WASTEWATER REUSE
GAZA STRIP - PALESTINE
2003-2012: LESSONS LEARNT

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2003 – 2007: first reuse experiment (1)

OBJECTIVES: **CREATION OF TECHNICAL REFERENCES**
two different pilot sites

	BEIT LAHIA	SHEIKH EJLEEN
Wastewater origin	Pumped directly from the former wastewater lake 	Conveyed from Gaza city wastewater treatment plant and stored in an irrigation pound 
Crops	Fodder crops (nearby bedouins breeders)	Citrus trees (local market)
Areas	1st phase: 17 dunums 2nd phase: 25 dunums Control block: 3 dunums	12 dunums Control block: 3 dunums
Farming structure	Originally non agricultural land Managed by workers	Privately owned land managed by the farmer himself who used to irrigate from his own water well

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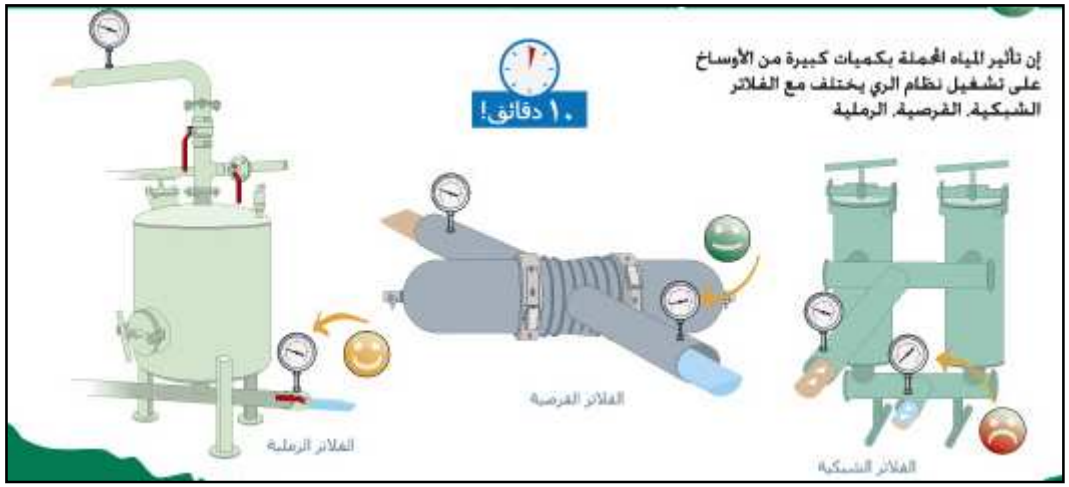
POOR WATER QUALITY

	BEIT LAHIA	SHEIKH EJLEEN (irrigation pound)	Palestinian standards
BOD5 (mg/L)	57	34	45/60
COD (mg/L)	119	76	150/200
TSS (mg/L)	64	38	40/50

MINIMUM IRRIGATION REQUIREMENTS



2003 – 2007: first reuse experiment (3)

MONITORING PROGRAM TO DEMONSTRATE:

- Technical feasibility of irrigation practices: best irrigation practices (easy to use, water savings oriented, safe for farmers, etc.)

- Safety of the reuse for farmers, consumers and the environment: lab analysis for water, soil, and products (crops and animals)

- Economically profitability: monitoring the production costs and yields and comparing them to control blocks

- Social acceptability: from the farmers, the consumers and the nearby population

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2003 – 2007: first reuse experiment (4)

SHEIKH EJLEEN RESULTS

WATER

Sanitary risks

FC > Palestinian standards

Salinity risk

EC WW	2.98
EC GW	2.39

Water loaded in fertilizing elements

No heavy metals

FARM MGMT

Drippers and filtration unit compulsory:

-Uniformity: 87%
- average flow per drippers: 3.5 L/h

Adding 10% leaching fraction

No fertilization needed

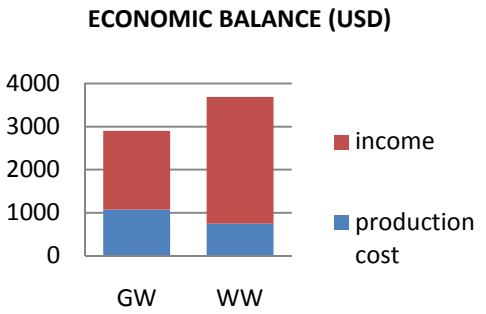
Average yield increase

+62%

GLOBAL IMPACT

Good sanitary production

Controlled soil salinity



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2003 – 2007: first reuse experiment (5)

