have been some joint workshops and interdisciplinary FSR activities, most work still proceeds as in the pre-project days. Effective intra-institutional collaboration and communication is limited. The result is the existence of two parallel efforts, one based on the JNADP and the other on the traditional functions and research program of the MOA; i.e., long-term breeding trials and variety testing, or services such as seed multiplication and soil testing.

This "parallel structure" is apparent in reviewing some of the proposals submitted for the ADF, which tend to reflect straightforward, traditional discipline orientation; e.g., with cereals virology work being undertaken by the plant protection section without reference to field crop priorities and programs, or indication that these have been considered. Such work is necessary and can be valuable, but only if related to broader programs and priorities and with an eye to ultimate use.

c. Commodities

The commodity situation also poses a problem for NCARTT. As mentioned in IV.B above, a contract was negotiated for procurement services with a private firm separate from the primary TA contract with CID/WSU. The major part of the project commodities are now on hand. However, procurement of commodities was not (and because of U.S. and Jordanian administrative complications probably could not have been) satisfactorily coordinated with the construction of the facilities in which most commodities are to be installed and used. These, as noted above, won't be completed until mid or late 1990 at the earliest.

Some portion of the commodities ordered--estimated at 10 percent or more--has not yet been received. NCARTT has been unable to get any information on these commodities from the procurement firm, and efforts are underway in the Mission and CID/WSU to ascertain the status of this portion of the order. A second problem relates to warranties which, for many commodities, will have expired by the time they are put into use. Finally, there will, unless the PACD is extended, be a fairly limited time for TA personnel to work with Jordanian NCARTT staff using the new equipment.

While the separate contract for procurement apparently facilitated commodity procurement and receipt, the premature and uncoordinated arrival of much of the commodities is more of a disadvantage than an advantage, since provision must now be made to protect the equipment until it can be installed. Further, several officers of NCARTT who

will be responsible for operating the equipment complain that no arrangements have been made for obtaining needed advice and assistance from the manufacturers on installation and start-up procedures. Combining the technical assistance and procurement service contracts might have helped avoid this problem. However, since an important reason for pushing ahead with commodity procurement was pressure from AID/W to reduce the project pipeline, this condition might have arisen in any event.

Without going into a detailed assessment of the specific commodities ordered, the evaluation team questions certain aspects of the commodity procurement rationale and process. The PP points out that, "Given the small agricultural land base, Jordan cannot afford or justify a large investment in primary (basic) research." The team would add that Jordan similarly cannot afford overly sophisticated and duplicative facilities. The staffing, maintenance and recurrent cost implications for NCARTT of these facilities will be significant.

Similarly, operating and maintaining the fleet of vehicles (65) procured for NCARTT could pose another problem. The PP itself didn't specify the total number of vehicles contemplated. Annex 3 of the PP (the "Boyd Post Report") cites a figure of 10 vehicles for each RASC plus, presumably, a somewhat larger number for the NCARTT central offices and labs at Baqa. However, there is no indication of an assessment at any point of the likely recurrent cost implications of the vehicle fleet finally procured.

B. Agricultural Development Fund

A review of the project documents for the twenty research/technical transfer projects being funded by the ADF indicate that all are in compliance with the specified requirements for ADF funding. Moreover, a number appear to represent at least partial adoption of the farming system research mode, which represents a major departure from the traditional mode. Eleven specify collaborative implementation by a multi-disciplinary team. In two additional cases, a collaborative approach is indicated by the implementation procedures although the list of participants does not specify multi-disciplinary participation. Eleven of the projects included on-farm trials or demonstrations for testing or verifying experimental plot results.

However, only two projects include economists on the implementation team, even though economic analysis is an essential element of farming systems research. At least four project proposals specify that an economic analysis will be made, but listed no economists as collaborators. Even if economic assistance is sought for the analysis stage, as suggested by some concerned staff, conclusions

relating to economic viability would be questionable if an economist does not participate in planning and implementation. The shortfall in documented plans for these four projects should have been identified and corrected in the review process.

Three of the projects do not exhibit any of the features that characterize farming systems research. However, these traditional, single discipline-oriented projects hold promise of providing information on new technologies which can be tested and verified by other staff in a coordinated, systematic research program. This traditional, discipline-oriented type of research probably will and should continue. However, this type of development points up the need for reorganizing and reorienting the research program of NCARTT to insure the integration of such projects into the total research program and assure economic viability and compatability with other elements of established farming systems before being recommended for farmer adoption.

All of the projects being funded by the ADF would probably be classified in the "general purpose" category of activities; none clearly fall in the "specific" category for which 34 percent of the funds are earmarked. A proposal has been developed which embraces both a pilot land consolidation and a loan guarantee phase that would fall in the specific purpose category eligible for financing out of the earmarked funds. However, this proposal, first submitted in January 1989, has not yet emerged from the approval process. The funding requirement is estimated at JD 228,360--substantially beyond currently available ADF funds. Even if approved and funded, the delay in initiation occasioned by the delay in approval will make it impossible to complete the project before the existing PACD.

