NEAR EAST EVALUATION ABSTRACT

PROJECT TITLE(S) AND NUMBER(S)	MISSION/AID/W OFFICE
Water Management Technology (278-0192) ISN 44616	USAID/Jordan

PROJECT DESCRIPTION To upgrade agricultural productivity in the Jordan Valley by systematically raising the efficiency of water utilization, the project provided the GOJ with U.S. technical assistance, training and commodities and was originally designed to complement a prior AID sprinkler equipment loan project.

AUTHORIZATION DATE AND U.S. LOP FUNDING AMOUNT	PES NUMBER	PES DATE	PES TYPE Project Completion Report
FY 77 $1.320 Million	PCR 85-3	2/9/86	☐ Regular ☒ Other (Specify)

ABSTRACT PREPARED BY, DATE	ABSTRACT CLEARED BY, DATE	
Nancy C. Hardy Evaluation Officer 2/9/86	PRM:RBrown PO :FQushair PO :TRishof PO :WFurtick	DD :RJohnson DIR:GGower

☐ Special
☐ Terminal

Water Management Technology (WMT) was designed to provide technical assistance, training and equipment to complement AID loan 278-K-018, Sprinkler Equipment project. The training and research components of the WMT project were tailored primarily to facilitate the introduction of sprinkler irrigation into the Jordan Valley. This Project Completion Report was prepared to: 1) assess progress and overall impact of project activities, 2) provide a record of problems faced and lessons learned, and 3) make recommendations for future programming, design and implementation of similar activities.

During the early stages of project implementation, external factors to the project such as the lack of a working agreement among key GOJ institutions involved in agriculture development in the Valley (the Jordan Valley Authority (JVA), the Ministry of Agriculture and the University of Jordan's Faculty of Agriculture); drought resulting in inadequate water supply; and the unexpectedly high farmer adoption rate of drip over sprinkler irrigation technology inhibited the introduction of sprinklers as planned. A project evaluation conducted in May 1981, recommended project termination and deobligation of remaining funds. These recommendations were never carried out; instead, USAID and the GOJ agreed, in order to attempt to achieve the project purpose, to extend the project and provide additional training to Jordan Valley Authority staff, and equipment and spare parts to assist the Authority in solving some of the irrigation and drainage problems in the Valley. The additional training and agreed-upon commodities were provided by December 31, 1984, the final Project Assistance Completion Date. Outputs of the project since the 1981 evaluation include trained JVA staff in irrigation techniques and system management, computerization of JVA's administrative and irrigation operations, and improved reliability of the Valley irrigation system through JVA's use of the project-financed excavator and trencher. Although Water Management Technology did not achieve its prime objective, i.e. to facilitate the introduction of sprinkler irrigation into the Jordan Valley, the technical assistance, training, and commodities provided under the Project did make a positive impact on increasing the efficiency of water utilization in the Valley, primarily by improving the JVA's institutional capability to manage the Valley's irrigation system.

The most important lessons learned from the Water Management Technology project are:

1. Sufficient research should have been carried out prior to the design and implementation of this project. Results from research in such areas

as adoption of sprinkler irrigation techniques versus other methods in Jordan would have undoubtedly changed the design of this project and/or increased the chances of project success.

2. Bringing institutions together to collaborate in project implementation is a difficult task and excessive optimism in the level of expected collaboration may not be warranted. Unless host country institutions are seriously committed to a project and are willing to commit the required level of resources and co-ordination, the success of a project which depends upon institutional collaboration will be limited.