BEIT LAHIA RESULTS

WATER

Sanitary risks

NUL

Salinity risk reduced
Sandy soil with important drainage

Water loaded in fertilizing elements

No heavy metals

FARM MGMT

Drip irrigation not compulsory

Open tube system recommended

No need for fertilization

	Crop export (Kg/du/y)	Water input (Kg/du/y)
N	372	587
P	30	32
K	287	396

GLOBAL IMPACT

Good sanitary production

More follow-up on cattle needed

Gross product (NIS/du/y)	3,200
Variable costs (NIS/du/y)	1,601
Fixed costs (NIS/du/y)	583
Added value (NIS/du/y)	1,016

2003 – 2007: first reuse experiment (6)

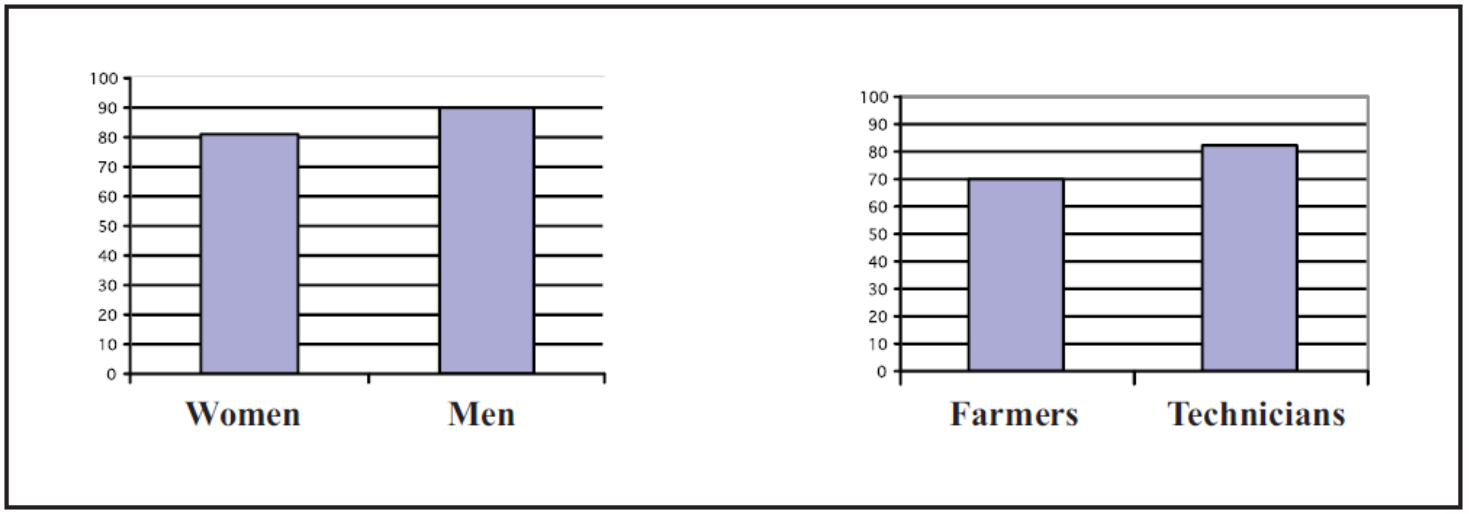
AWARENESS CAMPAIGN

- **400 farmers** trained (TWW reuse conditions mainly)

- **50 Palestinian professionals** trained (MoA, PWA, NGO's) on TWW reuse management (irrigation designing, filtration management, etc.)

