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Water and Environment Support
in the ENI Southern Neighbourhood region

WES Activity No. N-W-PS-2

Capacity building/trainings with pilot farmers' associations and relevant communities on optimal irrigation management and practices

Report on the Training in "Management and analysis of the performance of collective irrigation networks"

Deliverable 2.2 e

Version	*Document Title*	*Author*	*Review and Clearance*
v.1	*Training Report*	*Abdelouahid Fouial*	

WATER AND ENVIRONMENT SUPPORT IN THE ENI SOUTHERN NEIGHBOURHOOD REGION

The "Water and Environment Support (WES) in the ENI Neighborhood South Region" project is a regional technical support project funded by the European Neighbourhood Instrument (ENI South). WES aims to protect the natural ressources in the Mediterranean context and to improve the management of scarce water resources in the region. WES mainly aims to solve the problems linked to the pollution prevention and the rational use of water.

WES builds on previous similar regional projects funded by the European Union (Horizon 2020 CB/MEP, SWIM SM, SWIM-H2020 SM) and strives to create a supportive environment and increase capacity all stakeholders in the partner countries (PCs).

The WES Project Countries are Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, Libya, Palestine, Syria and Tunisia. However, in order to ensure the coherence and effectiveness of EU funding or to promote regional cooperation, the eligibility of specific actions can be extended to neighboring countries in the Southern Neighborhood region.

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ABBREVIATIONS

CB/MEP	Capacity Building/Mediterranean Environment Programme
ENI	European Neighbourhood Instrument
EU	European Union
EC	European Commission
ENI	European Neighbourhood Instrument
NKE	Non-Key Expert
PCs	Partner Countries
PWA	Palestinian Water Authority
SWIM	Sustainable Water Integrated Management
SWIM-Horizon2020 SM	Sustainable Water Integrated Management – Support Mechanism Project
UNEP-MAP	United Nations Environment Program - Mediterranean Action Plan
UfM	Union for the Mediterranean
WES	Water and Environment Support
WUA	Water Users Association

1 GENERAL INTRODUCTION

Water scarcity is a crucial issue especially in the Mediterranean region, and it is of special concern for Palestine. Recognizing the importance of irrigation in the development of agriculture, several irrigation development projects have been implemented in Palestine. Still, water use efficiency at the farm level is found to be quite low. It was noticed that many schemes lack sufficient on-farm irrigation infrastructures like waterconveyors, field canals and water distribution structures. In addition, on-farm irrigation suffers from wastage in irrigation water due to the lack of proper land leveling, grading, appropriate selection of irrigation methods and adequate drainage facilities.

Also, aspects related to the operation and maintenance of irrigation schemes are not adequately addressed, resulting in the rapid degradation of irrigation infrastructures, which require frequent rehabilitation actions.

1.1 RATIONALE OF ACTIVITY

To date, the Palestinian Water Authority (PWA) has formulated one User Association according to the new law. However, there are some other requests from farmers to establish their own water user associations (WUAs), which necessitate technical assistance and capacity-building support. PWA believes that introducing effective irrigation management including operation and maintenance procedures by the Water Users Associations (WUAs) will sustain their services, reduce water losses, and increase water use efficiency. Through the WES activity, Palestinian water Authority is looking to strengthen the capacity of a two pilot water user associations (that were recently established) on optimal irrigation management using different sources of water (fresh water and treated wastewater), to increase the overall water use efficiency (i.e. at the scheme level and the plot level).

2 OBJECTIVES OF ACTIVITY

The training was implemented within the framework of activity “Capacity building/trainings with pilot farmers' associations and relevant communities on optimal irrigation management and practices” as part of the Water and Environment Support (WES) Project, funded by the European Union (EU). As part of this activity, a Training of Trainers (TOT) on Management and analysis of the performance of collective irrigation networks was organised between 2 and 6 October 2022, in the dead sea, Jordan. The training aims to prepare the concerned technical personnel active in the field to extend guidance and advice to other WUAs and to strengthen their capacity in terms of management of collective irrigation networks and its impact on productivity, and management aspects related to the use of treated wastewater; for 5 days (including field visit)

To achieve the workshop objectives, a highly dynamic, interactive, , and participatory approach was adopted, which was facilitated by Dr. Roula Khadra, Non-Key Expert (WES), Water Resources Management (CIHEAM Bari), making use of professional learning tools such as:

- Presentations by trainers and by the participants
- Facilitated roundtable discussions

- Personal and/or National perspectives
- Visual aids (videos) to facilitate understanding by the participants.
- Hands-on exercises
- Field Visits to enhance the learning and expose the participants to success stories in the management of irrigation systems at the scheme level under water scarce conditions.