VI. Progress Toward Goal and Purpose Achievement

A. National Production Impact

The goal of the project--To increase food production and rural incomes in the highlands of Jordan--is, needless to say, an appropriate one. However, the relationship between the project and the "Objectively Verifiable Indicators" is weak in that the project could be successful in establishing a national research and extension organization to organize and carry out excellent trials and demonstrations, and yet be accompanied by a decrease in Jordanian agricultural production due to factors beyond the control of the project--e.g., rainfall (the major determinant of wheat, barley and forage production), exchange rates, prices of outputs and inputs, availability of labor, and numerous other factors. On the other hand, the project could fail to accomplish any of the above tasks while agricultural outputs and incomes could increase due to beneficial outside factors.

It is not reasonable to judge the project by standards over which it has little control. Further, if the relatively short time period of the project is also considered, statistically verifying the impact of the project on Jordanian production of cereals, pulses, tree crops, and livestock is virtually impossible.

There are indicators, however, which are related to the project and can be determined. For example, one of the project's objectives is to increase wheat and barley production through the adoption of improved practices. One of the practices is the use of chisel or duckfoot (sweep) plows instead of a disc or moldboard plow. Hence, an increase in the ratio of chisel/duckfoot plows to disc/moldboard plows would indicate that the new practice is being adopted. Sales data could also provide the same indicator. Since there is a much smaller number of custom equipment operators than farmers, gathering such information would be relatively simple.

Other indicators of the adoption of the new wheat and barley practices would be increased sales of improved seed, increased sales of herbicides for weed control (these should be different from herbicides for other crops), or an increase in the area under clean fallow. The means of verification would be surveys of custom equipment operators, farm inputs sales organizations and farmers.

The original project purpose is to "Stimulate greater agricultural production through applied research, improved extension methodologies and various activities to enhance institutional capabilities." Just as in the Jordan Valley, where a changed macroeconomic environment stimulated farmers to greater production and the adoption of yield-enhancing technology, the highlands could be stimulated to greater production with or without the project.

Objectively verifiable indicators could be the number of research and extension funding grants made under the Agricultural Development Fund (ADF), the number of technology packages approved for extension activity, higher yields when adjusted for rainfall (difficult to do with a limited time series).

B. Other Measures of Progress

Measures of progress relative to the project purpose cited in the revised logframe include:

- increased productivity/profitability per dunum in selected areas/systems;
- increased median income of farmers in target areas/systems; and
- increased farmer demand for and involvement in ARTT.

"Selected areas/systems" would be those in which the FSR work is being undertaken.

These are reasonable and appropriate indicators that should also be possible to monitor if systematically approached. Initial survey work relative to these indicators apparently has been undertaken; however, results are not yet available.

These indicators do not address thenselves well to the livestock/rangeland element of the project. The Livestock/Rangeland/Agroforestry section of NCARTT is conducting an intensive survey of social and cultural practices of migratory herders, which should provide a basis for assessing project progress in this sub-sector.

VII. OTHER ISSUES

A. Institutional Sustainability

Current thinking on the subject of institutional sustainability views institutions as productive systems; sustainability is a dynamic process of transforming inputs into valued outputs while continually adapting to changes in the institutional, political and economic environment. Some recent research and analysis by AID on this subject suggests that sustainability is highly dependent on:

1. The existence of a policy environment supportive of the institutional objectives and methodologies;
2. The maintenance of external support; and
3. The ability of the management system to balance short-term performance and longer-term capacity building and adaptation.

The maintenance of external support is largely contingent on the ability of a system to produce outputs sufficiently valued that sufficient inputs are provided to continue production.

The policy environment for NCARTT can be regarded as generally favorable. The Government of Jordan's current Five Year Plan is supportive of agricultural development and agricultural research. Both the MOA and the HCST agree on the importance of a broad, coordinated research and technology transfer effort in agriculture. The only significant questions at this time concern the GOJ position on "autonomous" bodies and their institutional connections, with recent pronouncements seeming to restrict the scope for creation of such bodies, and the willingness of the MOA to give up a degree of its existing direct control over NCARTT.

The extent of external support for NCARTT is less clear. It is too early in NCARTT's existence and the application of new approaches for research and technology transfer (the ADF, and use of FSR) to expect much overt support from farmers or other client groups directly involved in agricultural production--among them the Jordan Cooperative Organization and the Agricultural Credit Corporation; NCARTT is simply not yet to the point of providing "services" in the sense of technically and economically sound recommendations to farmers. It is still totally dependent on the MOA and MOP for its budget, and this has apparently been cut (at least in 1989) from the level of support called for in the PP and Project Agreement. Because it has not yet established itself as a sufficiently viable and valuable institution, it is not in a position to secure financial support from other sources.