- More than **1,100 people** leaving nearby for public acceptance for the results (DVD made by the project on purpose)

Acceptability of the wastewater reuse in the Gaza strip by the public, farmers and professionals:



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2003 – 2007: first reuse experiment (7)

CONCLUSIONS

+

TECHNICALLY FEASIBLE
(following recommendations especially in Sheikh Ejleen)

ECONOMICALLY PROFITABLE

SOCIALLY ACCEPTED

NO SANITARY RISKS

-

VARIABLE WATER QUALITY

CONSISTENT MONITORING NEEDED

BEIT LAHIA SITE NOT SUSTAINABLE (not agricultural land and transfer of wastewater lake towards BH)

EXTENDABLE

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2009 – 2012: extension in Sheikh Ejleen (1)

CONTEXT

- POST 2009 WAR

- PILOT PROJECT DESTROYED (70%)

- PRIVATE WELLS DESTROYED

- NO WATER SOURCE ANYMORE

-WILLINGNESS FROM FARMERS TO REUSE WW FOR IRRIGATION

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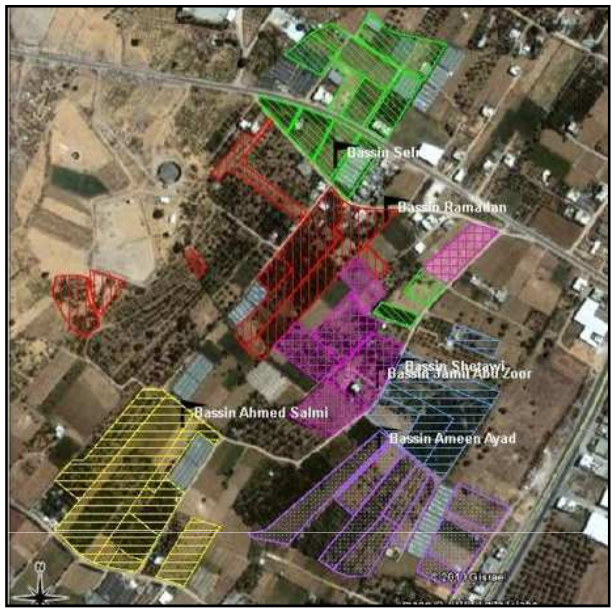
2009 – 2012: extension in Sheikh Ejleen (2)



Phase 1:

-180 dunums irrigated with wastewater

- Provision of pumps, filtration units, dripper line (as recommended)
- 35 farmers organized in 6 “irrigation units”
- Establishment of the wasteWater Users Association (wWUA)

Phase 2:

-Additional 150 dunums irrigated with wastewater (South of the P1)

- provision of pumps, filtration units, dripper line (as recommended)
- Around 20 farmers organized in 3 “irrigation units”
- Integration into the wWUA

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2009 – 2012: extension in Sheikh Ejleen (3)

9 IRRIGATION UNITS

- Geographically and/or family gathered
- Heterogeneous cultivated area
- Mainly citrus and olive trees
- Each unit is composed of a storage pound, a pump, a filtration units and dripper line. All equipments were dimensioned according to crop water requirements and irrigation practices.
- Collective use of the equipment
- Farmers are linked by a MoU

2 OPERATION MODES

- 6 irrigation units operated by 1 manager (farmer of the group) who:
    - operates
    - maintains (filters cleaning)
    - pays the overall costs
    - recovers the cost from the other users
- 3 units operated by every farmers for their own irrigation needs.
- No maintenance costs charged to the water users.