3 EXPECTED RESULTS OF ACTIVITY

After successful completion of the training, the participants will:

- understand the importance of irrigation water use efficiency in the context of water resources management at the irrigation scheme level.
- know the concepts of water management at the scheme level, including irrigation water allocation and distribution (water delivery schedule) and its impact on water productivity at the farm level.
- know the concepts of planning, designing, and operating collective pressurized irrigation distribution systems to provide reliable, adequate, timely and equitable irrigation water supply.
- learn the main considerations for the optimal design of collective irrigation systems.
- know the concepts and the importance of hydraulic analyses of collective systems to provide optimal services to farmers.
- learn about the specific considerations associated with irrigation using treated wastewater reuse.
- learn about the COPAM software that allows for an optimal design and analysis of collective pressurized irrigation systems.

4 PROFILE OF THE PARTICIPANTS

Ten (10) participants participated in the training, in addition to 1 independent consultant The duration of the training was 4 days, Monday 26 September – Thursday 29 September 2022, including 1 day in the field:

Training Workshop Demographics

FIGURE 4-1: REPRESENTATION OF TRAINEES PER COUNTRY

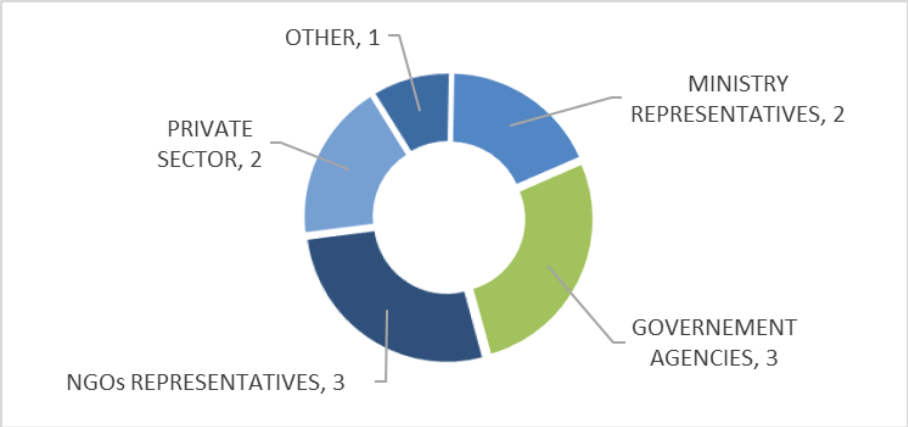

FIGURE 4-2: REPRESENTATION OF TRAINEES PER TYPE OF INSTITUTION

5 STATISTICS GENDER AND YOUTH

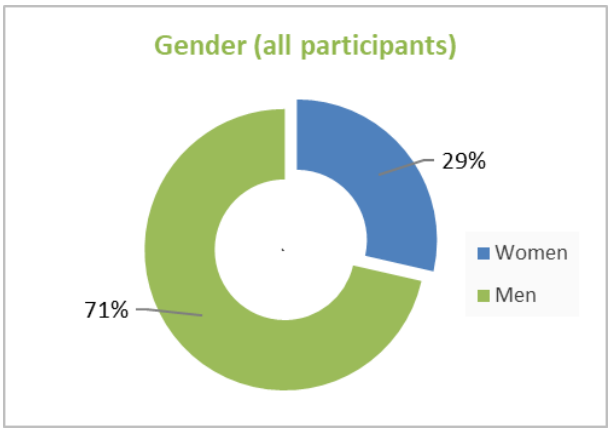

FIGURE 5-1: GENDER (ALL PARTICIPANTS)