UNITED STATES GOVERNMENT

memorandum

DATE: 12/31/85

REPLY TO ATTN OF: Fuad Qushair, PO

SUBJECT: Project Completion Report on Water Management Technology Project No. 278-0192

TO: See Distribution List

A meeting of the Project Committee for the above project was held at the conference room on Monday December 30, 1985, to review subject PCR. The meeting which started at 10 a.m. lasted for about one hour and was attended by the following members of the committee:

DRobertson - Regional Legal Advisor
WFurtick - Agricultural Development Officer
Nancy Hardy - USAID Evaluation Officer
Bishara Dabbas - Accountant, USAID Controllers Office
Fuad Qushair - Project Officer

Fuad Qushair opened the meeting by providing a summary of the history of the project which had terminated December 31, 1984. He highlighted project accomplishments, shortcomings, problems encountered during implementation, inputs and outputs, lessons learned and recommendations. The project officer indicated that the tomato activity using an improved package of technology carried out under the project and the training of JVA staff were among the significant accomplishments of the project. He also gave the reasons which were responsible for the non-achievement of the main thrust of the project, i.e. the introduction of sprinklers. These ranged from weather conditions (drought) to lack of collaboration/involvement of the three concerned agencies and to the accelerated and widespread adoption by farmers of drip in preference to sprinkler irrigation. He expressed the view that the Water Management Technology project should have preceded the AID Sprinkler Equipment Loan Project since the main thrust of the WMT project was the introduction of sprinklers.

Committee members did not raise any major issues concerning the PCR and generally felt that it was adequate. Nancy Hardy, Evaluation Officer, who had been absent on leave and did not have sufficient time to review the PCR, indicated she would review the document and make any comments and recommendations on it. Following this, the Project Officer, will prepare a revised draft incorporating any changes and submit to the Evaluation Officer for SRC review. In the meantime, if any committee member has second thoughts about the PCR and wish to make any suggestions, please send them to me.

Clearance:
RLA : DRobertson
PO : WFurtick (Draft)
EO : NHardy
CONT: BDabbas
PO : FQushair

Drafted by:FQushair:rs
Document name:fqldec31

OPTIONAL FORM NO. 10
(REV. 1-80)
GSA FPMR (41 CFR) 101-11.6
5010-114

☆U.S. GOVERNMENT PRINTING OFFICE : 1982 0 - 361-526 (7290)

CLASSIFICATION

PROJECT EVALUATION SUMMARY (PES) — PART I

Report Control Symbol U-447

1. PROJECT TITLE	2. PROJECT NUMBER	3. MISSION/AID/W OFFICE
WATER MANAGEMENT TECHNOLOGY	278-0192	USAID/JORDAN

4. EVALUATION NUMBER (Enter the number maintained by the reporting unit e.g., Country or AID/W Administrative Code, Fiscal Year, Serial No. beginning with No. 1 each FY) PCR 85 -3

PROJECT COMPLETION REPORT

☐ REGULAR EVALUATION ☐ SPECIAL EVALUATION

5. KEY PROJECT IMPLEMENTATION DATES			6. ESTIMATED PROJECT FUNDING	7. PERIOD COVERED BY EVALUATION
A. First PRO-AG or Equivalent FY 77	B. Final Obligation Expected FY 81	C. Final Input Delivery FY 85	A. Total $ 2,650.1 B. U.S. $ 1,320.0	From (month/yr.) Jan 1, 1982 To (month/yr.) Dec 31, 1984 Date of Evaluation Review Nov 30, 1985

8. ACTION DECISIONS APPROVED BY MISSION OR AID/W OFFICE DIRECTOR

A. List decisions and/or unresolved issues; cite those items needing further study. (NOTE: Mission decisions which anticipate AID/W or regional office action should specify type of document, e.g., airgram, SPAR, PIO, which will present detailed request.)	B. NAME OF OFFICER RESPONSIBLE FOR ACTION	C. DATE ACTION TO BE COMPLETED
Project Completion Report (PCR). No follow-on projects of a similar nature are planned or anticipated.	F. QUSHAIR USAID/ JORDAN	12/85

9. INVENTORY OF DOCUMENTS TO BE REVISED PER ABOVE DECISIONS

- ☐ Project Paper
- ☐ Financial Plan
- ☐ Logical Framework
- ☐ Project Agreement
- ☐ Implementation Plan e.g., CPI Network
- ☐ PIO/T
- ☐ PIO/C
- ☐ PIO/P
- ☐ Other (Specify) _____
- ☐ Other (Specify) _____