NCARTT's internal management is not yet systematized. Its status, in terms of degree of autonomy, will have much to do with its ability to attract, retain and develop staff (from top management on down). Meanwhile, it is attempting to develop internal systems of operation; however, long range planning is a questionable exercise at this time given the overriding questions regarding its role and status.

The conclusion must be that the current prospects for the sustainability of NCARTT as a distinct institution are dubious. Unless organizational and management conditions are changed, NCARTT will effectively continue as simply a research and extension arm of the Ministry of Agriculture.

B. Economic Analysis

The economic analysis conducted for the determination of the EIRR for the project was the standard approach employed in most AID projects; i.e., an optimistic set of assumptions was employed to justify a project already decided upon, yielding a satisfactory EIRR. However, running the basic data as used in the PP under less optimistic assumptions still yields an acceptable EIRR. (See Attachment 2 for a more detailed discussion of the economic analysis.)

The changed economic situation in the country and consequent changes in the agricultural factor-product prices and relative crop returns could result in an appreciably different result if the EIRR were completely updated. However, neither the data nor the time permitted such a full economic re-evaluation.

C. Documentation Inconsistencies & Inadequacies

Current project documentation is deficient. This is probably the result of numerous, relatively minor changes that individually do not warrant amending project documentation. The cumulative result, however, is project documentation that does not reflect the current realities of the situation in Jordan or the current direction of the project. Two examples stand out.

The recently signed contract amendment between USAID and CID (August 30, 1989) does not reflect the changes that have been taking place in the actual implementation of the project; references are made in the contract amendment to the ADC which does not exist and to the SCRAD method of establishing research priorities which is not being used. Further, no mention is made of the expanded scope of the project; i.e., including work in the Jordan Valley. This seems to be the result of instructions given to the Contracting Officer in the PIO/T; i.e., the PIO/T only specified the changes in the Level of Effort without providing a rationale or mentioning any of the other changes that had occurred in the project. (Both USAID/Amman and the Washington State University team voiced concern over not having the opportunity to review the contract amendment before it was signed.)

The report of the Project Implementation Start-Up Workshop (HADP Publication no. 3) indicates that the TA team and NCARTT officials modified the logframe of the project to more nearly fit the actual project activities within the existing institutional and economic environment of the country. NCARTT and the TA team appear to be

working under this new logframe. However, USAID/Amman has not officially documented this change; there is a question, therefore, as to which logframe is the operable one. As pointed out above, the differences between the two logframes are not great and may, in fact, lead to improved output targeting and monitoring. However, any such changes should be documented as having the agreement of all parties.

The above two examples, in and of themselves, do not indicate significant failures within the project. They do, however, seem to indicate deficiencies in communication and coordination between and among the various participants of the project. The Evaluation Team does not believe that the project has suffered significantly as a result of these deficiencies. However, the potential for major problems is present and, unless corrected, could cause the project to be less effective and productive.

D. Marketing Linkages

Throughout this evaluation, the team has identified a need for more economic analysis as a part of the overall research effort to determine the "profitability" of the recommendations. Clearly, "profitability" depends as much on the ability of the farmer to receive adequate prices for the output as it does to produce efficiently. As the Jordanian economy grows, it is logical to expect that the market will become increasingly discriminating on the type and quality of commodities demanded; i.e., higher quality will command higher prices and vice versa. This price/quality relationship is particularly true for the export market.

Marketing does not begin when the commodity is harvested; rather, it begins in the planning for a production year. For example, the choice of the time of planting is a partly a marketing decision, as planting time determines when the commodity can be sold. Similarly, the choice of variety planted is also a marketing decision, as some varieties command a higher price in some markets. The use of a particular pesticide may preclude the commodity from being sold in a particular market. There are many other examples of what may appear to be simple production decisions which, in fact, have major marketing implications. The point is that there is a significant information flow from the markets (domestic and export) that must be facilitated among all parties involved in agricultural production if the economically "correct" decisions are to be made.

Throughout the discussions with individuals in NCARTT and the RASCs, little, if any, mention was made of agricultural marketing research, and only passing comments were made concerning the necessary "linkages" between production and marketing. The PP mentioned marketing as an important aspect of the agricultural sector; however, only a limited amount of TA was devoted specifically to marketing (24 p/m for agribusiness TA) and this was oriented primarily toward supply of production inputs.

At present, the marketing research and extension activities are centered in the Agricultural Marketing Organization (AMO), supported by the USAID Agricultural Marketing Development Project. The production research and extension activities of NCARTT and marketing research activities of AMO need to be coordinated; a start in this direction has been made by the formation of a joint NCARTT/AMO task force to work on the marketing of green beans, with the intention of developing a pilot arrangement which can be adopted to the marketing of other commodities. The evaluation team believes that coordination might be further strengthened by adding a representative of AMO to the NCARTT Board of Directors and vice versa. The two USAID-funded projects should be in a position to facilitate this interaction.