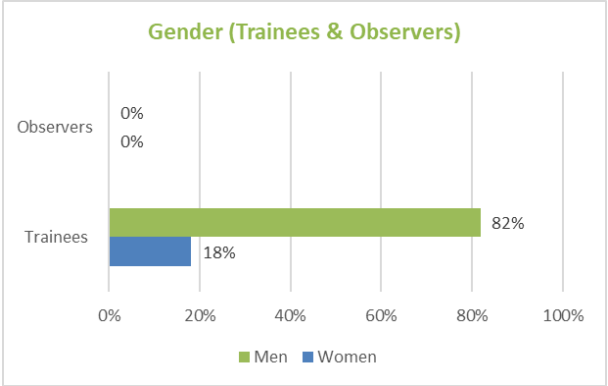

FIGURE 5-2: GENDER (TRAINEES AND OBSERVERS)

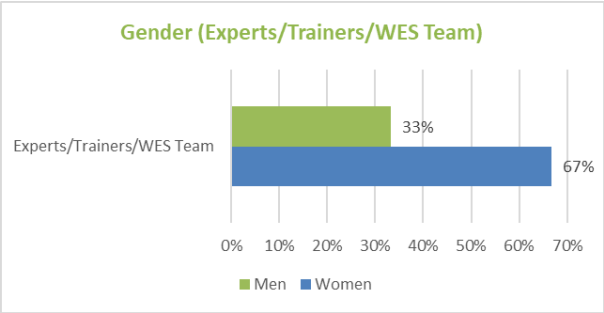

FIGURE 5-3: GENDER (EXPERTS/TRAINERS/WES TEAM)

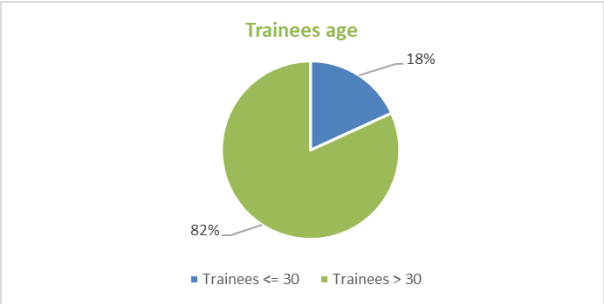

FIGURE 5-4: TRAINEES - AGE

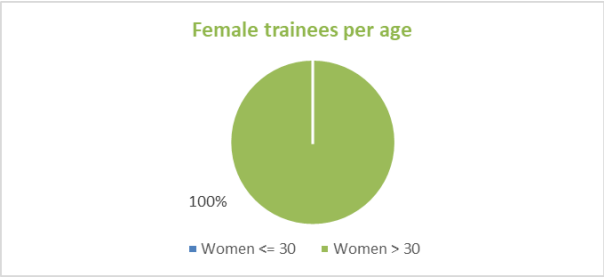

FIGURE 5-5: FEMALE TRAINEES - AGE

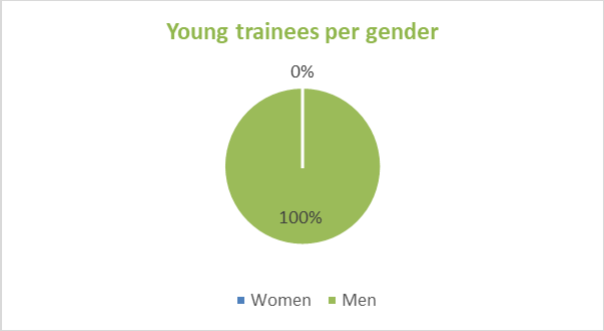

FIGURE 5-6: YOUNG TRAINEES (18-30) - GENDER

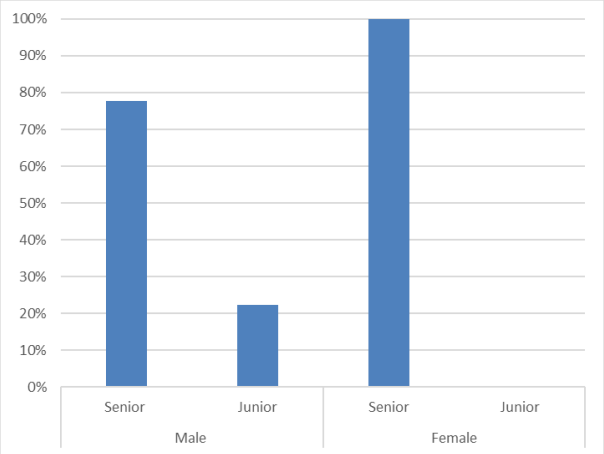

FIGURE 5-7: GENDER - POSITION LEVEL

6 EVALUATION OF THE EVENT[1]

6.1 EVALUATION RESULTS OF THE EVENT

A. Organisational, administrative, and planning issues before and during the event

A set of 11 criteria; A1-A11 (See table below) were assessed by the participants, using a qualitative description ranging between "Excellent" to "Poor".