10. ALTERNATIVE DECISIONS ON FUTURE OF PROJECT

- A. ☐ Continue Project Without Change
- B. ☐ Change Project Design and/or ☐ Change Implementation Plan
- C. ☐ Discontinue Project

11. PROJECT OFFICER AND HOST COUNTRY OR OTHER RANKING PARTICIPANTS AS APPROPRIATE (Names and Titles)

Fuad Qushair, USAID Program Specialist (AGR)
William Furtick, USAID Agricultural Development Officer
David Schroder, USAID Agricultural Economist

12. Mission/AID/W Office Director Approval

Signature: Gerald F. Gower

Typed Name: Gerald F. Gower

Date: 20 February 1986

AID 1330-15 (3-78)

13. Summary and Background Statement

The Grant Agreement for the Water Management Technology (WMT) project was executed in September of 1977. This project was designed to provide technical assistance, training and equipment related to irrigation operations, and tied in to AID Loan No. 278-K-018, Sprinkler Equipment Project. The main thrust of this project, as planned, was to facilitate the introduction of sprinkler irrigation into the Jordan Valley. Both the training and research components were targeted to this objective.

The contractor, Frederiksen, Kamine & Associates (FKA), for the WMT Project was selected in August of 1978 and a host country contract executed by the Jordan Valley Authority (JVA). Contract personnel were scheduled to arrive in Jordan in September 1978 but because delays were experienced in contracting, the advisors arrived in Jordan in February of 1979.

Implementation was to be undertaken jointly by the JVA, the Ministry of Agriculture (MOA) and the University of Jordan Faculty of Agriculture (FOA). While the overall impact of some project activities has been positive, the achievement of the project's main purpose and outputs has been minimal. This was mainly due to the near absence of institutional involvement of the MOA and the FOA and to other external factors including problems encountered in the distribution and utilization of AID-financed sprinklers in the Jordan Valley which are discussed in more detail below.

The first formal evaluation No. FY81-3 dated May 31, 1981 recommended termination of the Project. The recommendation for termination was largely based on the fact that there was to be no further input by the contractor, (FKA), and a determination that there was not sufficient time to redirect project activities. Following that evaluation, extensive discussions and negotiations between USAID and the Government of Jordan took place following which it was agreed that the project be extended to provide additional training for JVA staff and equipment and spare parts to assist JVA in solving some of the irrigation and drainage problems faced in the Jordan Valley. The project was extended and the additional training and the agreed upon commodities were provided. Final PACD for this project was December 31, 1984.

14. Methodology in Preparing Project Completion Report (PCR)

This Project Completion Report builds and draws upon the first formal evaluation and several USAID Mission in-house project reviews carried out during the life of the project. The PCR has been prepared by the Project Officer who has been associated with this project since its inception. It is based on monitoring by the Project Officer and other USAID personnel during project implementation and after termination on Dec. 31, 1984, the project assistance completion date (PACD).

The primary purposes of this report are to:

(a) assess progress and overall impact of project activities,

(b) provide a record of problems faced and lessons learned from the Project, and

(c) make recommendations for future programming, design and implementation of similar activities.

The host country officials who have been directly responsible for the implementation of the project have contributed to the PCR by providing certain useful data and information.

15. External Factors

As stated in the previous evaluation, external factors have had a major impact on project activities and were principally responsible for the very limited achievement of the project's prime purpose, i.e. the introduction of sprinklers. These factors can be summarized as follows:

(A) An effective, formalized working agreement was never reached among the Jordan Valley Authority, the agency which had prime responsibility for the project and the other two institutions, the Ministry of Agriculture and the Faculty of Agriculture (University of Jordan), which were to carry out project implementation. All three institutions participated in the project design and had generally agreed to accept responsibility for implementation.

The JVA attempted to pursue the project training objectives through informal arrangements with the Ministry of Agriculture and more than 2,000 farmers had been trained in the mechanics of sprinkler irrigation in the early stage of project implementation. However, with the appointment of a new Minister of Agriculture in late 1978 this arrangement broke down and the Ministry of Agriculture personnel were in effect drawn from the project.

