SDSU

Middle East & Mediterranean Desert Development Program

Improving the Efficiency of Water Use in Arid Land Agriculture

Project Coordinator & Extension Expert Meeting Accomplishments

Holiday Inn Hotel
Amman, Jordan
August 17-18, 1999

Funded by
United States Agency for International Development
Grant Number LAG-G-00-98-00035-00

Administered by
The Fred J Hansen Institute for World Peace
San Diego State University Foundation

In cooperation with
The Peres Center for Peace
International Arid Lands Consortium

September 10, 1999

Overview of Meeting Accomplishments

The meeting began with welcome remarks by Dr Bonnie Stewart followed by an official welcome from the Jordanian hosts, Dr Said Alloush – President of the Royal Scientific Society and Dr Abdel Nabi Fardous – Director General of NCARTT Brief introductions of all participants followed Mr Hushen provided an overview of the Hansen Institute for Peace Activities in the region

The Jordan television and newspaper covered the opening session of the meeting Interviews with Dr Azzam Tubaileh and Dr Stewart were aired on the Jordanian evening news An article appeared in the *Jordanian Times English* newspaper on August 19th summarizing the meeting, as well as the program goals and accomplishments

Dr Don Slack moderated the technical meeting The agenda was presented and modifications made in the meeting goals

The meeting was broken into two groups to work on the following

- ***Best Management Practices (BMPs)*** review of the BMPs prepared by Jordan and the PNA and the identification of the remaining BMPs needed by each participating country The country coordinators agreed to prepare the BMPs / facts sheets and send them to Dr Stewart by email by September 15, 1999
- ***Extension Dissemination Framework*** development a framework for sharing information generated from project supported activities in Phase II

Each group presented the results of their group meetings at the conclusion of the meeting on day one

The second day, Dr Ted Sammis presented his irrigation scheduling game model as an example of teaching approaches for irrigation management He also provided information on the use of the internet for dissemination of both research and extension materials on irrigation management

The meeting concluded at 10 30 am and the group left for a field visit to the Jordan Valley and the Dead Sea

Visits were made to the following

- Deir Alla Research Center of the Jordan Valley Association
- Private farm with green houses growing soil-less culture vegetables
- Observations of drip irrigation systems
- Visit to the Dead Sea

****

Attached to this meeting accomplishment report are copies of the following A) meeting agenda B) summary list of participants C) contact list of participants D) minutes of the meeting E) a list of BMP topics F) extension framework and organizational chart G) examples of BMPs prepared by Jordan and the PNA H) Jordanian Times newspaper article on the Middle East and Mediterranean Desert Development Program - August 19 1999

ATTACHMENTS

A

Meeting Agenda

Middle East & Mediterranean Desert Development Program

Country Coordinator's Meeting - Draft Agenda
Amman, Jordan
August 16-19, 1999

Monday
August 16, 1999

Arrival – Participants	Holiday Inn Hotel Al Madonna Street	Phone 962-6-552-8822 Fax 962-6-552-9944
Hotel Reception	Meeting Materials	

Tuesday
August 17, 1999

Objectives Finalize a collection of best management practices for project related crops using water efficient methods, to develop information exchange mechanisms for facilitating the dissemination of information across the region

7 30 – 8 30 a m **Informal Meeting**

8 30 – 9 30 a m **Opening Remarks**

Dr Said Alloush, President
Royal Scientific Society
Higher Council on Science and Technology, Jordan

Introduction of Participants

Egypt	Dr Ayman Abou-Hadid
Israel	Dr Dov Pasternak
Jordan	Dr Abdul Nabi Fardous
Morocco	Dr Abdel Hafid Debbarh
Palestinian Authority	Dr Azzam Tubaileh

9 30 – 10 30 a m **Overview**

Hansen Institute for World Peace
Middle East & Mediterranean Desert Development
Work Plans Overview
Meeting Objectives

10 30 – 11 00 a m **Break**

Country Coordinator's Meeting Agenda – *continued*

11 00 – 1 00 p m	**Session One Development of Extension Materials for Project Related *Research & Application*** - *Dr Don Slack, University of Arizona* **Overview** • Best Management Practices (BMP) Example • Template Example • Review of Extension Materials from participants with discussion/illustration of how to incorporate into BMP's • "Break-out " working groups for discussion / development of BMP's for assigned cropping systems
1 00 – 2 30 p m	**Lunch**
2 30 - 6 00 p m	**Session One Development of Extension Materials for Project Related Research & Application – *continued*** • BMP working group wrap-up • Presentation and discussion of working group results • Next steps?
6 30 – 9 00 p m	**Dinner**

Wednesday
August 18, 1999

7 30 – 8 30 a m	**Informal Meeting**
8 30 – 10 00 a m	**Session Two Development of Information Exchange Mechanism** - *Dr Ted Sammis, New Mexico State University* • Introduction to irrigation decision making (The "Irrigation Game") • Requirements for data/information needed to manage irrigated farming systems – some example formats • Production Functions (Water, Salinity and Nitrogen)& data requirements • Dissemination Approaches • Published, Internet, CD Roms • Examples
10 00 – 10 30 a m	**Concluding Remarks**

11 00 a m	**Depart Hotel for Jordan Valley, Deir Alla Research Station**
5 00 p m	**Return to hotel**
6 30 – 9 00 p m	**Wrap-up Dinner**

Thursday
August 19, 1999

DEPARTURES

B

Summary List of Meeting Participants

Country Coordinator's Participant List
August 17-18, 1999 Meeting
Amman, Jordan

Middle East Participant Participant	Title and Position
Egypt	
Dr Ayman Farid Abou Hadid	Director Central Laboratory for Agricultural Climate (CLAC)
Dr Mahmoud Medany	Extension Specialist Central Laboratory for Agricultural Climate (CLAC)
Israel	
Dr Dov Pasternak	Head, The Institute for Agriculture & Applied Biology- Ben Gurion University
Mr Moshe Goren	Director General, Ministry of Agriculture and Rural Development Extension Service
Jordan	
Dr Said Alloush	President, The Royal Scientific Society
Dr Abdel Nabi Fardous	Director General, The National Center for Agricultural Research and Technology Transfer (NCARTT)
Dr Ahmed Boulad	Director of Water and Environment Management Research Program (NCARTT)
Eng Qasem Mamdouh	Director of Technology Transfer and Training Department (NCARTT)
Dr Majid Zubi	Director of Irrigated Agriculture Research Program (NCARTT)
Mrs Mona Saba	Office Manager, Director General's Office (NCARTT)
Eng Masnat Hiary	Researcher (NCARTT)
Dr Najib M El-Assi	Postharvest Physiologist & Technologist, Faculty of Agriculture, UOJ
Mr Husam Alidi	Agriculture Eng , Jordan Valley Authority (JVA) Irrigation Advisory Services (IAS), Dep Of Irrigation
Mr Mohammed Sha ban	Agriculture Eng , Jordan Valley Authority (JVA) Irrigation Advisory Services (IAS), Dep Of Irrigation
Mr Mohammad Al-Qudah	Assistant, Secretary general for planning and environment Jordan Valley Authority, Ministry of Water and Irrigation
Dr Bassam Hayek	Acting Director, Environmental Research Center Royal Scientific Society (RSS)
Morocco	
Dr AbdelHafid Debbarh	Professor, Institut Agronomique et Veterinaire Hassan II
Palestinian Authority	
Dr Azzam Tubaileh	Deputy Minister of Agriculture
Mr Shaker Judeh	Extension Specialist, DG of Agri-Extension, Publicity and Applied Research Ministry of Agriculture
Mr Issam Nofal	Vice Director of Water and Irrigation Department, Ministry of Agriculture
US Participants	
Dr Theodore Sammis	Professor, Department of Agronomy and Horticulture New Mexico State University
Dr Bonnie Stewart	US Program Director San Diego State University Foundation
Mr W Timothy Hushen	Director, Program Management San Diego State University Foundation
Dr Donald C Slack	Professor and Head Department of Agricultural and Biosystems Engineering

C

Contact List of Meeting Participants

Country Coordinator's Participant List
August 17-18, 1999 Meeting
Amman, Jordan

Middle East Participant

Participant	Title and Position	Address
Egypt		
Dr Ayman Farid Abou Hadid	Director Central Laboratory for Agricultural Climate (CLAC) Agricultural Research Center Ministry of Agriculture and Land Reclamation	6, El Nour St , Dokki P O Box 296 Imbaba Tel no (202) 3367274 Fax no (202) 3490053 Email ruafah@rusys eg net
Dr Mahmoud Medany	Extension Specialist Central Laboratory for Agricultural Climate (CLAC) Agricultural Research Center Ministry of Agriculture and Land Reclamation	6, E, Nour St , Dokki P O Box 296 Imbaba Tel no (202) 3367274 Fax no (202) 3368059 Email rumedany@rusys eg net Home 202-2666634
Israel		
Dr Dov Pasternak	Head, The Institute for Agriculture & Applied Biology Ben Gurion University	P O Box 653 Beer-Sheva 84105 Israel Tel no 972-7-6461972 Fax no 972-7-6472984 Email dovp@bgumail bgu ac il
Mr Moshe Goren	Director General Ministry of Agriculture and Rural Development Extension Service	P O Box 7054 Tel-Aviv, 61070 Tel no 972-3-6971717 Fax no 972-3-6971664 Email mosgor@shaham moag gov il Residence 2 Borohov St Kiryat Tivon, 36046 Tel 972-4-9833293
Jordan		
Dr Said Alloush	President The Royal Scientific Society	P O box 1438 Al-Jubaiha Amman 11941 Jordan Tel no 962-6-5344701 Fax no 962-6-5344806 Tlx 21276 RAMAH JO
Dr Abdel Nabi Fardous	Director General The National Center for Agricultural Research and Technology Transfer (NCARTT)	P O Box 639 Baqa' 19381 Jordan Tel no 962-6-4726680 Fax no 962-6-4726099 Email Director@ncartt gov jo Or Fardous@ ncatt gov jo Mobile no 079-500136
Dr Ahmed Boulad	Director of Water and Environment Management Research Program (NCARTT)	P O Box 639 Baqa' 19381 Jordan Tel no 962-6-4725071/ 266 Fax no 962-6-4726099 Email Director@ncartt gov jo