A. ORGANISATIONAL, ADMINISTRATIVE AND PLANNING ISSUES BEFORE AND DURING THE EVENT		EXCELLENT	GOOD	AVERAGE	POOR	Total Replies	Average Score (max = 4)
A1	Appropriate handling of invitations, visa support, information sharing and smoothing obstacles	9	1	0	0	10	3.90
A2	Efficient logistics: accommodation, transportation, location of venue and interpretation	10	0	0	0	10	4.00
A3	Provision of support (if requested) for participants' preparation for the event	10	0	0	0	10	4.00
A4	Efficient and effective follow-up of preparations and progress towards the event	9	1	0	0	10	3.90
A5	Planning for the event: selection and design of methodology, programme/daily agenda and work rules	9	1	0	0	10	3.90
A6	Smooth flow of programme, efficient handling of emerging needs and attentiveness to participants concerns	9	1	0	0	10	3.90
A7	Presentations correspond and contribute to the planned objectives and are conducive to enhanced shared understanding and participation on addressed topics	9	1	0	0	10	3.90
A8	Clarity, coverage and sufficiency of concepts, objectives, anticipated outputs	10	0	0	0	10	4.00
A9	Usefulness of the distributed material	10	0	0	0	10	4.00
A10	Efficiency and effectiveness of the facilitation	10	0	0	0	10	4.00
A11	Overall rating of the event	10	0	0	0	10	4.00

[1] As Event is considered to be: training session, peer-to-peer session and study tour

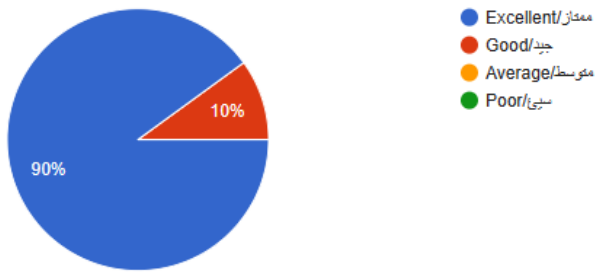

FIGURE 6-1: PLANNING FOR THE EVENT (A.5)

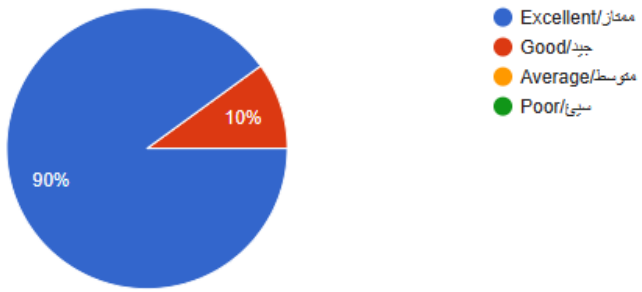

FIGURE 6-2: FLOW OF PROGRAMME, HANDLING OF EMERGING NEEDS (A.6)

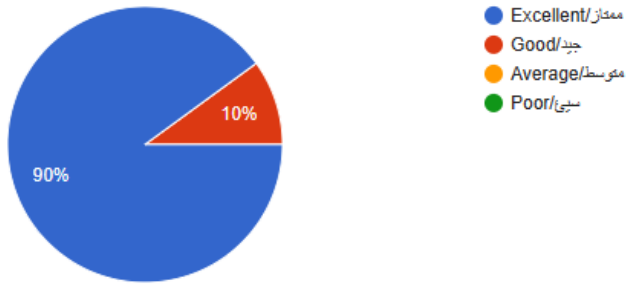

FIGURE 6-3: EVALUTION OF PRESENTATIONS (A.7)

FIGURE 6-4: CLARITY, COVERAGE AND SUFFICIENCY OF CONCEPTS, OBJECTIVES, ANTICIPATEDOUTPUTS (A.8)

FIGURE 6-5: USEFULNESS OF THE DISTRIBUTED MATERIAL (A.9)

FIGURE 6-6: EFFICIENCY AND EFFECTIVENESS OF THE FACILITATION (A.10)