On the research side, the Faculty of Agriculture (FOA) designed research projects to address the research areas identified in the Project Paper. Some of the projects were initiated in anticipation of an agreement between the Faculty and JVA. However, because the working agreement was not reached, the FOA project research was discontinued.

(B) A major external factor was the weather which prevailed during the crop years 1977/78 and 1978/79 when Jordan suffered from an extended drought. As a result of the drought, there was insufficient water available for regular delivery through the pressurized system which had at that time been newly completed in the Valley. Therefore, sprinklers could not be used. Training farmers in the use of sprinklers when there was no water to operate made little sense.

(C) Another major external factor was the unexpectedly accelerated rate at which farmers adopted drip irrigation both in and outside the Jordan Valley in preference to sprinklers. This was the result of demonstrated benefits of drip irrigation, at least in the short run. Private sector firms were very aggressive and active in introducing drip irrigation under greenhouses, tunnels and open fields often in combination with plastic mulch. Drip irrigation is now the predominant advanced irrigation technique being used. It is estimated that over 50,000 dunums were under drip irrigation in 1984/85, or approximately 20 percent the total area under irrigation in the Jordan Valley. The area under sprinkler irrigation is estimated at only 1,500 dunums.

16. Inputs

The project inputs as planned in the Project Paper's log frame consisted of:
(1) Jordanian: Personnel (research and extension), land, facilities, and equipment for research and training activities.
(2) US: Personnel, resident and TDY, and equipment to supplement Jordanian resources in research and training. Participant training to upgrade Jordanian staff capabilities.

The project provided for two long-term advisors; a chief of party who served as the project research advisor and was to have served a 36 month tour in Jordan. The extension/training advisor was funded for 18 months. The candidate selected for the research slot, Dr. George Marlowe, would only agree to a 24 month contract. As Dr. Marlowe was highly qualified, the JVA and USAID jointly agreed to settle for a 24 month contract.

The extension/training advisor, Mr. Duane Lindgren, completed his tour in July 1980. Dr. Marlowe completed his tour in January 1981 and since then no US technical assistance under this project was provided. The FKA contract expired in November 1981.

As indicated in the PES FY81/3, there were serious problems associated with inputs particularly those expected of the Jordanian side. Substantial Jordanian input of research and extension personnel was envisioned which did not come about for the reasons discussed under external factors above. Although the JVA made a serious and sincere effort to supply both research and extension personnel, it was realized that without the direct involvement of the Ministry of Agriculture in extension and the Faculty of Agriculture in research, achievement of project targets would be very limited.

The overall project expenditures were as follows:

Contract Services	$444,597
Participant training	$ 69,104
Commodities	$806,299
Total	$1,320,000

Since the last evaluation, the US inputs consisted of training of JVA staff in the United States and commodities and related training to help improve the reliability and increase the efficiency of JVA's irrigation system. U.S. inputs provided since May 1981 at a value of $635,000 were:

(A) Training in US

Six JVA engineers attended training courses in Utah and Colorado during 1982 and 1983. These courses ranged from four to six weeks in duration and dealt with the following topics:

1. Irrigation Scheduling
2. On-Farm Water Management
3. Irrigation Problems and Practices
4. Soil Testing
5. Irrigation Projects
6. Operation and Management of Irrigation Districts

The JVA has indicated that all the above courses were of great use and benefit to the participants who, through the training received, have significantly enhanced their capabilities and skills. All the returned six participants are still working with JVA in their respective fields of engineering.

(B) Commodities

1. Computers and related training

Two digital PDP 11/03 computer systems were installed and have been in use since June 1983 by JVA Irrigation Department in Amman and in the Jordan Valley. The two computer systems are being used in ordinary office work in the Irrigation Department and in solving some design excercises. This has been the first time computer systems were either purchased or used by JVA for this purpose. This step was the beginning of JVA's efforts towards computerization of all of its administrative and irrigation operations.