E. Beneficiaries

Potential project beneficiaries have changed with the broadened scope of the project and the change in commodity emphases. It is essential to document this change in terms of beneficiary profiles and likely impact. Some baseline survey work has apparently been initiated, but results are not yet available. (See Attachment C for further discussion of this issue.)

ATTACHMENT A: Persons Contacted

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Mr. Don Masters, (former) Projects Officer, USAID/Amman

USAID MISSION

Dr. Randall Cummings, ARDO
Mr. Fuad Qushair, Agricultural Officer

MINISTRY OF AGRICULTURE, GOJ

Dr. Bassam Saket, Minister of Agriculture
Dr. Sami Sunna, Secretary-General
Mr. Osama Belbeisi, Director, Department of Projects

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Mr. Harold Kerr, Extension Methodologies Specialist

NATIONAL CENTER for AGRICULTURAL RESEARCH & TECHNOLOGY TRANSFER

Dr. Yousef Rushdi, Acting Director & Director, Division of Research
Mr. Nabiel Katkhuda, Deputy Director & Dir., Division of Centers & Stations
Dr. Jalil Gammoh, Director, Division of Extension
Mr. Ahmad Abu Ali, Head, Agricultural Information Section
Mr. Naji Hadaddin, Head Soils/Irrigation Section
Mr. Khaled Massanet, Head, Plant Protection Section
Dr. Abdul Fateh El-Kadi, Head, Monitoring/Evaluation Section
Mr. Ali Massadeh, Head, Field Crops Section
Dr. Abdullatif Kamal, Consultant, Vegetable Crops Section
Mr. Ali Abu-Zuraiq, Fruit Crops Section
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Dr. Mahmoud Duwayri, Professor; Former Dean
Dr. Ayed Al-Wir, Professor

JORDAN COOPERATIVE ORGANIZATION (JCO)

Mr. Moraiwid Tell, Director-General

AGRICULTURAL CREDIT CORPORATION

Mr. Mansur Bin Tareef, Director-General

AGRICULTURAL MARKETING DEVELOPMENT PROJECT

Dr. Kelly Harrison, Chief of Party

JNADP AUDIT TEAM (Regional Auditor-General's Office, Nairobi)

Mr. Ken Reager, RIG/A/N
Mr. Jack Aki, RIG/A/N

ATTACHMENT B: Changes in Macroeconomic Situation

The GOJ budget deficit has increased sharply over the past four years, from 10 percent in 1985 to 20 percent in 1986 and 18 percent in 1987 and 1988 (see Table 1). During this period, salaries and wages in the budget continued to rise and reached JD 151.2 million from a level of JD 112.8 million in 1985. Other operational costs, however, remained around the same level, fluctuating from JD 49.8 million to JD 54.5 million.

Table 1: Jordanian Government budget, budget deficit and ratio of deficit to GDP and GNP; 1985-1988

Year	Actual Budget in Million JD			Deficit in	Percent of:	
	Recurrent	Capital	Total	Million JD	GDP	GNP
1985	542.5	263.2	805.7	87.6	5.5	4.7
1986	570.5	410.8	981.3	242.4	14.8	12.6
1987	602.7	363.2	965.9	211.4	12.5	11.3
1988	661.1	384.6	1045.7	227.3	13.4	12.2

One of the more important sources of FX in the Jordanian economy is the remittance income of Joranians working abroad, mainly in the Gulf States. Remittances decreased sharply in 1987 from their 1986 level and continued to decline in 1988. The value of these remittances during the period 1985-1988 was as follows:

	1985	1986	1987	1988
in Million JD	402.9	414.5	317.7	335.7
in million US $	1007.3	1202.1	953.1	906.4

(Source: Central Bank Annual Report 1988)

Data for remittances in 1989 are not published, but indications for the first half of the year shows a level which was much lower than 1987. There were also some indications that remittances have increased since June 1989.

Several economic developments have effected the exchange rate of the JD against all major foriegn currencies including the US dollar. The exchange rate of the JD took a sharp decrease in value against the US dollar starting mid-1988.

Table 2: Exchange Rate, 1985-1989

	Average				December	August	October
	1985	1986	1987	1988	1988	1989	1989
US$/JD	2.5	2.9	3.0	2.7	1.85	1.35	1.45

In October 1988, the Central Bank decided to float the exchange rate of the JD to reduce the widening gap between its actual exchage rate in the free market and the rate declared by the Central Bank. In the later months of 1988, the JD lost 20.8 percent of its value against the US dollar. This drop against the US dollar continued, with wide fluctuations, throughout the early months of 1989. Beginning in June, 1989, the Central Bank took steps to reduce the fluctuations in the exchange rate with the intention of holding it to approximately $1.50 per JD. Furthermore, the Central Bank apparently plans to maintain this 1.5 exchange rate for 1990 and perhaps through 1991.