B. Feedback by participants:

B.1. Coverage of the event. In your opinion did the event cover (tick one of the following): / تغطية الدورة التدريبية. برأيك هل غطت الدورة التدريبية (ضع علامة على واحد مما يلي):

9 responses

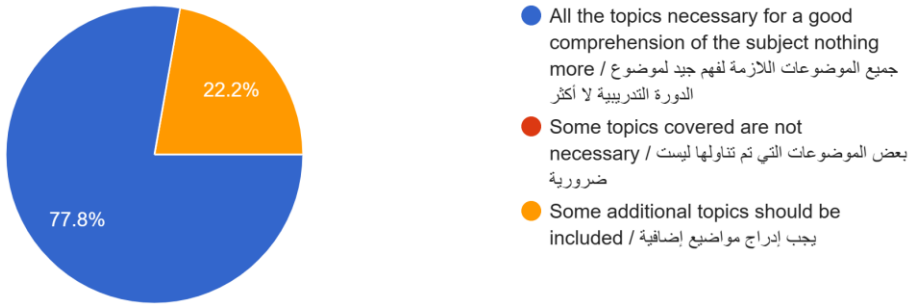

FIGURE 6-7: WORKSHOP COVERAGE

B.2. Level of difficulty (tick one of the following): / مستوى الصعوبة (حدد أحد الخيارات التالية):

10 responses

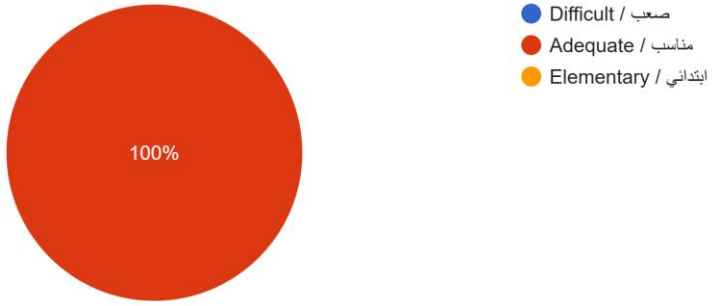

FIGURE 6-8: WORKSHOP DIFFICULTY

B.3. Length of the training. In your view the workshop duration (tick one of the following): / مدة الدورة التدريبية. برأيك ، كانت مدة الدورة (حدد أحد الخيارات التالية):

10 responses

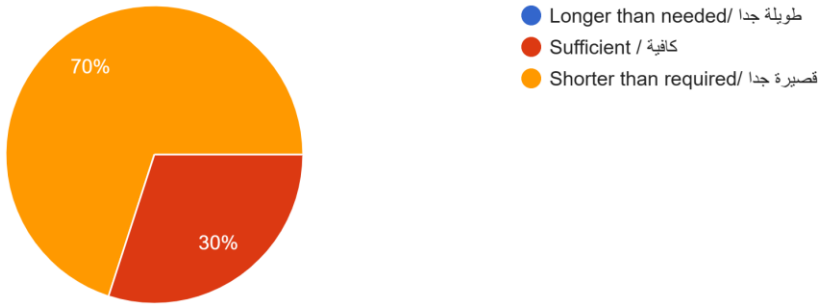

FIGURE 6-9: WORKSHOP LENGTH

Summary of most frequent statements made by the participants	
B4	**What is the most valuable thing you learned during the workshop (knowledge or skills)?**
	• Extensive knowledge of the use of the software COPAM and the methods of Labye's and Clément • Customized irrigation management and organization • Both knowledge and skills • Everything we learned was useful and new to me. • Knowing how to design and analyze the performance of collective irrigation networks, and the most important factors affecting the design.
B5	**How do you think that the current event will assist you in your future work on the subject?**
	• Planning and designing main irrigation networks, reading designs, and identifying strengths and weaknesses in the designs • Use COPAM • Application to Water Users Associations • Improvement of irrigation networks, as well as a comprehensive evaluation of existing networks and their effectiveness • Newly learned information will help in the work.
B6	**Please indicate whether (and how) you could transfer part of the experience gained from the event to your colleagues in your country?**
	• By holding workshops and training for colleagues and informing them of the content of the course and conducting training on the software • Conduct training workshops for irrigation associations. • Lobbying and advocacy to include and implement this system for water users cooperatives.
B7	**What did you like most about this event?**
	• Smooth access to information from trainers and their education and knowledge of training materials • Group collaboration by trainer and trainees • New information, excellent trainer, • The trainer, the facilitator, and the performances are all good • The method of delivering information by the trainers and distributing the activities in this training workshop in an excellent way and using practical computer programs related to what has been explained theoretically, such as the COPAM program. • Everything was great... The trainers are excellent and special. The coordination is very great. The hotel is more than excellent... The team is harmonious and wonderful... The topic of the course is at the heart of our work and our problem with irrigation water.... And how to solve part of these problems with good planning and design