11

Cont Jordan Eng Qasem Mamdouh	Director of Technology Transfer and Training Department (NCARTT)	P O Box 639 Baqa' 19381 Jordan Tel no 962-6-4725071/ 126 Fax no 962-6-4726099 Email Q_mammdoh@hotmail com
Dr Majid Zubi	Director of Irrigated Agriculture Research Program (NCARTT)	P O Box 639 Baqa' 19381 Jordan Tel no 962-6-4725071/ 152 Fax no 962-6-4726099 Email majfan@usa net
Mrs Mona Saba	Office Manager, Director General's Office (NCARTT)	P O Box 639 Baqa 19381 Jordan Tel no 962-6-4726680 Fax no 962-6-4726099 Email msaba_karkar@hotmail com
Eng Masnat Hiary	Researcher (NCARTT)	P O Box 639 Baqa' 19381 Jordan Tel no 962-6-4725071 Fax no 962-6-4726099 Email masnat1@hotmail com
Dr Najib M El-Assi	Postharvest Physiologist & Technologist The University of Jordan Faculty of Agriculture Dep. tment of Horticulture and Plant Protection	Office tel no 962-6-5355000/3006 Home tel no 962-6-5234857 Email nagassi@hotmail com
Mr Husam Alidi	Agriculture Eng Jordan Valley Authority (JVA) Irrigation Advisory Services (IAS) Dep Of Irrigation	Office South Shoneh Al Karamah directorate Tel no 962-5-572382 ext 140 Fax no 962-6-5689916 Cable JOVAC0 Email Jva2@amra nic gov jo
Mr Mohammed Sha'ban	Agriculture Eng Jordan Valley Authority (JVA) Irrigation Advisory Services (IAS) Dep Of Irrigation	Office Middle Jordan Valley Al Karamah directorate Tel no 962-5-570546 ext 104 Fax no 962-6-5689916 Cable JOVAC0 Email Jva2@amra nic gov jo
Mr Mohammad Al-Qudah	Assistant, Secretary general for planning and environment Jordan Valley Authority Ministry of Water and Irrigation	Fax no 962-6-5604162 Tel no 962-6-5604144 Residence tel no 962-6-5238884
Dr Bassam Hayek	Acting Director Environmental Research Center Royal Scientific Society (RSS)	Tel no 962-6-5340373 Fax no 962-6-5344806 Email b hayek@rss gov jo

Morocco Dr AbdelHafid Debbarh	Professor Institut Agronomique et Veterinaire Hassan II	B P 6202 Rabat-Instituts-Maroc Tel no 212-7-777119 Fax no 212-7-777119 Email debbarh@iav refer org ma
Palestinian Authority Dr Azzam Tubaileh	Deputy Minister of Agriculture	P O Box 197 Ramalah Tel no 970-2-2961220 Fax no 970-2-29612122 Email research@planet edu
Mr Shaker Judeh	Extension Specialist DG of Agri-Extension, Publicity and Applied Research Ministry of Agriculture	Tel no 970-2-2961085 Fax no 970-2-2961212 Mobile 050/ 583243 Email research@planet edu
Mr Issam Nofal	Vice Director of Water and Irrigation Department Ministry of Agriculture	P O Box 197 Ramalah Tel no 970-2-2961220 Fax no 970-2-29612122 Email research@planet edu
US Participants Dr Theodore Sammis	Professor, Agricultural Engineer/ Hydrogolist State Climatologist Agricultural Experiment Station College of Agriculture and Home Economics Department of Agronomy and Horticulture New Mexico State University	P O Box 30003, MSC 3Q Las Cruces, NM 88003-8003 Tel no (505) 646-2104 Fax no (505) 646-6041 Email tsammis@nmsu edu http weather nmsu edu Home 505 523 2032
Dr Bonnie Stewart	US Program Director Middle East & Mediterranean Desert Development Program San Diego State University Foundation	5250 Campanile Drive San Diego, CA 92182-1933 Office 619-594-5644/1900 Home 619-698-7636 Fax 619-583-5734/ 582-9164 Email bstewart@foundation sdsu edu Mobile 619 981 7716
Mr W Timothy Hushen	Director Program Management San Diego State University Foundation	5250 Campanile Drive San Diego, CA 92182-1933 Voice 619-594-4102 Fax 619-582-9164 Home page http //www foundation sdsu edu Email thushen@foundation sdsu edu Home 619 792 0089
Dr Donald C Slack	Professor and Head Department of Agricultural and Biosystems Engineering	403 Shantz Bldg , # 38 Tuscon, Arizona 85721 Office (520) 621-7230 Fax (520)621-3963 Email slackd@u arizona edu Home (520) 722-2162

D

Minutes of the Meeting

Minutes of the Meeting

Tuesday
August 17, 1999

Opening remarks

The meeting began with welcome remarks by Dr Bonnie Stewart followed by an official welcome from the Jordanian hosts, Dr Said Alloush – President of the Royal Scientific Society and Dr Abdel Nabi Fardous – Director General of NCARTT

- Dr Bonnie Stewart thanked the participants for coming to the meeting and also for their continuing efforts in developing the program

- Dr Abdel Nabi Fardous pointed out that the importance of this program comes from the scarcity of water, especially in this region where the main objectives are to improve water use efficiency, quality of agricultural production, farmers skills and capacity building for national institutions

- Dr Said Alloush referred to the regional cooperation, which is designed to make water used in agricultural more profitable and productive through improving the efficiency of it's use by utilizing science and technology in all the participating countries

Introductions of the participants followed the opening remarks

The Jordan television covered the opening session of the meeting Interviews with Dr Azzam Tubaileh and Dr Stewart were aired on the Jordanian evening The *Jordanian Times* English newspaper reporter interviewed Dr Stewart An article appeared in the newspaper on August 19th summarizing the meeting, as well as the program goals and accomplishments

Overview of Meeting Objectives

- Dr Stewart reveiwed the meeting objectives, the goals for phase one and two of the Middle East and Mediterranean Desert Development Program, and emphasized the importance of developing the Best Management Practices (BMPs) as base line reference information on the current management practices used throughout the Middle East region for growing selected crops These BMPs will be considered as deliverables for phase one of the program

- Mr W Timothy Hushen gave an historical overview of the involvement of the San Diego State University's Hansen Institute for World Peace in Middle East regional cooperation programs from 1980 to the present

- Dr Don Slack gave an overview of the program workplans for "Improving the Efficiency of Water Use in Arid Land Agriculture Program", reviewed the draft agenda and incorporated recommended modifications in the scheduled activities

15

Session One Development of Extension Materials for Project Related Research and Application - Dr Donald Slack, Moderator

Topics Best Management Practices, Extension Services in Participating Countries and Extension Dissemintation Framework for Sharing Results of Project Generated Research

Best Management Practices

The discussion included

- The importance of sharing information between participating countries on the best management practices for selected crops
- Developing BMPs for selected crops for each country
- Identifying the regional similarities and differences in BMPs for selected crops

An example of a BMP for eggplant production in California was submitted to the participants

Review of Extension Services in Participating Countries

Each country was asked to give a presentation on their extension service and provide examples of extension materials

Israel

Mr Moshe Goren - Director General/ Ministry of Agriculture and Rural Development Extension Service- presented the ' Shaham' -Extension Service of Israel - as a governmental organization which provide technical service in the field He went through the roles of 'SHAHAM" the guiding principles, group activities and its structure

PNA

Mr Shaker Judeh - Extension Specialist/ Director General of Agri-Extension, Publicity and Applied Research/ Ministry of Agriculture- mentioned that the extension directorate is one of eight directorates The extension unit solves the immediate problems in both animal and plant activities The methodology of this unit depends on farm visits meeting, field days and experimental stations

Jordan

Eng Qasem Mamdouh - Director of Technology Transfer and Training Department (NCARTT)- highlighted the role of the Technology Transfer directorate in NCARTT through the center and the 6 Regional Centers for Agricultural Research and Technology Transfer (RCARTT) He displayed an example about the mechanism of the development and dissemination of feed blocks technology

Egypt

Dr Mahmoud Medany - Extension Specialist/ Central Laboratory for Agricultural Climate (CLAC)/ Agricultural Research Center / Ministry of Agriculture and Land Reclamation- explained the roles of the extension research institution which are executed through daily agenda, field days, radio broadcast and written fliers

Morocco

Dr AbdelHafid Debbarh - Professor/ Institut Agronomique et Veterinaire Hassan II- mentioned the background of the extension activity in Morocco and he concentrated on the main factor which is technology dissemination

Lunch Break

Session One Development of Extension Materials for Project Related Research and Application - continued