The impact of these developments on JNADP is varied. The local currency component of JNADP, for example, will be losing almost 50 percent of its value in the purchase of most materials and equipment imported from industrial countries. Furthermore, the JD component will lose anywhere between 15 to 40 percent of its value in the purchase of materials and services that are available in local markets. These commodities and services include fuel, maintenance, seeds, fertilizers, pesticides, office materials and laboratory material.

One implication of these developments for the JNADP is that the local currency requirements for project operations will increase. Such a need may not be met if JNADP has to continue to compete with the normal operational funds that will be made available to the Ministry of Agriculture.

Prices of imported agricultural inputs have risen sharply in 1989. The prices of agricultural output have also increased. The total picture of relative increase in inputs and outputs is not clear as yet. However, this aspect must monitored carefully to determine the impact of rising prices of inputs on the rate of utilization of present technologies and the adoption of new ones.

Prices guaranteed to farmers by the Government for cereals and legumes have increased over the last few seasons. The picture for 1987-1990 seasons is given in Table 3.

Table 3: Changes in price index of cereals and legumes as guaranteed by the GOJ for the seasons 1987-1990 (1987=100)

Crop/Season	1987	1988	1989	1990
Wheat	100	100	110	117
Barley	100	100	110	133
Lentils	100	100	110	167
Chickpeas	100	100	110	147

Source: Ministry of Agriculture.

ATTACHMENT C: Tables

Table (T-1): Workshops and Seminars Implemented Under the JNADP up to October 1989.

Type of activity and duration	Month,Year	Objective
1. Strategic planning workshop (3 days)	Dec. 1986	To improve capacity of strategic planning of research and technology transfer
2. Implementation start up workshop (4 days)	1987	Review of JNADP project and its implementation.
3. Program review and planning workshop (4 days)	1987	To identify major cropping systems in Jordan
4. Management skills seminar (information systems) two (44-47 days each)	1987,1988	To improve capacity of participants in the general administration and management of institutions.
5. Research Management Workshop (3 days)	Nov. 1988	To improve capacity of participants in planning and formulation of research activities.
6. Subject matter workshops pruning trees, preparation of on farm trials (2-5 days)	1987	To acquaint NCARTT staff with procedures for on-farm trials.
7. Management training workshop; three (5-6 days)	1988	To improve capacity of middle managers in management concepts and procedures.
8. Computer training workshop (18 days)	?	To upgrade participants' skills in use of personal computers
9. Technology transfer workshops: two (18-24 days)	1988	To acquaint extension agents with importance of clientele involvement--"Training the Trainers"
10. Subject matter workshops: response farming (1); safe pesticide use (4) (1 to 2 days)	1988	To acquaint participants with safe methods of pesticide use and introduce them to concepts of response farming.

Table T-1 (Cont.)

11. Regional Workshops on soil test calibration/ FAO/ARDA/UOJ/NCARTT (6 days)	Sept.1988	To upgrade NCARTT soils analysis capability
12. Subject matter workshops: pruning of almonds (3, one day each)	Jan-Feb 1989	To acquaint participants in three regions on methods of almond pruning.
13. Communication workshops (6 workshops each for 3 days)	April-June	To acquaint heads of RASCs and heads of sections in NCARTT and RASCs in effective communication skills and methods. Workshops were held in each RASC & NCARTT Headquarters in Baqa.
14. Farming system research and extension workshops (20 days)	Aug.1989	To introduce NCARTT personnel to concepts and procedures of farming system research and extension as well as to the formulation of research and extension workplans.
15. Plant protection seminar (3 days) (with UOJ)	Oct.1989	To upgrade NCARTT staff plant protection skills.

Total number of workshops = 33, total number of participants = 1330

Table T-2: Summary of degree or certificate trainees and their number distribution by field of study, place of enrollment, level of trainees and date of completion (through September 1989)

A: Distribution by field of study and place of enrollment.

Degree or Certificate	Total number	Enrolled at: WSU	UOJ	Distribution by field of study: Soils	Plant Prod.	Plant Protect.	Agric. Econ.	Animal Prod.
PhD	2	2	-	1	1	-	-	-
MSc	21	1	20	1	11	5	3	1
Diploma	10	-	10	-	6	2	1	1
	33	3	30	2	18	7	4	2

B. Distribution by completion or expected date of graduation.

	Completed 1989	Expected date of completion after June of: 1990	1991	1992	Total
PhD	-	-	-	2	2
MSc	1	12	8	-	21
Diploma	1	6	3	-	10

Plant Production: includes field crops, vegetables and fruits.
Plant Protection: includes plant pathology and entomology

Source: Summary of progress on JNADP 1987--October 1989, submitted by Dr. Gordon Rodewald and Dr. Yousef Rushdi in October 1989.

Table C-1: Type and area of facilities as proposed in the PP and being constructed in the five locations. (All areas are in square meters--m2)

Type of facility	Area proposed in the PP (in m2) for:			Actual area under construction in m2:		
	NCARTT	Each RASC	Total	NCARTT	Each RASC	Total
- Main Building	1850	1140x4	6410	10008	1213x4	14860
- Farm Buildings	780	780x4	3900	-	545x4	2180
- Vehicle cover	480	360x4	1920	-	-	-
- Storage	135	135x4	675	-	265x4	1060
- Staff housing	200	390x4	1760	-	292x4	1168
- Workers' housing*	-	-	-	-	100x8	800

* Four houses are under construction in each of Rabba and Shubak.