Nine JVA engineers attended a one-week training course which was offered by National Computer Systems Co. (NCS) following the installation and commissioning of these computer systems.

2. Drainage Equipment

A trencher and an excavator were procured to assist JVA's Drainage Division to more effectively carry out its vital role in the development and rehabilitation of the Jordan Valley. The problems of salinity and high water table in irrigation areas are being treated by open and sub-surface drainage

systems. The project-financed trencher and excavator proved extremely useful in dealing with the drainage problem in the Jordan Valley. Through Oct. 1985, the trencher's performance was 10,000 meters for sub-surface drainage, while the excavator was used in clearing existing open drains and in excavating 7,850 meters of new drains.

3. Irrigation Equipment Spare Parts and Related Training

Valves, control systems and spare parts were financed by the project. These have been of great value to the irrigation systems in the Jordan Valley and in improving and increasing the efficiency of irrigation operations, particularly in the 18 km extension of the East Ghor Main Canal Project and in the Zarqa Triangle Irrigation Project- two areas in which AID formerly invested.

The supplier of the irrigation equipment spare parts (Claval of California) provided related technical services and training. Mr. Brooks Wyles, International Sales Manager of Claval and a professional engineer presented many seminars on design, application and services of control valves in water projects. He adjusted some valves of existing irrigation projects and made professional recommendations following his observations and sit visits to the various pumping stations in the Jordan Valley (Wadi Arab pumping station and Zimalyeh pumping station). Nineteen JVA engineers and technicians attended the seminars presented by Mr. Wyles in Amman and in the Jordan Valley. One JVA engineer and one technician also attended a training course at the Claval factory and facilities in New Port Beach, California.

17. Outputs

The last PES No. FY81-3 of May 1981 listed project planned outputs and those actually achieved. It also provided a discussion of the reasons for the limited project achievement as of that date which were covered under the above sections of this PCR. Since May 1981, and as indicated under the inputs fairly significant outputs were realized, although all of these were not originally envisioned in the PP. These include:

(A) Training of JVA engineers in various irrigation disciplines and in the mechanics of sprinkler irrigation equipment.

(B) The computerization of JVA's administrative and irrigation operations and related training provided to JVA's staff.

(C) Improving the reliability and increasing the efficiency of the irrigation system and reducing the problems stemming from salinity and high water table in the Jordan Valley.

18. Purpose

The stated purpose of this project is "to upgrade agricultural productivity in the Jordan Valley by systematically raising the efficiency of water utilization " While the above outputs have had a positive impact on the project purpose, a prime project objective, i.e., the introduction of sprinklers, was only partially achieved and could well be a far fetched target.

Assessment of Progress

It is the judgement of the Project Officer that the outputs referred to under 17 above, have had a positive impact on the project purpose. This is particularly true in so far as: (1) water use efficiency which permitted the expansion of the area irrigated four fold or more by using drip irrigation

method and (2) tomato yields obtained from farms adopting new technology which more than doubled. Improvement in tomato yields was not directly related to improved water management but to adoption of complete package of improved technology. However, as stated earlier in this report, a prime project objective, i.e., the inproduction of sprinklers, has not been achieved and could well be unattainable in the foreseable future. This belief shared by various individuals in both the public and private sectors is further corroborated by the low rate of adoption of the sprinkler irrigation method as well as the slow progress made in the sale of sprinkler equipment under AID loan No. 278-K-018 for $4.5 million made in 1977. The value of sprinkler equipment sold under the AID loan through 1984 amounted only JD 297,802 ($804,870) and, through 1985, is not expected to significantly increase. At the time of project development, it was considered that almost universal adoption of sprinkler irrigation was not only desirable but practical and would be rapidly accepted. This did not come true.

19. Goal

The stated project goal is to "to support the GOJ's sector goals of increasing agriculture yields and production, improving farmer's welfare through increased incomes and increasing foreign exchange earnings."