The afternoon session was broken into the following two working groups

1 BMP Working Group

Participants Dr Donald Slack (USA), Dr Ayman Farid Abou Hadid (Egypt), Dr Dov Pasternak (Israel), Dr Abdel Nabi Fardous (Jordan), Dr Ahmed Boulad (Jordan), Dr Majid Zubi (Jordan), Eng Masnat Hiary (Jordan), Dr Najib M El-Assi (Jordan), Dr Azzam Tubaileh (Palestinian Authority), Mr Issam Nofal (Palestinian Authority), Dr Bonnie Stewart (USA)

Task Review the best management practices (fact sheets) for selected crops prepared by Jordan and the PNA and determine what additional BMPs need to be prepared by each participating country

Outcome The group agreed on selected BMPs (fact sheets) to be developed for each country and prepared a list of these topics (see Attachment D) Morocco, Egypt and Israel are to translate existing fact sheets from French, Arabic and Hebrew to English PNA is to prepare an additional BMP

The country coordinators will send BMPs / facts sheets to Dr Stewart by email by September 15, 1999

2 Extension Working Group

Participants Dr Theodore Sammis (USA), Dr Mahmoud Medany (Egypt), Mr Moshe Goren (Israel), Eng Qasem Mamdouh (Jordan), Mr Husam Alidi (Jordan), Mr Mohammed Sha'ban (Jordan), Dr AbdelHafid Debbarh (Morocco), Mr Shaker Judeh (Palestinian Authority), Mr W Timothy Hushen (USA)

Task Develop an extension dissemination framework for sharing information generated from project supported research activities in phase II The extension dissemination framework detail methods of transferring technology to Ministries of Agriculture and also to farmers, such as field days, demonstrations, preparing land and publications

Outcome An extension dissemination framework was produced (see Attachment E, "Extension Framework and Organizational Chart")

Wednesday
August 18, 1999

Session Two Development of Information Exchange Mechanism - Dr Ted Sammis, Moderator

Dr Sammis - New Mexico State University- presented his irrigation scheduling game model as an example of teaching approaches for irrigation management decision making

He also provided information on the use of the internet for dissemination of both research and extension materials on irrigation management For example, a crop history form, located on the internet at http //weather nmsu edu/nmcrops/crop_history_form htm, was shown as an method of coordinating future research activities The data recorded on the form will be the beginning of an irrigation management response data base

10 30	***Concluding Remarks***
11 00	***Sites Visits***
	Visit to the Jordan Valley "Deiralla RCARTT"
	Observations of drip irrigation systems
	Visit to a private farm with soilless culture green houses
2 30	***Lunch at the Dead Sea***
5 00	***Return to Hotel***

Minutes respectfully submitted by Eng Masnat Hiary

F

Extension Framework & Organizational Chart

MIDDLE EAST AND MEDITERREAN DESERT DEVELOPMENT PROGRAM, Extension Dissemination and Diffusion Framework

Dr Ted Sammis (USA) Dr Mahmoud Medany (Egypt) Mr Moshe Goren (Israel) Eng Qasem Mamdouh (Jordan) Dr AbdelHafid Debbarh (Morocco) Mr Shaker Judeh (Palestine Authority) Mr Husam Alidi (Jordan) Mr Mohamed Sha'ban (Jordan)

Introduction

Diffusion of Innovation Process Diffusion of innovations is a method of introducing new ideas Over time these new ideas are accepted or rejected Diffusion is considered a mechanism for social change When new research ideas are introduced and diffused, and subsequently adopted or rejected, social change may result The four main elements for diffusion are innovation, communication channels, time and the social system A full description of each of the components of the diffusion process is presented by Rogers (1995)

Diffusion of irrigation management techniques must satisfy the farmers' perceptions that the techniques are both innovative and that they present a relative advantage over not using the technology The techniques must be compatible with current farming practices and not too complex to use The results must be easy to interpret Diffusion works only if the farmers that are taught the technology are both innovators in the area of irrigation management and if they are willing to teach others about the new technology In other words, successful diffusion occurs when the leaders in the farming community are convinced to adapt the technology and then they demonstrate the new technology to other farmers The time frame for adoption (how long it takes to convince farmers to adopt irrigation management techniques) is a component of diffusion and depends on the economic advantage of the new technology Finally, the social system determines if the farmers will work together or separately in adopting irrigation management technology The social system also has governmental and community components that can either increase that rate of adoption or reject completely the technology

Best Management Practices BMPs are sets of farm management techniques that minimize the harmful environmental effects of agricultural production (Watson et al 1994) BMPs are innovations Farmers are encouraged to adopt changes recommended in BMPs in order to decrease fertilizer applications and increase water use efficiency Adoption of BMP practices could minimize the leaching fraction through proper scheduling of irrigation and application of N fertilizer according to the crop's uptake Knowledge about farmers current irrigation water use efficiencies is needed to formulate BMPs for specific cropping patterns and field conditions for each region in the Middle East Irrigation efficiencies depend on the soil, crop, irrigation methods, and irrigation scheduling practices of the farmers

Diffusion of BMPs Adoption of BMPs is not always easy Bultena and Hoiberg (1983) reported that many producers continue to reject the use of recommended Best Management Practices (BMPs), even though they are aware that these practices and have been presented with valid and persuasive reasons for their adoption This is the challenge of the diffusion of innovation process - to convince farmers of the validity of the new ideas so that they will adopt them and in turn demonstrate the techniques to other farmers

Adopting new agricultural technologies has played a prominent role in increasing productivity per unit area, as well as, protecting the environment from pollution However, adoption of BMPs by farmers might be more affected by their personal values, neighborhood, social pressure, and traditions For instance, Carlson and Dillman (1986) reported that producers switched from conventional to no-till practices because it saved them money, not because of improved soil fertility Most diffusion research studies have considered the adoption process years after the innovation has been adopted (Carlson and Dillman, 1986) The major weakness with these diffusion research designs is that they rely on recall data from respondents regarding their adoption of an innovation (Rogers, 1995) Therefore, Rogers (1995) recommends the use of more efficient designs for gathering data, such as field experiments and case studies of the diffusion process

Organizations Responsible for Diffusion of Agricultural Innovations Diffusion of agricultural innovations is accomplished by different organizations Most frequently, the agricultural extension services are charged with the task of informing farmers of new ideas and techniques The agricultural extension services in the Middle East Countries are organized similar to the United States Cooperative Extension Services All extension service programs have slightly different administrative structures, but the dissemination of irrigation management information is through both irrigation and soil specialists or regional extension personnel

The methods of diffusion are seasonal recommendation and information leaflets, production guidance handbooks, extension video tapes, computer software programs , research result summaries, radio broadcasts, on-farm visits, telephone consulting , field days, demonstrations plots, workshops, courses, seasonal summary meetings , grower clubs meetings, farm and experimental station tours, and evening village tours Development of these materials is done by the irrigation specialist, regional extension personnel, researchers and extension communication specialists Material is developed in the language used by the farmers

Objectives

The objective of this report is to develop a framework for collaboration and cooperation for the extension diffusion portion of the *Middle East and Mediterranean Desert Development Program - Improving the Efficiency of Water Use in Arid Lands Agriculture* (Hansen Institute for World Peace, et al 1999) This framework will insure that new ideas generated by program activities will be shared throughout the region The approach also will facilitate the integration of research, development and extension activities among the participating countries

Procedures

The innovation portion of the research activities and the diffusion process are described in the *Middle East and Mediterranean Desert Development Program - Improving the Efficiency of Water Use in Arid Lands Agriculture* proposal (Hansen Institute for World Peace, et al, 1999) Each research activity will generate new ideas or practices on how to manage the limited water resources in the region This new information will need to be diffused across the region

To facilitate the diffusion process, communication networks need to be established Therefore, each country will have an internet site as part of the research program, and the information from the research and the extension material generated from the research will be posted on the internet sites in English As individual countries translate the information into another language, it will the responsibility of the country coordinator to post the translation of the material onto the internet site The pages on the internet will be written in HTML language as a primary file type and PDF format as a secondary file type The country coordinators will determine the most effective methods to distribute the information to the farmers

In order for the diffusion process to be effective, an extension person from each country will be a member of every research team for each activity under the objectives in the program elements of the project Consequently, even though a research activity may not have researchers from each country participating in that activity, an extension person from each country will be a member of the research team Under this structure, each country will benefit from the research results conducted by scientists in other countries because the extension persons will develop material from the research that is appropriate for his country (see Table 1) The regional leader for each activity can be either a researcher or an extension person from countries participating in the research activity This person will have the responsibility to disseminate all the research and extension material generated from that activity by posting the material on the internet sites and distributing it to all the countries through the country coordinator

Workshops will be held annually to facilitate interaction among scientists and extension personnel from participating countries to meet, share outcomes and problems, and coordinate planning for activities in the subsequent years A secondary purpose of the workshops is to foster the dissemination of results of research and extension activities through the region In addition to the annual workshops, the team members will communicate throughout the years by telephone and e-mail The extension personnel on each team will work together to generate information for workshops, bulletins, newsletters, on-site training, operation of demonstration plots, written description of the methodology used at the demonstration plots, internet training materials for the demonstration plots and development of study tours of demonstration sites The workshops will be held in a different country each year so that all the team members can observe the research activities through half day field trips to the research and demonstration sites One-to-one visitations among team members and will occur as part of the extension diffusion process