Source: USAID Jordan Project Paper number 278-0264 and the construction contract documents of JNADP.

Table C-2: Schedule of facilities of NCARTT headquarters building and RASC main buildings

A. NCARTT Headquarters (location: Baqa)

Major discipline or unit	Laboratory and work room complex Number	Subdisciplines	Number of staff offices
1. Plant Protection	7	Mycology and bacteriology, Nematology, Entomology, Weeds, Insert toxicolgy	15
2. Tissue culture	1	Plant tissue culture	2
3. Soil and Irrigation	9	Salinity and chemistry, Fertility and texture, Physical properties and irrigation, Soil micro-biology and mincrology, Sampling and preparation, Central analytical facilities (2), Computer	17
4. Horticulture (Vegetables)	5	General vegetable, seeds post harvest, cold Storage	13
5. Horticulture (Fruits)	5	Deciduous, evergreen, general fruits, post harvest, cold rooms	10
6. Field Crops	5	Cereals, legumes and in-dustrial crops, seeds, forages, post harvest	22
7. Livestock/Range and Agroforesty	3	Animal general, animal nutrition, forages and foresty	7
8. Other unspecified			12
9. Administration		Auditorium, conference Hall, small meeting room(2), library, meeting hall, typing, photo copying, files computer, stores.	8

Total number of laboratories = 35. Each laboratory has additional preparation room while many have adjacent storage space. Total number of offices= 106.

Table C-2 (continued)

B. RASC Main Buildings (locations: Ramtha, Mushagar, Rabba, and Shubak)

Facilities described below are for each RASC.

Type of facility	Number	Main usage
1. Laboratories	5	Chemistry and soils, General diagnostic, Seed, Fruit and Vegetables, for research and services.
2. Offices	10	To house researchers, agricultural service officers, demonstration coordinator and manager of RASC's.
3. Auditorium	1	To hold about 100 persons.
4. Meeting room	1	To hold about 30 persons
5. Library	1	To house reference materials and books.
6. Offices of support staff	3	

Source: Plans of construction of JNADP physical facilities and contract agreement for consulting services for the design and supervision of construction.

Table C-3: Facilities Construction Starting and Expected Completion Dates and Cost of each in JD

Location of facilities	Construction implementation dates* Starting	Expected completion	Cost in JD
NCARTT main building (Baqa)	6 March 1989	24 February 1991	1,604,449.5
Ramtha RASC	29 April 1989	21 October 1990	426,712.7
Mushagar RASC	18 March 1989	9 September 1990	376,493.0
Rabba RASC	3 April 1989	24 October 1990	513,100.8
Shubak RASC	12 April 1989	12 October 1990	569,391.0
	Total construction cost		3,490,147.0
	Plus cost of design and supervision		199,990.0
	Grand Total		3,690,133.0

* Expected date of competion of construction as envisaged in the PP:
NCARTT main building, October 1987
RASC facilities, October 1988

Source: USAID Jordan JNADP Project Paper (278-0264) and documents of the construction contracts of JNADP.

Table C-4: Land area, existing facilities, elevation, type of farming, local rainfall, and location of experiment stations that have been allocated for NCARTT/JNADP by the Ministry of Agriculture.

	Name	Location	Elevation (meters)	Rainfall mm/year	Type of farming	Area in Dunums	Existing facilities
1.	Ramtha*	North	+520	273	Rainfed	2200	Offices, stores, housing
2.	Marriw	North	+650	370	Rainfed	950	Offices, stores, housing
3.	Khaldiyah	North	+580	-	Irrigated	2300	Offices, stores, housing
4.	DeirAlla-Jordan Valley	Middle	-224	269	Irrigated	886	Offices, laboratories, stores, meeting hall, housing
5.	Yabis-Jordan Valley	North	-200	280+	Irrigated	200	Offices and stores
6.	Karameh-Jordan Valley	South	-	-	Irrigated	120	Offices, stores, housing
7.	Mushagar*	Middle	+780	305	Irrigated	1200	Offices & stores
8.	Rabba*	Middle South	+920	335	Rainfed	570	Offices & stores
9.	Ghwair	South	+980	250	Rainfed	500	Offices & stores
10.	Shubak*	Far South	+1365	350	Rainfed	1212	Offices & stores

* New physical facilities are being constructed in these four locations.

Source: Rushdi, Yousif (Director/NCARTT): Progress report of JNADP submitted to the Minister of Agriculture September 1989.

Table C-5: Summary of numbers and types of facilities to be available by 1991 to NCARTT and RASCs in existing buildings and those under construction.