Summary of most frequent statements made by the participants	
	• the practicality of the software, and the focused training.
B8	**What needs to be improved?**
	• Increase the training duration. • Conducting supplementary courses for development and continuity • Field visits to success stories, visit to the Irrigation Association in Italy to benefit from their experience, from which we can learn and gain experience • I think that the training course is of a great level, and I do not see that there is anything missing from a personal point of view. participants should be (chosen) tested for their irrigation background as this is very specialized course.

C. Remarks by the trainer

A set of 9 criteria; B1-B9 (See table below) are assessed by the trainer(s). Please use either the qualitative descriptions used in Section A or open text, as appropriate.

B1	**Efficient and effective performance and interaction by participants** Excellent
B2	**Efficient and effective cooperation and team spirit** Excellent
B3	**Level of achievement of planned objectives** Excellent
B4	**Did the event contribute to helping participants practice skills or gain knowledge related to course concepts** To a large extent
B5	**What worked well during the event** All, particularly group work
B6	**What didn't work well and why** N.A.
B7	**What components/concepts did participants seem to understand well** The importance of planning, design and analysing collective irrigation systems
B8	**Were there any components/concepts that participants appeared to not understand** No
B9	**What aspects of the event could be improved and what to be kept** All good

7 ANALYSIS OF THE TRAINING COURSE RESULTS (QUIZ RESULTS)

Changes in awareness, knowledge and skills. New acquired knowledge	Before	After	Before the training	After the training	

No. of completed Q2 (Training Assessment Questionnaire) received by the PC participants	9	9	Correct replies before the event	Correct %	Correct replies after the event	Correct %	Improvement based on right answer
Question No1			8	89%	9	100%	13%
Question No2			7	78%	9	100%	29%
Question No3			7	78%	9	100%	29%
Question No4			5	56%	9	100%	80%
Question No5			6	67%	7	78%	17%
Question No6			7	78%	9	100%	29%
Question No7			6	67%	7	78%	17%
Question No8			7	78%	9	100%	29%
Question No9			8	89%	9	100%	13%
Question No10			3	33%	9	100%	200%