The time frame for the diffusion process to occur is the duration of the project - five years All of the diffusion process may not occur within the five years of the project However, the communication portion of diffusion process will continue after the project terminates Each country has an extension structure already set up to follow through on the communication portion of the diffusion process

The social system of the project is structured so that all participants are engaged in joint problem-solving to accomplish the goal of increasing water use and irrigation efficiency Information and methodologies will be developed to overcome any social problems that restrict the adoption of the new innovative ideas generated by the research by having extension personnel from each country as members of the team associated with each activity This structure of the project personnel prevents the generation of communication procedures that will fail because they are not appropriate for the social structure of each country

References

Bultena, G L , & Hoiberg, E O (1983) Factors affecting farmers' adoption of conservation tillage *J of Soil Water Conservation 38*, 281-284

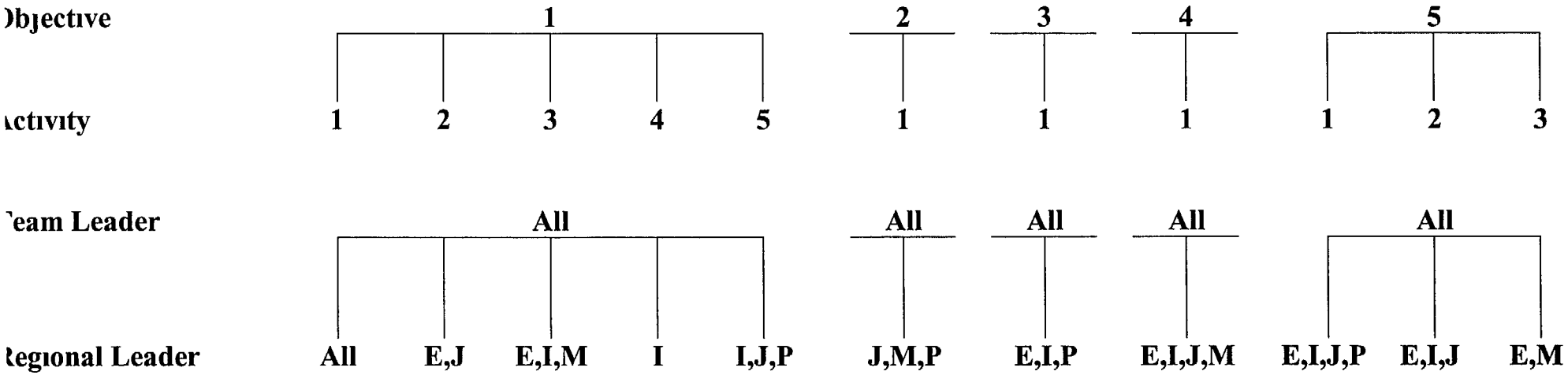
Carlson, J E , & Dillman, D A (1986) Early adopters and nonusers of no-till in the Pacific Northwest A comparison In S B Lovejoy & T L Napier (Eds), *Conserving Soil Insights from socioeconomic research* (pp 83-93) Ankeny, IA Soil Conservation Society of America

Hansen Institute, San Diego State University Foundation, Peres Center for Peace, & International Air Lands Consortium (1999) *Middle East and Mediterranean Desert Development program Improving the efficiency of water use in arid land agriculture* (pp 1-150) San Diego, CA San Diego State University Foundation

Rogers, E (1995) *Diffusion of innovations* New York The Free Press

Watson, J , Hassinger, E , Reffruschinni, K , Sheedy, M , & Anthony, B (1994) Best management practices meeting water quality goals *J Soil and Water Conserv , 49*, 39-43

Extension Activities

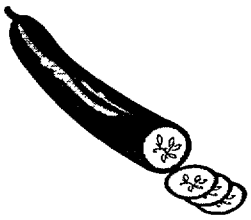


E: Egypt I: Israel J: Jordan M: Morocco P: PNA

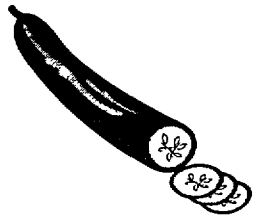
G

Examples of BMPs Prepared by Jordan & the PNA

Jordan BMPs



Best Management Practices
For
Cucumbers grown in plastic houses
Using fresh water



Best Management Practices (BMP) are the best recommended practices for growing a specified crop These recommended practices are based on research and experience and apply to the specified crop under the specified conditions These recommended best management practices are not the only way to grow a crop but are the best way determined by the authors of the BMP The BMP may change as additional research becomes available

Author Dr Majid Fandi, Director of irrigated agriculture research program at the National Center for Agricultural Research and Technology Transfer (NCARTT) Mr Nabil Deeb, vegetable researcher at NCARTT , P O Box 639 - Baqa' 19381 Jordan - Tel 4725411-4725461 - Fax 4726099 , E-mail majfan@usa net

Consultants

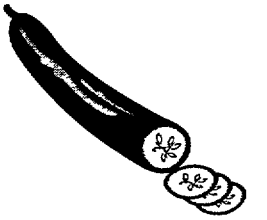
Best Management Practices for growing **Cucumbers**

Comments This is a BMP for cucumbers grown in the soil of 500 m^2 plastic house in Jordan valley and high lands of Jordan The cucumbers are picked when ready for market

Steps	Recommendation
1 Plant variety	Sultan , Hayat , Merva , Kanz
2 Planting date	High lands 1/3 – 1/4 , 1/7 – 15/8 Jordan Valley North(1/11-1/1),Middle(15/10 – 15/12),South(1/10-1/1)
3 Plant configuration (spacing) depth of seed	Planting in beds Spacing between seedlings in each bed 40 cm Spacing between beds 100 cm
4 Field preparation	Deep plowing followed by (two weeks later) soil smoothing , rise the beds (8-10 cm above the soil) with the recommended distance ,add manure and pre-plant fertilizer , install irrigation pipes and cover with plastic mulch , transplant ready seedlings to the permanent soil after moistening the soil for at least 15-20 cm depth by using drip irrigation
5 Pre-plant fertilizer	Add 50 kg /du Triple super-phosphate (TSP) Add fermented organic manure 1 ton /du on beds and mix with soil
6 Pre-emergence herbicide	Solarization could be done during summer season in Jordan Valley Methyl bromide gas (65-70 kg /du), add the gas to a moist soil after covering the soil with plastic , remove plastic after 2 days of application
7 Monitoring for diseases	-The plastic house can be divided into five equal parts -In each part ,field inspection can be done by taking 2 to 3 plants at random , these plants must be examined carefully from the top to the bottom including the leaves , flowers and fruits -The inspector should concentrate on the main pest (white fly , spider mites , aphids , thrips , caterpillars and leaf minor) and diseases like powdery mildew -Evaluating the degree of infection ,mark the infected area and make a record for the evaluation

<table>
<tr><td></td><td></td></tr>
<tr><td>8 Post-emergence herbicide</td><td>Not used</td></tr>
<tr><td>9 Post-emergence fertilizer application method and amount</td><td>Fertigation according to plant requirements during growth stages
Growth stages according to leaves No
<table>
<tr><td>Element</td><td>6-7</td><td>7-14</td><td>14-21</td><td>21-28</td><td>28-35</td><td>35-42</td><td>42-end</td><td>Total</td></tr>
<tr><td>N (kg)</td><td>0 7</td><td>3 1</td><td>3 9</td><td>4 1</td><td>6 9</td><td>6 8</td><td>4 2</td><td>29 7</td></tr>
<tr><td>P_2O_5(kg)</td><td>0 2 0</td><td>0 7</td><td>1 2</td><td>1 6</td><td>2 8</td><td>2 8</td><td>1 6</td><td>10 8</td></tr>
<tr><td>K_2O(kg)</td><td>1 6</td><td>3 2</td><td>7 7</td><td>9 4</td><td>13 3</td><td>12 9</td><td>7 2</td><td>55 2</td></tr>
<tr><td>Fe(g)</td><td>7 0</td><td>19 8</td><td>37 9</td><td>300 6</td><td>310 5</td><td>274 8</td><td>177 8</td><td>1128 5</td></tr>
</table></td></tr>
<tr><td>10 Irrigation schedule</td><td></td></tr>
<tr><td>11 Harvesting date</td><td>For high lands 15/4 – 1/8 , 15/8 – 15/12
For Jordan valley North(15/1-15/3),Middle(1/12 – 15/5),South(1/12-1/6)</td></tr>
<tr><td>12 Storage</td><td>Storage conditions 10-13 C at 95 % RH for 10-14 days</td></tr>
<tr><td>13 Additional information needed to grow crop</td><td></td></tr>
</table>

Best Management Practices For Cucumbers grown in plastic houses Using Saline water



Best Management Practices (BMP) are the best recommended practices for growing a specified crop These recommended practices are based on research and experience and apply to the specified crop under the specified conditions These recommended best management practices are not the only way to grow a crop but are the best way determined by the authors of the BMP The BMP may change as additional research becomes available

Author Dr Majid Fandi, Director of irrigated agriculture research program at the National Center for Agricultural Research and Technology Transfer (NCARTT) Mr Nabil Deeb, vegetable researcher at NCARTT , P O Box 639 - Baqa' 19381 Jordan - Tel 4725411-4725461 - Fax 4726099 , E-mail majfan@usa net

Consultants

Best Management Practices for growing **Cucumbers**

Comments This is a BMP for cucumbers grown in the soil of 500 m^2 plastic house in Jordan valley and high lands of Jordan The cucumbers are picked when ready for market