While both individual farmer yields and overall production in the Jordan Valley have increased substantially during the project period (see tables 1 and 2 and chart attached to this report), it is not possible to attribute such increases to project activities. The heavy investment by the public sector in infrastructure projects which included pressurized irrigation facilities

suitable for both sprinkler and drip irrigation, marketing facilities, schools, hospitals and clinics, housing, roads and the installation of power grid as well as by the private sector which capitalized on such investment has been the principal contributor to the gains and achievements made in the Jordan Valley.

20. Beneficiaries

The principal direct beneficiaries of this project were:

(A) More than 2000 farmers who participated in the sprinkler irrigation activity and received training in the mechanics of sprinklers. However, according to data provided by Jordan's Agricultural Credit Corporation no more than 460 farmers purchased sprinkler systems to date.

(B) The Jordanian employees of JVA who worked and received training under the Water Management Technology Project. These employees benefited both from learning a new technology and effective means of extending this technology as well as acquiring skills which enhanced their capabilities in different fields. Particular mention should be made of the four agriculturists who underwent a specially tailored program administered by the University of Florida to meet the need of the "tomato activity" that proved to be highly successful and of six other engineers who attended short-term irrigation training courses in the U.S. in 1982 and 1983. Training was also provided to a significant member of JVA engineers in using computers installed at JVA's Irrigation Department and those who attended seminars in the design, application and service of control valves in water projects.

21. Unplanned Effects

Since a sound Water Management Training Program did not materialize because of the absence of a concerted effort by the three institutions which were to implement the project in a collaborative fashion, an adaptive research and demonstration program was developed and implemented. The program was based on the most limited factors for tomatoes (a crop representing 40 per cent of the agriculture income from the Jordan Valley) and was implemented by the Jordan Valley Authority/Water Management Technology personnel and coordinated with the Ministry of Agriculture and the Faculty of Agriculture, whenever possible. Water management was the pivotal activity for all program elements. An established technology from the United States which provides high water use efficiency was tested, demonstrated and transferred in the various areas of the Jordan Valley. Technology was, however, adapted more readily to drip rather than sprinkler irrigation.

About 300 farmers participated in the pilot tomato growing demonstration activities carried out in the early stage of project implementation. It is estimated that at least 1,500 additional tomato growers throughout the Valley have since adopted the package of practices demonstrated on the fields of the 300 farmers, indicating the multiplier effect of the pilot demonstration activity. The new technology increased yield and quality of tomatoes two to three fold as compared with conventional practices. There is little doubt that the tomato activity has changed farmers' outlook toward yield potential, more effective use of fertilizer and water, and reduced labor due to the proper use of mulch and irrigation.

22. Lessons Learned

(A) The Water Management Technology Project (a Grant technical assistance project) tied in and was closely related to a $4.5 million (originally $8 million) 1976 AID sprinkler equipment loan project in as much as the main thrust, not achieved, was the introduction of sprinkler irrigation. In retrospect - and hindsight - the technical assistance project (WMT) should have preceded the Loan project and sufficient research carried out to provide the basis for the type of irrigation and the sprinkler equipment Loan. The following excerpt on Jordan Valley farmers acceptance of sprinkler irrigation taken from a report entitled Water Management Technology, sprinkler irrigation (Jordan) prepared in February 1977 by Dr. Jack Keller, is reproduced below. The views expressed almost 9 years ago by the author of the report proved to be true.

Farmers Acceptance of Sprinkler Irrigation

Several farmers were apprehensive about sprinkler irrigation. Their main concern was with sprinkler tomatoes, cucumbers, and squash. They said they feared sprinkling would result in fungus and disease problems and cracking to tomato skins. The basis for these worries, stemmed from the fact that when there were unusually heavy rains, these problems arose.

Prof. Max Jensen (then with the Faculty of Agriculture) and this writer (Dr. Jack Keller) both understand and share this concern. There is a lack of tested and detailed viable packages for the crops

under sprinkle irrigation in the Valley, and at this writing (February 1977) it appears risky to push sprinkling without providing the farmers with very explicit and reliable information on how to handle their three most important crops, tomatoes, cucumbers and squash. In fact, if for these JVC (now JVA) should advise the farmers to hold off sprinkling them.