Location	Laboratories	Offices	Library	Seminar meeting Rooms	Meeting Halls	Stores	Total Gross area (m2)
- Baqa: existing building--NCARTT	13	24	1	1	-	yes	2970
- Baqa: New Olive Building	4	6	-	-	-	yes	600
- Baqa: New NCARTT Headquarters	35	106	1	2	2	yes	10008
- Deir Alla: Existing Buildings Allocated to Research	9	18	1	1	1	yes	1820
- RASCs: total in the four new main buildings	20	52	4	4	4	yes	4852
Total	81	206	7	8	7		20250

Source: Plans and design contracts of each building.

TABLE S-1: Distribution of research and core extension staff in NCARTT and Deir Alla, 1986/87

Discipline	Distribution by level of Qualification					
	PhD	MSC	Diploma	BSc	Total	Percent
Field Crops (Cereals & Legumes	-	4	-	19	23	23
Vegetables	3	4	-	10	17	17
Fruits	1	3	1	7	12	12
Soil and Irrigation	4	7	-	10	21	21
Plant Protection	1	6	2	12	21	21
Extension (core staff)	1	3	-	-	4	4
Agri. Economics	-	-	-	1	1	1
TOTAL	10	27	3	59	99	
PERCENTAGE	10	27	3	59	100	

Deir Alla Technical Staff in 1986/87	= 36
NCARTT Technical Staff	= 63
TOTAL	99
Administrative staff	= 49

Source: Annual Reports of Deir Alla, 1986/1987, NCARTT 1985/1986

TABLE S-2 Distribution of NCARTT and RASC staff (BSc and above) by discipline and level of qualification in October 1989. (Staff include those on board and trainees inside and outside Jordan.)

Disciplinary Work	Distribution by Qualification					
	PhD	MSc	Diploma	BSc	Trainee	Total
Field Crops	1	6	2	21	5	35
Vegetables	3	5	1	9	6	24
Fruit Trees	1	5	1	6	6	19
Plant Protection	1	12	4	13	6	36
Soils	3	4	2	12	1	22
Irrigation	-	6	-	-	1	7
Economics (Planning & Monitoring)	1	-	2	10	4	16
Livestock/Range	1	2	-	3	3	9
Research staff total	11	40	11	74	32	168
% distribution	7	24	7	44	19	100
Extension (Core & regional)	2	2	1	79	-	84
Computer Technology	-	-	-	3	-	3
GRAND TOTAL	13	42	12	156*	32	255
PERCENTAGE	5.1	16.5	4.7	61.1	12.5	100

Source: Management Information System.

* This column includes 77 in research and 79 extension.

TABLE S-3 Distribution of research and extension staff of NCARTT and RASCs by location and qualification, October 1989

	Distribution by qualification					
Location	Phd	MSc	Diploma	BSc	Total	Percent
NCARTT	12	24	5	26	67	30.0
Deir Alla	-	10	4	20	34	15.3
Ramtha	-	4	1	29	34	15.3
Khaldieh	1	1	1	19	22	10.0
Mushaqar	-	1	1	32	34	15.3
Rabba	-	1	-	22	23	10.0
Shubak	-	1	-	8	9	4.0
TOTAL	13	42	12	156	223	100
Percent	6	19	5	70	100	-
TOTAL NCARTT	12	24	5	26	67	
TOTAL RASCs	1	18	7	130	156	

NOTE: All Extension agents included here have BSc degree.

SOURCE: NCARTT Management Information System

Attachment D: Discussion of the Economic Analysis

While AID Handbook 3 requires an economic analysis for all new projects, it does not require the calculation of an EIRR or a B/C ratio in the same way that is required to use those tools for selection among competing projects. Originally, an EIRR or B/C ratio was used to select among competing projects; however, over time such exercises have become virtually a "mandatory" component to a PP but without the "selection" value--development of a PP normally indicates that the "selection" has already taken place. If this is true, the calculation of an EIRR is of far less importance than the range of assumptions that could yield an "acceptable" EIRR; i.e., the determination of the minimum set of assumptions necessary for the project to have an EIRR equal to or above long run cost of capital. The latter approach could be called a synthetic or simulated analysis.

Clearly, before a project is initiated, there is no alternative to making assumptions in the conduct of an economic analysis about how the project will perform or what economic conditions will prevail during the life of the project. The basic assumptions used in the economic analysis for this project were as follows:

- static production pattern (no switching among crops);
- constant real prices for all commodities;
- marketing channels sufficient to handle any additional output;
- 60 percent of the technological packages will be adopted (farmers will not necessarily adopt the total package and there will be a "yield gap" between what is possible on research activities and what is possible on the farmers field);
- 15 percent discount rate for the cost of capital;
- maximum acceptance rate of up to 85 percent (85 percent of the area then devoted to the various commodities will have new technical packages applied);
- six year lag before the research component of the project will become effective;
- research will increase yields by 20 percent over the presently available technological packages;
- Extension activities account for 66 percent of the cost of the project and research 34 percent; and
- Only wheat, barley, lentils, chickpeas, hay (forage) and fruit production will be affected by the project (implicit in the farm budgets used).