Steps	Recommendation
1 Plant variety	Sultan , Hayat , Safir
2 Planting date	High lands 1/3 – 1/4 , 1/7 – 15/8 Jordan Valley North(1/11-1/1),Middle(15/10 – 15/12),South(1/10-1/1)
3 Plant configuration (spacing) depth of seed	Planting in beds Spacing between seedlings in each bed 40 cm Spacing between beds 100 cm
4 Field preparation	Deep plowing followed by (two weeks later) soil smoothing , rise the beds (10 cm above the soil) with the recommended distance ,add manure and pre-plant fertilizer , install irrigation pipes and cover with plastic mulch , transplant ready seedlings to the permanent soil after moistening the soil for at least 15-20 cm depth by using drip irrigation
5 Pre-plant fertilizer	Add 50 kg /du Triple super-phosphate (TSP) Add fermented organic manure 1 ton /du on beds and mix with soil
6 Pre-emergence herbicide	Solarization could be done during summer season in Jordan Valley Methyl bromide gas (65-70 kg /du), add the gas to a moist soil after covering the soil with plastic , remove plastic after 2 days of application
7 Monitoring for diseases	-The plastic house can be divided into five equal parts -In each part ,field inspection can be done by taking 2 to 3 plants at random , these plants must be examined carefully from the top to the bottom including the leaves , flowers and fruits -The inspector should concentrate on the main pest (white fly , spider mites , aphids , thrips , caterpillars and leaf minor) and diseases like powdery mildew -Evaluating the degree of infection ,mark the infected area and make a record for the evaluation

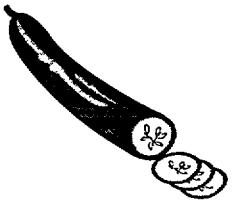
8 Post-emergence herbicide	Not used

9 Post-emergence fertilizer application method and amount

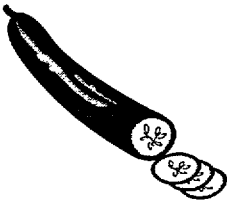
Fertigation according to plant requirements during growth stages
Growth stages according to leaves No

Element	6-7	7-14	14-21	21-28	28-35	35-42	42-end	Total
N (kg)	0 7	3 1	3 9	4 1	6 9	6 8	4 2	29 7
P_2O_5(kg)	0 2 0	0 7	1 2	1 6	2 8	2 8	1 6	10 8
K_2O(kg)	1 6	3 2	7 7	9 4	13 3	12 9	7 2	55 2
Fe(g)	7 0	19 8	37 9	300 6	310 5	274 8	177 8	1128 5

10 Irrigation schedule	
11 Harvesting date	For high lands 15/4 – 1/8 , 15/8 – 15/12 For Jordan valley North(15/1-15/3),Middle(1/12 – 15/5),South(1/12-1/6)
12 Storage	Storage conditions 10-13 C at 95 % RH for 10-14 days
13 Additional information needed to grow crop	



Best Management Practices
For
Cucumbers grown in open field
Using fresh water



Best Management Practices (BMP) are the best recommended practices for growing a specified crop These recommended practices are based on research and experience and apply to the specified crop under the specified conditions These recommended best management practices are not the only way to grow a crop but are the best way determined by the authors of the BMP The BMP may change as additional research becomes available

Author Dr Majid Fandi, Director of irrigated agriculture research program at the National Center for Agricultural Research and Technology Transfer (NCARTT) Mr Nabil Deeb, vegetable researcher at NCARTT , P O Box 639 - Baqa' 19381 Jordan - Tel 4725411-4725461 - Fax 4726099 , E-mail majfan@usa net

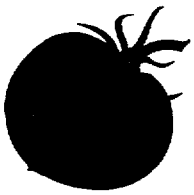
Consultants

Best Management Practices for growing **Cucumbers**

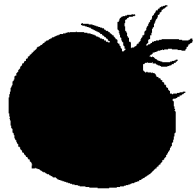
Comments This is a BMP for tocucumbers grown in the soil of open field in Jordan Valley and high lands of Jordan The cucumbers are picked when ready for market

Steps	Recommendation
1 Plant variety	Thamine
2 Planting date	High lands 15/4 – 15/5 Jordan valley Middle(15/10 – 1/12),South(1/8-1/10)
3 Plant configuration (spacing) depth of seed	Planting in beds , two rows per bed Spacing between seedlings in each row 40 cm Spacing between beds 200 cm
4 Field preparation	Deep plowing followed by (two weeks later) soil smoothing , add manure and pre-plant fertilizer ,rise the beds (8-10 cm above the soil) with the recommended distance, install irrigation pipes and cover with plastic mulch , transplant ready seedlings to the permanent soil after moistening the soil for at least 15-20 cm depth by using drip irrigation
5 Pre-plant fertilizer	Add 50 kg /du Triple super-phosphate (TSP) Add organic manure 3-4 ton /du
6 Pre-emergence herbicide	Not used
7 Monitoring for diseases	-Open field can be divided into five equal parts -In each part ,field inspection can be done by taking 2 to 3 plants at random , these plants must be examined carefully from the top to the bottom including the leaves , flowers and fruits -The inspector should concentrate on the main pest (white fly , spider mites , aphids , thrips , caterpillars and leaf minor) and diseases like powdery mildew -Evaluating the degree of infection ,mark the infected area and make a record for the evaluation

8 Post-emergence herbicide	Not used
9 Post-emergence fertilizer application method and amount	Fertigation according to plant requirements during growth stages
10 Irrigation schedule	
11 Harvesting date	For high lands 1/6 – 15/8 For Jordan valley Middle(1/1 – 1/4) , South(20/9-31/12)
12 Storage	Storage conditions 10-13 C at 95 % RH for 10-14 days
13 Additional information needed to grow crop	



Best Management Practices
For
Tomato grown open field
Using fresh water



Best Management Practices (BMP) are the best recommended practices for growing a specified crop These recommended practices are based on research and experience and apply to the specified crop under the specified conditions These recommended best management practices are not the only way to grow a crop but are the best way determined by the authors of the BMP The BMP may change as additional research becomes available

Author Dr Majid Fandi, Director of irrigated agriculture research program at the National Center for Agricultural Research and Technology Transfer (NCARTT) Mr Nabil Deeb, vegetable researcher at NCARTT , P O Box 639 - Baqa' 19381 Jordan - Tel 4725411-4725461 - Fax 4726099 , E-mail majfan@usa net

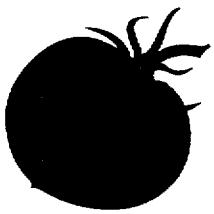
Consultants

Best Management Practices for growing **Tomatoes**

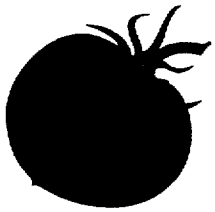
Comments This is a BMP for tomatoes grown in the soil of open field in Jordan Valley and high lands of Jordan The tomatoes are picked when ready for market

Steps	Recommendation
1 Plant variety	Jackal , GS-12
2 Planting date	High lands 1/3 – 15/7 Jordan valley North (15/2-1/4),Middle (15/10-15/12),South(1/10-1/2)
3 Plant configuration (spacing) depth of seed	Planting in beds , two rows per bed Spacing between seedlings in each row 40 cm Spacing between beds 200 cm
4 Field preparation	Deep plowing followed by (two weeks later) soil smoothing , add manure and pre-plant fertilizer ,rise the beds (8-10 cm above the soil) with the recommended distance, install irrigation pipes and cover with plastic mulch , transplant ready seedlings to the permanent soil after moistening the soil for at least 15-20 cm depth by using drip irrigation
5 Pre-plant fertilizer	Add 50 kg /du Triple super-phosphate (TSP) Add organic manure 3-4 ton /du
6 Pre-emergence herbicide	Not used
7 Monitoring for diseases	-Open field can be divided into five equal parts -In each part ,field inspection can be done by taking 2 to 3 plants at random , these plants must be examined carefully from the top to the bottom including the leaves , flowers and fruits -The inspector should concentrate on the main pest (white fly , spider mites , aphids , thrips , caterpillars and leaf minor) and diseases like powdery mildew -Evaluating the degree of infection ,mark the infected area and make a record for the evaluation
8 Post-emergence herbicide	Not used

9 Post-emergence fertilizer application method and amount	Fertigation according to plant requirements during growth stages
10 Irrigation schedule	
11 Harvesting date	For high lands 1/6 – 15/12 For Jordan valley North(1/5 – 1/8),middle(1/1-1/4),south(1/1-1/7)
12 Storage	Storage conditions for full-ripened tomato 8-10 C at 90-95% RH for 3-7 days Storage conditions for firm (not fully ripened) tomato 13-21 C at 90-95% RH for 1-3 weeks
13 Additional information needed to grow crop	



Best Management Practices
For
Tomato grown open field
Using saline water



Best Management Practices (BMP) are the best recommended practices for growing a specified crop These recommended practices are based on research and experience and apply to the specified crop under the specified conditions These recommended best management practices are not the only way to grow a crop but are the best way determined by the authors of the BMP The BMP may change as additional research becomes available

Author Dr Majid Fandi, Director of irrigated agriculture research program at the National Center for Agricultural Research and Technology Transfer (NCARTT) Mr Nabil Deeb, vegetable researcher at NCARTT , P O Box 639 - Baqa' 19381 Jordan - Tel 4725411-4725461 - Fax 4726099 , E-mail majfan@usa net