On the other hand, there is agreement that the root, forage, grain, citrus, and most other vegetable crops (with the exception of eggplant) will produce very well under sprinkle irrigation with no unexpected difficulties.

(B) Bringing institutions to collaborate in the implementation of projects is a difficult task and excessive optimism in the level of expected collaboration may not be warranted. Unless institutions are seriously committed to a project and its objectives and unless the required level of resources and coordinating effort are provided, coupled with follow through, the success of a project which depends upon institutional collaboration will be limited. This project's limited achievement is largely attributed to inadequate or near absence of institutional involvement and collaboration. As stated in the previous evaluation PES No. FY81-3, the requirement that a formal agreement, satisfactory to AID, appeared in the project agreement as a Condition Precedent (CP) to disbursement of project funds. When it became evident that such an agreement could not be consummated as anticipated during project design and as farmers were to begin purchasing sprinkler systems to irrigate their 1978 fall crops and needed training in the use of sprinklers, AID agreed to amend the Grant Agreement and reduce this CP to a covenant. The Agreement was so amended in June 1978, but the covenant was not met.

(C) Only the first GOJ Project Director was assigned to the project on a full time basis. Projects of this nature require a full time director supported by adequate staff and resources.

23. Remarks and Recommendations

(a) The collaboration of the three institutions (MOA, JVA and FOA) which did not come about under the Water Management Technology Project as envisioned will have a better chance of being attained under the auspices of the recently created semi-autonomous National Center for Agricultural Research and Technology (NCARTT).

The NCARTT will be under the supervision of a steering committee formed by the Prime Minister which consists of high level officials of the agencies and institutions concerned with agriculture. NCARTT will be headquatered in Amman and will, initially, have five satelite regional offices for research and technology transfer in the predominently rainfed highlands. It is planned that at some later date the MOA Deir Alla Research Station which serves irrigated agriculture in the Jordan Valley will be attached to NCARTT.

Given the Steering Committee's composition of officials of all the concerned agencies in one body and its mandate should make it the logical forum and proper mechanism for coordinating and supervising research and technology transfer for both irrigated and rainfed agriculture.

NCARTT will, at the appropriate time, be able to deal more effectively with the kind of problems which contributed to the non-achievement of the principal objective of the WMT Project.

(B) USAID and JVA should continue tapping the resources provided under the centrally-funded Water Management Synthesis II Project, which has the key objective of providing services in irrigated regions of the world for improving water management practices in the design and operation of existing and future irrigation projects and giving guidance to USAID for selecting and implementing development options and investment strategies. Technical assistance from this project has been well-utilized by the JVA, and the Authority wishes to continue using this mechanism for improving the Valley irrigation system.

(C) In order to maintain the agricultural gains made in the Jordan Valley and with the expected increase in production resulting from expansion of the irrigated area and improved technology being developed and used, continued efforts should be made to address the problem of marketing fruits and vegetables.

Table [illegible]

PRODUCTION AND ACREAGE ESTIMATES FOR

SELECTED VEGETABLES IN JORDAN VALLEY

1977 and 1982

Crop	1977 Production (Metric tons)	1977 Area (dunums)	1982 Production Metric Tons)	1982 Area Dunums	% Change in Area
Tomato	66,290	66,936	154,210	75,259	13
Eggplant	23,365	20,710	42,001	24,186	17
Potato	11,697	10,440	2,353	1,411	(86)
Cucumber	6,027	6,178	48,130	22,036	353
Squash	25,398	22,674	29,341	22,457	1

Source: Department of Statistics Agricultural Sample Surveys

Table Two

Estimated Yield Increases for Selected Vegetables

In Jordan Valley

1977-1982

Crop	1977 kg/du	1978 kg/du	% increase in yield
Tomato	990	2,049	107
Eggplant	1,128	1,737	54
Potato	1,124	1,668	48
Cucumber	976	2,184	123
Squash	1,120	1,307	17