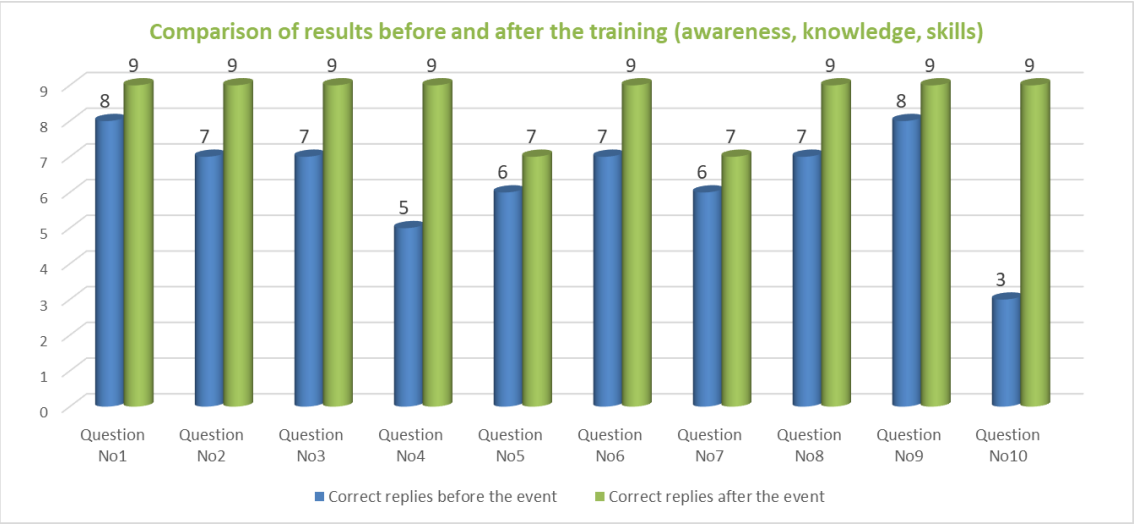

FIGURE 7-1: CHANGES IN THE PARTICIPANTS' AWARENESS, KNOWLEDGE AND SKILLS

8 CONCLUSIONS & OVERALL ASSEMENT

The training for the management of collective irrigation systems was very successful. Participants clearly expressed their interest in the subject even though it was new for them. They gained a lot of extensive new knowledge regarding the design and analysis of collective irrigation systems. This is indicated by the participants' evaluations of the training and the quiz. Because it is not a common topic in Palestine, it is highly recommended to provide this training for other technicians because of its importance in the case of Palestine.

This training has certainly achieved its objective and it is imperative that the gained knowledge be transmitted to local water Users' Associations.

The training covered the following topics:

- Irrigation: Generalities

- Purposes and Variables
- Water availability and Irrigation efficiency
- Scheduling

- Irrigation systems design: Main issues
  - Determination of Crop water requirements
  - Computation of specific continuous flow
  - Networks dimensioning: Basics
- Large scale pressurized irrigation systems: Design & Performance Analysis
  - Distribution schedules and peculiarities
  - A window on on demand schedules
- Design of on demand pressurized irrigation systems
  - One flow Regime Model: First Clément's Formula
  - Practical exercise: Irrigation system layout & Hydrants modules calculation
- COPAM: Design - Clément discahrges and optimised collective on demand network
- Systems performance analysis: Indexed Characteristic Curves and AKLA models
- COPAM: performance simulation and analysis of results
- Field visits to Jordan Water Authority and Water Users Association

9 ANNEXES

9.1 AGENDA

WES Activity No. N-W-PS-2

Capacity building/trainings with pilot farmers' associations and relevant communities on optimal irrigation management and practices

Management and analysis of the performance of collective irrigation networks

26 – 29 September 2022, Dead Sea, Jordan

Dr. Roula Khadra, Non-key expert (WES)
Water Resources Management (CIHEAM Bari)

AGENDA

DAY 1 – Roula Khadra & Abdelouahid Fouial	
09:00	**Registration of participants**
09:30	Opening ceremony and Overview of the objectives of the training by: ▪ WES Key Expert ▪ Representative of Palestine ▪ Presentation of the trainers ▪ QUIZ – Pre-training ▪ General introduction to training, concepts
10:30 -11:00	*Coffee Break*
11:00	Irrigation: Generalities - A good start ▪ Purposes and Variables ▪ Water availability and Irrigation efficiency ▪ Scheduling Irrigation systems design: Main issues ▪ Determination of Crop water requirements ▪ Computation of specific continuous flow ▪ Networks dimensioning: Basics
13:00 -14:30	*Lunch Break*
14:30	Large scale pressurized irrigation systems: Design & Performance Analysis ▪ Distribution schedules and peculiarities ▪ A window on on demand schedules
16:30	***End of Day 1***

DAY 2: Roula Khadra & Abdelouahid Fouial
9:00 Design of on demand pressurized irrigation systems ▪ One flow Regime Model: First Clément's Formula ▪ Practical exercise: Irrigation system layout & Hydrants modules calculation
10:30 -11:00 Coffee Break
11:00 Cont'd: Practical exercise & COPAM input files preparation
13:00 -14:30 Lunch Break
14:30 COPAM: Design - Clément discahrges and optimised collective on demand network
16:30 End of Day 2
DAY 3 Roula Khadra & Abdelouahid Fouial
9:00 Systems performance analysis: Indexed Characteristic Curves and AKLA models
10:30 -11:00 Coffee Break
11:00 COPAM: performance simulation and nalysis of results
13:00 -14:30 Lunch Break
14:30 Analysis of results (continued) and interface on-off farm performance
16:30 End of Training– ▪ Post Training QUIZ ▪ Conclusions et Recommandations
DAY 4 Roula Khadra & Abdelouahid Fouial
9:00 Field Visit
Evaluation of the Training of Trainers,