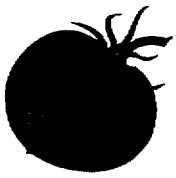
Consultants

Best Management Practices for growing **Tomatoes**

Comments This is a BMP for tomatoes grown in the soil of open field in Jordan Valley and high lands of Jordan The tomatoes are picked when ready for market

Steps	Recommendation
1 Plant variety	Jackal , GS-12
2 Planting date	High lands 1/3 – 15/7 Jordan valley North (15/2-1/4),Middle (15/10-15/12),South(1/10-1/2)
3 Plant configuration (spacing) depth of seed	Planting in beds , two rows per bed Spacing between seedlings in each row 40 cm Spacing between beds 150 cm
4 Field preparation	Deep plowing followed by (two weeks later) soil smoothing , add manure and pre-plant fertilizer ,rise the beds (10 cm above the soil) with the recommended distance, install irrigation pipes and cover with plastic mulch , transplant ready seedlings to the permanent soil after moistening the soil for at least 15-20 cm depth by using drip irrigation
5 Pre-plant fertilizer	Add 50 kg /du Triple super-phosphate (TSP) Add organic manure 3-4 ton /du
6 Pre-emergence herbicide	Not used
7 Monitoring for diseases	-Open field can be divided into five equal parts -In each part ,field inspection can be done by taking 2 to 3 plants at random , these plants must be examined carefully from the top to the bottom including the leaves , flowers and fruits -The inspector should concentrate on the main pest (white fly , spider mites , aphids , thrips , caterpillars and leaf minor) and diseases like powdery mildew -Evaluating the degree of infection ,mark the infected area and make a record for the evaluation
8 Post-emergence herbicide	Not used

9 Post-emergence fertilizer application method and amount	Fertigation according to plant requirements during growth stages
10 Irrigation schedule	
11 Harvesting date	For high lands 1/6 – 15/12 For Jordan valley North(1/5 – 1/8),middle(1/1-1/4),south(1/1-1/7)
12 Storage	Storage conditions for full-ripened tomato 8-10 C at 90-95% RH for 3-7 days Storage conditions for firm (not fully ripened) tomato 13-21 C at 90-95% RH for 1-3 weeks
13 Additional information needed to grow crop	



Best Management Practices For Tomato grown in plastic houses Using fresh water

Best Management Practices (BMP) are the best recommended practices for growing a specified crop These recommended practices are based on research and experience and apply to the specified crop under the specified conditions These recommended best management practices are not the only way to grow a crop but are the best way determined by the authors of the BMP The BMP may change as additional research becomes available

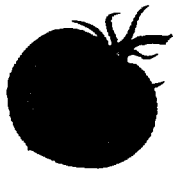
Author Dr Majid Fandi, Director of irrigated agriculture research program at the National Center for Agricultural Research and Technology Transfer (NCARTT) Mr Nabil Deeb, vegetable researcher at NCARTT, P O Box 639 - Baqa' 19381 Jordan - Tel 4725411-4725461 - Fax 4726099 , E-mail majfan@usa net
Consultants

Best Management Practices for growing **Tomatoes**

Comments This is a BMP for tomatoes grown in the soil of 500 m^2 plastic house in Jordan Valley and high lands of Jordan The growing tomatoes are used mainly for fresh market

Steps	Recommendation
1 Plant variety	T18 , Favori , Bella
2 Planting date	High lands 1/3 – 1/7 Jordan Valley North (15/9-1/1),Middle (1/10 – 15/11),South(1/10-1/12)
3 Plant configuration (spacing) depth of seed	Planting in beds Spacing between seedlings in each bed 50 cm Spacing between beds 100 cm
4 Field preparation	Deep plowing followed by (two weeks later) soil smoothing , rise the beds (8-10 cm above the soil) with the recommended distance ,add manure and pre-plant fertilizer , install irrigation pipes and cover with plastic mulch , transplant ready seedlings to the permanent soil after moistening the soil for at least 15-20 cm depth by using drip irrigation
5 Pre-plant fertilizer	Add 50 kg /du Triple super-phosphate (TSP) Add fermented organic manure 1 ton /du on beds and mix with soil
6 Pre-emergence herbicide	Solarization could be done during summer season in Jordan Valley Methyl bromide gas (65-70 kg /du), add the gas to a moist soil after covering the soil with plastic , remove plastic after 2 days of application
7 Monitoring for diseases	-The plastic house can be divided into five equal parts -In each part, field inspection can be done by taking 2 to 3 plants at random, these plants must be examined carefully from the top to the bottom including the leaves, flowers and fruits -The inspector should concentrate on the main pest (white fly , spider mites, aphids, thrips, caterpillars and leaf minor) and diseases like powdery mildew -Evaluating the degree of infection, mark the infected area and make a record for the evaluation

8 Post-emergence herbicide	Not used											
9 Post-emergence fertilizer application method and amount	Stage	Establishment Flowering and fruit set	First fruit harvest	Fruit development and harvest								Total
	No	I	II	III	IV	V	VI	VII	VIII	IX	X	
	Days	50	14	14	14	14	14	14	14	14	14	176 days
	N	0 3	0 9	1 2	3 6	4 8	5 3	5 0	7 0	6 1	4 0	38 25 kg/du
	P_2O_5	0 25	0 39	1 15	1 31	2 36	3 10	3 01	2 87	2 80	1 60	18 84 kg/du
	K_2O	0 63	2 31	7 10	8 47	11 5	15 79	18 72	21 21	14 65	7 20	107 6 kg/du
10 Irrigation schedule												
11 Harvesting date	For high lands 1/6 – 15/12 For Jordan valley North(1/1 – 1/5),middle(1/1-1/5),south(1/1-1/6)											
12 Storage	Storage conditions for full-ripened tomato 8-10 C at 90-95% RH for 3-7 days Storage conditions for firm (not fully ripened) tomato 13-21 C at 90-95% RH for 1-3 weeks											
13 Additional information needed to grow crop												



Best Management Practices For Tomato grown in plastic houses Using Saline water

Best Management Practices (BMP) are the best recommended practices for growing a specified crop These recommended practices are based on research and experience and apply to the specified crop under the specified conditions These recommended best management practices are not the only way to grow a crop but are the best way determined by the authors of the BMP The BMP may change as additional research becomes available

Author Dr Majid Fandi, Director of irrigated agriculture research program at the National Center for Agricultural Research and Technology Transfer (NCARTT) Mr Nabil Deeb, vegetable researcher at NCARTT, P O Box 639 - Baqa' 19381 Jordan - Tel 4725411-4725461 - Fax 4726099 , E-mail majfan@usa net
Consultants

Best Management Practices for growing **Tomatoes**

Comments This is a BMP for tomatoes grown in the soil of 500 m^2 plastic house in Jordan Valley and high lands of Jordan The growing tomatoes are used mainly for fresh market

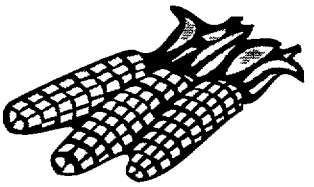
Steps	Recommendation
1 Plant variety	T18 , Matra RZ
2 Planting date	High lands 1/3 – 1/7 Jordan Valley North (15/9-1/1),Middle (1/10 – 15/11),South(1/10-1/12)
3 Plant configuration (spacing) depth of seed	Planting in beds Spacing between seedlings in each bed 50 cm Spacing between beds 100 cm
4 Field preparation	Deep plowing followed by (two weeks later) soil smoothing , rise the beds (10 cm above the soil) with the recommended distance ,add manure and pre-plant fertilizer , install irrigation pipes and cover with plastic mulch , transplant ready seedlings to the permanent soil after moistening the soil for at least 15-20 cm depth by using drip irrigation
5 Pre-plant fertilizer	Add 50 kg /du Triple super-phosphate (TSP) Add fermented organic manure 1 ton /du on beds and mix with soil
6 Pre-emergence herbicide	Solarization could be done during summer season in Jordan Valley Methyl bromide gas (65-70 kg /du), add the gas to a moist soil after covering the soil with plastic , remove plastic after 2 days of application
7 Monitoring for diseases	-The plastic house can be divided into five equal parts -In each part, field inspection can be done by taking 2 to 3 plants at random, these plants must be examined carefully from the top to the bottom including the leaves, flowers and fruits -The inspector should concentrate on the main pest (white fly , spider mites, aphids, thrips, caterpillars and leaf minor) and diseases like powdery mildew -Evaluating the degree of infection, mark the infected area and make a record for the evaluation

8 Post-emergence herbicide	Not used

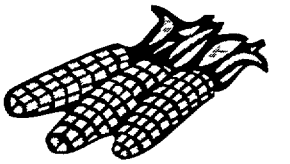
9 Post-emergence fertilizer application method and amount

Stage	Establishment Flowering and fruit set	First fruit harvest	Fruit development and harvest								Total
No	I	II	III	IV	V	VI	VII	VIII	IX	X	
Days	50	14	14	14	14	14	14	14	14	14	176 days
N	0 3	0 9	1 2	3 6	4 8	5 3	5 0	7 0	6 1	4 0	38 25 kg/du
P_2O_5	0 25	0 39	1 15	1 31	2 36	3 10	3 01	2 87	2 80	1 60	18 84 kg/du
K_2O	0 63	2 31	7 10	8 47	11 5	15 79	18 72	21 21	14 65	7 20	107 6 kg/du