Source: Department of Statistics Agricultural Sample Surveys
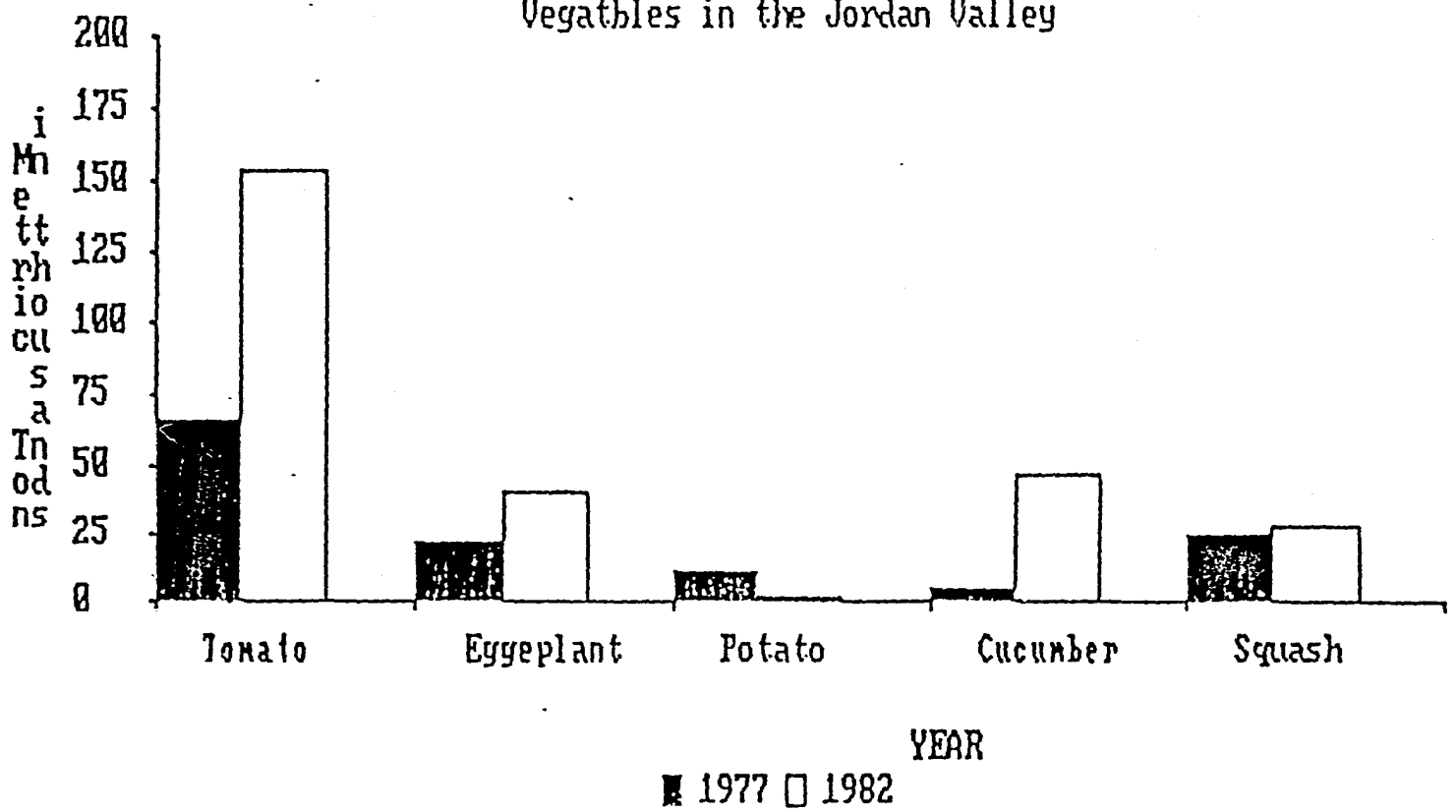
FIGURE 1
Production Changes for Selected
Vegathles in the Jordan Valley