9.2 LIST OF PARTICIPANTS

COUNTRY	TYPE OF INSTITUTION (please use the options provided*)	TITLE (Mr/Ms)	FIRST NAME	LAST NAME	POSITION/ FUNCTION	ORGANISATION/ INSTITUTION	EMAIL
PALESTINE	MINISTRY REPRESENTATIVES	Ms	Rana	HAMMAD	Acting G.D of Regulatory Directorate	PWA	ranasoud@hotmail.com
PALESTINE	MINISTRY REPRESENTATIVES	Mr	Amro	Barqawi	Hydrologic	Palestinian Water Authority	amrobarqawi97@gmail.com
PALESTINE	GOVERNMENT AGENCIES	Mr	Osama	ABUWA'AR	Civil Engineer - Sanitation department	Palestinain Water Authority (PWA)	osamaabuwaar@gmail.com
PALESTINE	GOVERNMENT AGENCIES	MS	Reema	MASRI	HEAD OF WATER SECTION	MINISTRY OF AGRICULTURE	reemamasry@yahoo.com
PALESTINE	GOVERNMENT AGENCIES	Mr	Bahaa	KHADRAH	HEAD OF WATER SECTION	MINISTRY OF AGRICULTURE	baha_khader@yahoo.com
PALESTINE	PRIVATE SECTOR	Mr	Ghassan	GHANEIM	WUA	WUA	PPP_1982@hotmail.com
PALESTINE	PRIVATE SECTOR	Mr	Hisham	KHALILIA	WUA	WUA	baha_khader@hotmail.com
PALESTINE	NGOs REPRESENTATIVES	Mr	Naseh	SHAEEN	Coordinator	Agriculture Development Association (PARC)	naseh.shahen@pal-arc.org
PALESTINE	NGOs REPRESENTATIVES	Mr	Mohammad	MARI'E	Project Manger	Palestinian Hydrology Group	mohamadphg@yahoo.com

COUNTRY	TYPE OF INSTITUTION (please use the options	TITLE (Mr/Ms)	FIRST NAME	LAST NAME	POSITION/ FUNCTION	ORGANISATION/ INSTITUTION	EMAIL
						(PHG)	
PALESTINE	NGOs REPRESENTATIVES	Mr	Abdullatif	KHALED	Project Manager/Water Supply Engineer for Irrigation & Drinking Water Projects	Palestinian Hydrology Group	phglatif@yahoo.com
PALESTINE	OTHER (including Diplomats, Consultants, Members of Parliament etc)	Mr	Fawzi	ABDOH	Consultant	Freelancer	fawziabdoh@yahoo.com

9.3 QUIZ FORMS

WES Activity No. N-W-PS-2

Capacity building/trainings with pilot farmers' associations and relevant communities on optimal irrigation management and practices

Management and analysis of the performance of collective irrigation networks

26 – 29 September 2022, Dead Sea, Jordan

Dr. Roula Khadra, Non-key expert (WES)
Water Resources Management (CIHEAM Bari)

QUIZ

1. The water content where a crop is expected to start experiencing yield reduction is called the yield threshold (YT) and the difference between Field Capacity (FC) and YT is called the YT Depletion (YTD).

   ☒ True

   ☐ False

2. An evaluation of the Daily Net Irrigation Requirements allows the definition of the peak month. This value should be affected by an efficiency coefficient and converted in l/sec/ha, which is the value used for the collective irrigation network design.

   ☒ True

   ☐ False

3. The design of collective irrigation systems considers initially two critical and technical issues: Availability of water & Gross Irrigation Requirements.

   ☒ True

   ☐ False

4. A collective irrigation system with rotational schedule can better meet the water needs of crops as compared to other methods of water distribution.

   ☐ True

   ☒ False

5. The design and specifically the calculation of flow rates/discharges in a collective irrigation system does not depend on the adopted irrigation schedule.

   ☐ True

   ☒ False

6. The cost of an irrigation network is a performance indicator.

   ☐ True

   ☒ False

7. The performance analysis of a collective irrigation system considers the service provided to the terminal/hydrant/FTA for proper operation of the irrigation system at the plot.

   ☒ True

   ☐ False

8. A collective on-demand irrigation system operates 24 hours a day during the peak period to meet crops needs.

   ☐ True

   ☒ False

9. The challenge in the design of collective irrigation systems is in the optimization of the diameters.

   ☐ True

   ☒ False

10. The analysis of the performance of collective irrigation systems is carried out only on existing and/or in operation systems.

    ☐ True

    ☒ False