10 Irrigation schedule	
11 Harvesting date	For high lands 1/6 – 15/12 For Jordan valley North(1/1 – 1/5),middle(1/1-1/5),south(1/1-1/6)
12 Storage	Storage conditions for full-ripened tomato 8-10 C at 90-95% RH for 3-7 days Storage conditions for firm (not fully ripened) tomato 13-21 C at 90-95% RH for 1-3 weeks
13 Additional information needed to grow crop	



Best Management Practices
For
Sweet corn grown in open fields



Best Management Practices (BMP) are the best recommended practices for growing a specified crop These recommended practices are based on research and experience and apply to the specified crop under the specified conditions These recommended best management practices are not the only way to grow a crop but are the best way determined by the authors of the BMP The BMP may change as additional research becomes available

Author Dr Majid Fandi, Director of irrigated agriculture research program at the National Center for Agricultural Research and Technology Transfer (NCARTT) Mr Galib shalaldeh, field crops researcher at NCARTT , P O Box 639 - Baqa' 19381 Jordan - Tel 4725411-4725461 - Fax 4726099 , E-mail majfan@usa net

Consultants

Best Management Practices for growing **Sweet corn**

Comments This is a BMP for sweet corn grown in the open field in Jordan

Steps	Recommendation
1 Plant variety	Merit, NK 199 , Jochief and Bonanza F1
2 Planting date	15, March
3 Plant configuration (spacing) depth of seed	70-75 cm between rows , 25 cm between plants , 3-5 cm depth
4 Field preparation	Moldboard plowing + Discking + Furrow
5 Pre-plant fertilizer	DAP 300 kg/ha
6 Pre-emergence herbicide	---
7 Monitoring for diseases	At seedling , Elongation , Flowering and seed setting stage
8 Post-emergence herbicide	Broad leaf herbicide Ester-D,4 (2,4-D)
9 Post-emergence fertilizer application method and amount	Urea , row banding 16N/Dunum
10 Irrigation schedule	The first month 60 m^3 /du , next 15 days 100m^3/du , next month 200m^3/du
11 Harvesting date	70-75 days after planting , harvest on 70-75% water content in the seed
12 Storage	Canning to store it fresh , you need to can
13 Additional information needed to grow crop	To get red of tillers at the beginning of the growing season

Palestinian Authority BMPs

Best Management Practices
For
Pepper grown open field

Best Management Practices (BMP) are the best recommended practices for growing a specified crop These recommended practices are based on research and experience and apply to the specified crop under the specified conditions These recommended best management practices are not the only way to grow a crop but are the best way determined by the authors of the BMP The BMP may change as additional research becomes available

Author (Insert Information)
Consultants (Insert Information) - include name, address, phone, fax, e-mail

Best Management Practices for growing **(Insert Information)**

Comments

Steps	Recommendation
1 Plant variety	Maccabi, Royal Star – To be planted in open fields has green fruits and high production Yuel -has yellow fruits
2 Distances	160 cm between the rows, each row has two lines, the distance between the rows and plants 4-50 cm The average of seedlings will be 2100-2300/dunum The age of seedlings must be from 30-40 days
3 Land Preparation	1 30-40 cm deep plowing one month pre cultivation 2 2 10-20 cm deep cultivating of the soil 3 3 Tenderizing of the soil and making rows by using Rolivator with the Torpedo 4 Installing the irrigation network and plastic sheet malsh, according to the date of planting (The transparent used in spring and the black in summer)
4 Basic Fertilizers	1 Manure 4-6 cubes before the preparation of land 2 2 Jaroon compounds 15-12-5, 200kg/dunum
5 Controlling Weeds before growth	Methyle Bromid 10 Kg/dunum or solar sterilization 30-40 days before cultivation
6 Controlling of Diseases	1 Bacterial diseases 2 Powdery mildew 3 Thrips 4 Red spider mites 5 Sclorotenia 6 Botrotis 7 Sun scald 8 Nematode
7 Head Fertilizers	1 The following quantities to be added weekly per dunum from the beginning of cultivation – flowering - Sulfate ammoniac 7-10 kg - Phosphoric acid 2 5 liters - Potassium nitrate 5-6 kg,

	2 The following quantities to be added weekly form the flowering time-the end of knotting - - Sulfate ammoniac 10-14 kg - Phosphoric acid 1 5-2 liters - Potassium nitrates 2 5-3 kg, 3 The following quantities to be added weekly per week since the swelling of the fruits and during the picking process - Sulfate ammoniac 8-14 kg - Phosphoric acid 1 5-2 liters - Potassium nitrates 3-3 5 kg, 4 One kg Sequestering (iron) and of the micro elements to be added during the season
8 Irrigation	Every dunum needs 40-80 % of the daily evaporation average according to the age of the crop
9 Harvesting	Harvesting starts 50-60 days after the cultivation of the seedlings according to the type and area and continues for two months

Last printed 09/14/99 9/14/99 11 54 AM

Best Management Practices
For
Planting Cucumbers in Greenhouses

Best Management Practices (BMP) are the best recommended practices for growing a specified crop These recommended practices are based on research and experience and apply to the specified crop under the specified conditions These recommended best management practices are not the only way to grow a crop but are the best way determined by the authors of the BMP The BMP may change as additional research becomes available

Author (Insert Information)
Consultants (Insert Information) - include name, address, phone, fax, e-mail

Best Management Practices for growing **(Insert Information)**

Comments

Steps	Recommendation
1 Plant variety	Early knotting (Partino Carpi)- Winter types – with strong and thick branches such as, IV-40, Barakah, Express, Alaska, Extram and improved Average of production 8 tons/dunum Spring types, little branches, such as Uval, sryng, Ambid bribal Autumn types, little branches and weak green growth such as, IV-36, Ringo, Dinar, Ambid and Marid
2 Planting date	End of August – October, concentrated production types such as IV-36 October – December winter crops January – February concentrated production types (spring types)
3 Preparation of Land	Plow the land early and expose it to the sun for sufficient period of time In the fields that have been planted for many years, it is recommended to plow it by the deep vibrating plough (Sub-Soiler) in order to disjoin the solid beds
4 Distances of cultivation & the number of seedlings	Winter types – 45-50 cm between the seed ling and the other and 120-150 cm between the lines, thus the number of seedling/dunum will be 1200-1300 Production concentrated types 45-50 cm between the seedlings and 50-60 cm between the lines, thus every terrace will have two lines and the number of seedlings will be 2200-2400
5 Basic fertilizer	It is recommended to add - Compound fertilizer Jaroon 15-12-5, 200-300 g/d precultivation - Manure, 10-12 cubic meter (1/3 paltry manure and 2/3 cattle manure) - The land will have to be plowed once again, in order to cover the manure and the fertilizers, then to be irrigated 50-70 cubic meter/dunum before carrying out the serialization process
6 Diseases	1 Powdery mildew 2 Downy mildew

	3 Grey mold 4 White rot 5 Fungal wilt 6 Nematode 7 California trips 8 White fly 9 Aphid 10 Red Spiders
7 Controlling of weeds prior to its growth	Sterilization by Methyle – Promid and solar sterilization 50 kg/dunum
8 Fertilizers (after cultivation)	1 First Week composites 5kg/d 20/20/20 2 Second Week 100gmpure Neutrogena/d + 500 gm P205 + 100 K20/d/day 3 Third Week 200 gm pure Neutrogena/d + 100 gm P205+200 gm K20/d/day 4 Fourth Week the end of picking, double the previous qty 5 During the growing season, cucumbers need on kg of the micro-element 6 All previous fertilizers must be mixed with the irrigation waters
9 Dates of Harvesting	1 Spring and Autumn dates – after 30 days of cultivation and continues from 2-3 months 2 Winter dates – after 40 days of cultivation and continues for 4 months

Last printed 09/14/99 9/14/99 11 54 AM

Best Management Practices
For
Planting Potatoes in Open Fields

Best Management Practices (BMP) are the best recommended practices for growing a specified crop These recommended practices are based on research and experience and apply to the specified crop under the specified conditions These recommended best management practices are not the only way to grow a crop but are the best way determined by the authors of the BMP The BMP may change as additional research becomes available

Author (Insert Information)
Consultants (Insert Information) - include name, address, phone, fax, e-mail

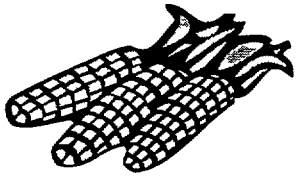
Best Management Practices for growing **(Insert Information)**

Comments

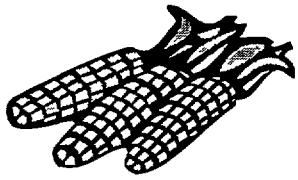
Steps	Recommendation
1 Plant variety	Siont, Mundial
2 Planting date	1 Autumn – (end of September – beginning October) 2 Spring – (end of December –January)
3 Plant configuration (spacing) depth of seed	70cm between the furrows and 20-25 between the balds
4 Field preparation	1 30-40 cm deep plowing 2 10-15 cm deep cultivation 3 Opening of furrows
5 Basic fertilizer	Manure, 200kg 15-12-5, 7-10 cubic meter/d
6 Controlling of weeds prior to its growth	Wide weeds 35-50 gr/D Sincore oceran 20cubic cm/d
7 Controlling of weeds after its growth	Thin weeds deganol 200 cubic cm/d
8 Controlling of Diseases	1 Early blight 2 Late blight 3 Yellow spiders 4 Aphid 5 Bacterial scab 6 Rizoctonia solant 7 Leak miner 8 Cut warms 9 Nematode
9 Head Fertilizer	1 1st and 2nd weeks, 300gr pure Neutrogena/day 2 3rd and 4th weeks, 300gr pure Neutrogena/day 3 5th - 8th weeks, 300gr pure Neutrogena/day