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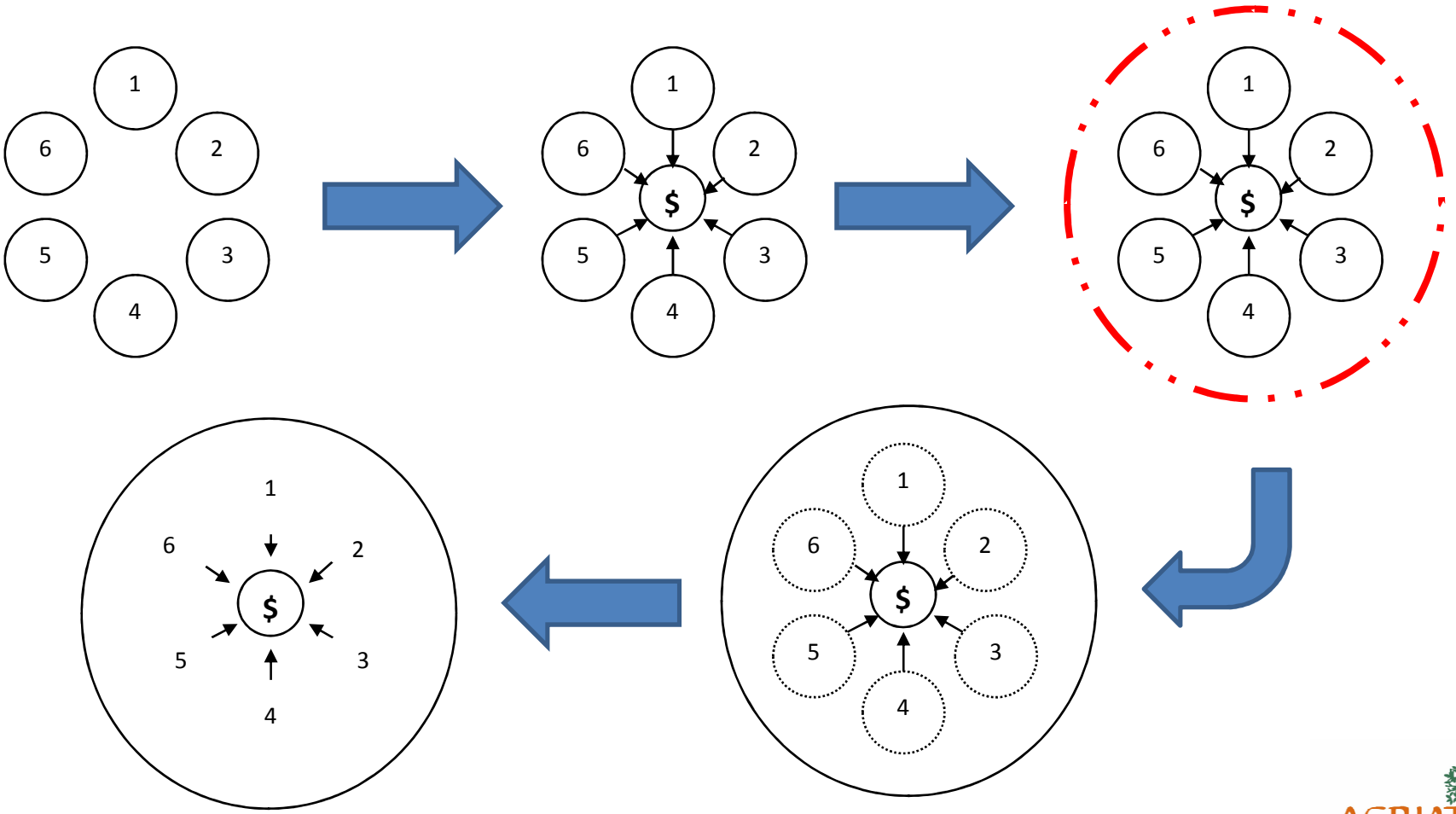
2009 – 2012: extension in Sheikh Ejleen (4)

wasteWater Users' Association establishment: A step by step building process



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Achievements of the wWUA

- Officially registered in the ministry of labor as a cooperative.

- Internal regulations/statutes enabling the wWUA to manage a collective irrigation network supplied by wastewater.

- Critical mass of farmers who are registered members of the cooperatives, more are to come once the Phase 2 project will be completed.

- Strong commitment for wastewater reuse following specifications.

- First successful experience of shared management of irrigation equipments (at a moderate scale) and cost recovery.

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2009 – 2012: extension in Sheikh Ejleen (6)

Limits / Difficulties

- Inconsistent wastewater supply & quality .

- Bad quality of irrigation equipment manufactured in Gaza (especially sand filters).

- wWUA not organized enough and not technically skilled for the management of a fully-collective distribution system.

- Limited Palestinian experience of management of collective pressurized network for agriculture (ex: Jericho – failure)

- Wastewater is free – it will be difficult to turn back and make the farmers pay for the wastewater (unless they receive an excellent service quality).

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Wastewater reuse: ways forward

WASTEWATER QUALITY

Need to continue supplying wastewater at Palestinian standards

WASTEWATER SERVICE PROVIDER

Define the wastewater service provider and its responsibilities (CMWU? GCWWTP?)

wWUA

Continue empowerment, encourage maintenance cost recovery (for anticipation) and develop its technical skills in water distribution network management

INSTITUTIONAL BUILDING

Establish a body of concerned authorities, including wWUA representatives

IRRIGATION NETWORKS

Build the appropriate water distribution network (conveyance from TP to farm and for irrigation)

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