Using these assumptions, the EIRR was estimated to be 24 percent; 28 percent for the production component (extension) and 19 percent for the research component.1/

A "synthetic" analysis of the data presented in Annex C of the PP, changing one assumption for each iteration, leaving all other assumptions as given in the PP and accepting the 15 percent cost of capital still resulted in an EIRR of 15 percent or higher for each iteration. The specific changes tested were as follows:

1. The maximum area under the new practices is reduced by 40 percent from the assumed increase--i.e., extension effectiveness is less than that assumed;
2. Farm production costs increase by 50 percent (the possible effect of devaluation);
3. Prices of farm commodities decrease by 15 percent;
4. Research investment has no effect on yields--i.e., the use of "off-the-shelf" technology could "carry" the project;
5. Research has no effect on yields and the extension effect is reduced by 15 percent (less area using the new technologies).

In other words, a number of these changes would have to come into effect together to seriously shake the economic viability of the project given the initial data set.

Under present (i.e., November 1989) conditions, new assumptions would be needed. Specifically, the cropping pattern within Jordan is changing as a result of the economic situation; wheat and barley area is decreasing and more area is being used for fruits and vegetables. Because the profitability under present conditions is larger for fruits and vegetables, the EIRR would be higher than indicated in the PP if the project could take credit for the change. However, much, if not most, of the "extension" support for fruit and vegetable production in Jordan has come from the private sector--equipment dealers and other farmers. Considerable additional work would be required to determine the financial and economic rates of return to the new cropping patterns, and the extent to which these changes may be attributable to the project--a task that was beyond the scope of this evaluation.

1. The analysis presented in the PP has some computational and/or typographical errors. When these errors are corrected, to the extent possible given the data in the analysis, the overall project EIRR is 21 percent. The major error was the use of financial prices for wheat and barley to estimate the benefit from the new technology. The analyst makes it clear in the text of the PP that the economic prices are the correct prices to be used.

Attachment E: Beneficiaries:

The Social Analysis of the PP stated that it was not possible to identify a simple, unified population for this project. The subsequent expansion of the scope of the project to include the Jordan Valley and upland irrigated agriculture has further expanded this diversity. Even if this population was identified as farmers and herders in a very strict sense, the benefits of the project will not accrue to that group only, but will "spill over" to many other groups. For example, if cereals farmers adopt part the technology being advocated (mechanized tillage, spraying for weed control, fertilizer), the farmers may benefit from increased yields, the custom equipment operators will benefit from tilling more area, the equipment dealers from selling more machines or spare parts, the herders from more fodder from the straw, fertilizer dealers from more sales, etc. The same type of statement could be made for vegetable or fruit farmers.

In spite of the statement that it was not possible to identify a specific target group, the Social Analysis did identify several groups that may deserve attention beyond that normally given in conventional agricultural development projects: small scale farmers, those producing at home for direct consumption, herders, and women.

The Social Analysis went into some detail on the role of women in the agricultural sector of Jordan; this included the recommendation to involve women in the research and technology transfer activities of the project. The evaluation team noted a significant number of women professionals within the NCARTT and RASC system (some 17 percent of the total professional staff) working as full members of the teams. While this will not necessarily insure that all of the concerns raised in Social Analysis will be met, it is an encouraging sign.

There are few, if any, projects or programs that result in all parties gaining and none losing; this is the nature of change. It is necessary, however, to monitor developments and conduct special studies periodically to determine the effect of the project (and economic development, in general) on the groups identified above in order to mitigate any extreme or highly discriminatory negative effects.

The change in project emphasis away from rainfed cereals raises a series of additional questions regarding, e.g., women's roles in commercial fruit and vegetable production, identification of which farmers are getting into irrigated upland fruit and vegetable production, how this is affecting the labor market and the very poor, landless rural residents. If serious adverse effects are being observed, special programs may need to be developed to help alleviate some of the problems. However, these ameliorative

measures do not necessarily have to consist of special steps to maintain them in a basically unsustainable agricultural production mode--some of the programs may need to be outside of agriculture, per se (and therefore, outside the specific scope of this project).

The PP called for a baseline study to be conducted in order to establish a point of departure for the project. A unified baseline study was not conducted, as it was believed that the agricultural situation in Jordan was too diverse to capture within one major baseline study. Instead the project chose to initiate numerous small studies in the areas surrounding project activities (e.g., wheat production field demonstrations). Results of these studies were not available at the time of the evaluation; however, it is understood that these more limited studies focused primarily on economic questions and not on the possible effects of the project on the wider community (i.e., women issues, landless laborers, etc.).

It is essential for USAID and NCARTT to maintain a concerted monitoring effort, including the expansion of the studies in the "project areas" to include extra-economic variables, and to begin analyzing and releasing the results of these studies.