	4 9th- 10th weeks, 300gm pure Neutrogena/day 5 11th week, 300gm pure Neutrogena/day 6 during the first stages 30kg potassium nitrate to be added
10 Irrigation schedule	Potatoes need 70-80% of the daily evaporation average, including rainfall The average of addition 300-400 cubic meter/d according to the date of cultivation
11 Harvesting date	After 100-1100 days after planting
12 Storage	Period room temperature Storage in cooling rooms under 4C for local markets

Last printed 09/14/99 9/14/99 11 55 AM



Best Management Practices For Planting of Sweet Corn



Best Management Practices (BMP) are the best recommended practices for growing a specified crop These recommended practices are based on research and experience and apply to the specified crop under the specified conditions These recommended best management practices are not the only way to grow a crop but are the best way determined by the authors of the BMP The BMP may change as additional research becomes available

Author (Insert Information)
Consultants (Insert Information) - include name, address, phone, fax, e-mail

Best Management Practices for growing **(Insert Information)**

Comments

Steps	Recommendation
1 Plant variety	Jeboolyeh, Royal, XZ, Calabour
2 Planting date	1 Spring (Feb, March & April) according to the area, the Jordan Valley etc 2 Autumn Sept – Oct, Jordan Valley 3 Summer June – July, high areas 4 Winter Dec (short time covering)
3 Plant configuration (spacing) depth of seed	160 cm between the rows 50cm between the seeds (4 seeds in the same hole)
4 Field preparation	30-40 cm deep plowing 10-15 cm cultivation 10cm Rorriration and opening of the furrows by torpedo
5 Pre-plant fertilizer	Super phosphate 100kg/d
6 Pre-emergence herbicide	Atrazine 50 cubic cm prior to the growth or after in the same rate
7 Monitoring for diseases	1 Spiders 2 Cut warms 3 Leak miner
8 Head Fertilizers	1 2nd week 200 gr pure Neutrogena/day 2 3rd – 5th week gr pure Neutrogena/day 3 6th – 8th week gr pure Neutrogena/day 4 30 kg potassium nitrate to be added during the first stages All previous fertilizers must be mixed with the irrigation waters
9 Irrigation	40-8-% of the daily evaporation average, according to the age of the plant and the type of the soil
10 Picking	After 70-100 days, according to the type and date of cultivation

Last printed 09/14/99 9/14/99 11 56 AM

Best Management Practices For Carnations grown in Large Greenhouses

Best Management Practices (BMP) are the best recommended practices for growing a specified crop These recommended practices are based on research and experience and apply to the specified crop under the specified conditions These recommended best management practices are not the only way to grow a crop but are the best way determined by the authors of the BMP The BMP may change as additional research becomes available

Author Dr Theodore Sammis, New Mexico State University
Consultants Various monthly & yearly publishing

Best Management Practices for growing

Comments This is a BMP for carnaitons grown in large ventilated greenhouses in the soil in the Southern governates of Palestine (Gaza governates) The planting date start in June-August Carniation as cutting flowers are exported to Europe markets

Steps	Recommendation
1 Plant variety	Standard carnations varieties as GiGi, Castelaro, Tenipo and outher
2 Planting date	June 10 – August 25
3 Plant configuration (spacing) depth of seed	11-15 cm between seedlings (down the row) Spacing between rows 27Cn number of plants/ Dun=20000 – 24000
4 Field preparation	Cultivate the land with achisel plow one month ahead At planting, plant an seats
5 Pre-plant fertilizer	Before planting add 150-200 Kg 15 – 12 –5/dun Add Organic manure 4 –5 m3 Cultivate again and use rotatiler – irrigate between cultivation if necessary to get fine seedling bed preparation
6 Pre-emergence herbicide	Put contatiner of methyl bromide gas below plastic sheet at 70 Kg/dun Cover with plastic 4 –5 mil thickness After two days, remove the plastic and wash (irrigate) soil with 50 – 80 m3 water
7 Monitoring for diseases	Alternaria SP Rhizoctonia Sp Insects effect Rednites Black Trips California Trips Mites Damages
8 Post-emergence herbicide	Inject into drip system 1 Kg/dun of 20-20-20 daily during the first month Month Two – to the last month (May) inject 1 litter per 1 m3 in

	the irrigation water from shefer 3 fertilizer Mirco nutrients add Fe, Mg Cu Br
9 Irrigation schedule	After planting light sprinkle irrigation 2 m3 every two hours during day at the first two weeks, and the 5 – 7 m3 water daily (According to the weaather case)
10 Harvesting date	Last harvest in May – June Total growing days 300 – 330 days
11 Storage and Post harvesting treatments	Add T O G or S T S material as to extend the life shelf – and to store the cuttings 6 hours in cool place at 4 –8 C degree

Last printed 09/14/99 9/14/99 11 53 AM

Best Management Practices
For
Planting Strawberries in Large Greenhouses

Best Management Practices (BMP) are the best recommended practices for growing a specified crop These recommended practices are based on research and experience and apply to the specified crop under the specified conditions These recommended best management practices are not the only way to grow a crop but are the best way determined by the authors of the BMP The BMP may change as additional research becomes available

Author (Insert Information)
Consultants (Insert Information) - include name, address, phone, fax, e-mail

Best Management Practices for growing **(Insert Information)**

Comments This is BMP for strawberries grown in large ventilated greenhouses in the soiless culture n the sauther governarates of Palestine planting dates start in September Strawberries are for fresh market and exported crop and small amount is for processing Strawberries are picketed when ready for market

Steps	Recommendation
1 Plant variety	Sweet Charly, Tamar, hsmadar, varieties are required in the European markets
2 Planting date	September 20 – October 5
3 Plant configuration (spacing) depth of seed	40 Cm x 120 Cm x 20 Cm between seedling Each donum contains 1248 row Eash row contains 8 seedlings No of plants/donum = 9990
4 Field preparation	Each donum contains of 27 ton of Tov material + 5m3 of compost fertilizer
5 Pre-plant fertilizer	Adding Arthoforforic til it reachs 5 6 – 6 25 PH
6 Monitoring for Nutrition	1 Measure irrigation 2 Measure PH 3 Measure EC 4 Measure loss of micro nutrients 5 Adding Fe, Zn, MG (Micro Nutrient)
7 Monitoring for diseases	Spots Leaves Ramolaria Marsonia Anthracnose Powdery mildew Botryris Sp Red mites California Trips
8 Irrigation Schedule	Irrigated 2-4 times after planting, depending on the weather conditions Irrigated 1-2 times daily Irrigated amount is 60-80% of Et

9 Harvesting Date	15-20 November – May Beginning of harvesting (after 240 days of planting)

Last printed 09/14/99 9/14/99 11 55 AM

H

Jordanian Times Newspaper Article

"Conference Proposes Project to Improve Water Use in Arid Land Farming"
August 19, 1999

Conference proposes project to improve water use in arid land farming

By a Staff Reporter

AMMAN — A two-day regional workshop concluded here on Wednesday, shedding light on a proposed project to improve the efficiency of water use in arid land agriculture and to help sustain the region's most scarce resource

Organised by the Middle East and Mediterranean Desert Development Programme the seminar examined an integrated plan to help conserve develop and effectively manage the region s scarce water and other natural resources while supporting sustainable development, accord ing to Programme Director Bonnie Stewart.

The Middle East and North Africa group five per cent of the world s people but have less than one per cent of the globe's renewable fresh water experts say

Jordan the Palestinian National Authority Egypt, Morocco, Israel the International Arid Lands Consortium and San Diego University Foundation will focus on the optimisation of water distribution at regional and national levels as well as the optimisation of water use through scientific and technological solutions

Abuse of water for agricultural industrial and domestic purposes has reduced the already-limited per capita supply to one-third of its 1960 level water studies show

The plan whose USAID-funded idea was initiated in 1998 in Tucson Arizona, has two main goals The first is to improve the efficiency of water use in irrigated agriculture through the development and adoption of intensive agricultural management and irrigation technologies and strategies The second is to supplement existing fresh water supplies with alternative resources, and to release available high-quality water for municipal and industrial purposes

Under Objective 1, the project will work to develop irrigation scheduling and crop management systems for the improvement of intensive agricultural production systems throughout the region, facilitate technology transfer for the improvement of on-farm water management, promote improved protected agricultural systems for the production of high value crops using soilless cultures and adopt water-and-chemical-efficient irrigation techniques

In line with Objective 2 the scheme will develop improved water supplies and cropping systems to better utilise saline water resources and alleviate negative environmental effects

A recent study, entitled "Water for the Future" conducted by scientists from the U S Jordan the PNA and Israel warned that "fresh water supplies in the Middle East now are barely sufficient to maintain a quality standard of living"

The MEMDDP, which held several similar workshops since its establishment in 1993 through the efforts of leaders in the region is budgeted at $5 million annually for five years while additional annual inkind contributions from involved countries are estimated at around $2 5 million

55