DAMIAH INTERVIEW

Introduction

During summer 2005 an inquiry was carried out with the farmers in the whole area of Damiah, based on questionnaires prepared by the NCARTT and revised together with the IRWA team.

The area and the irrigation system

The area is highly specialized in production of full field vegetables, which cover the great majority of the territory, from September/October up to May/June.

The units - around 3-4 ha each - are 121, so that the whole area is as large as 350-400 hectares.

The Damiah irrigation system originates from the Turnout (TO) 70 on the King Abdullah Canal (KAC) and receives water from Yarmouk River (at least the left-over one) mixed with the treated one from King Talal Dam.

Out of a simple iron-bar screen, cleaned occasionally by hand-rake, there isn't suitable filtering system.

The main pipeline is very long, more than 11, 0 km, and there are about twelve sub-mains and other smaller laterals, serving separate small units.

The gradient between the KAC and the last served unit is higher than 100 m.

The Survey

It was carried out among the whole farmer's community, which resulted to be formed of 41 families.

The questions covered several aspects: social and economical (farmer's age, family, members of family involved in the farm's work, source of external income, full time/part time work, costs of technical inputs etc.) as well as other technical aspects.

ANNEX 1 Copy of the questionnaire

ANNEX 2 Tables summarizing the results of some single questions, related to the in-farm water use and management, linked to the IRWA Project's mission in Damiah.

ANNEX 3 **O**utline of the main Problems and Suggestions emphasized by Farmers.

ANNEX 4 Note about sand filters

ANNEX 5 Some preliminary subjects for training courses

SUMMARY OF MAIN HINTS RELEVANT TO THE IRWA PROJECT

a) In-Farm water management:

- The in-farm water distribution network is assembled yearly and disassembled at the end of crop cycle.
- The assembling of the lines, both primary and secondary ones, and of the pumping unit as well is approximate, without any calculation of head and flow, so that nobody knows the volume of water provided to the crop or to each definite farm plot.
- Tools intended to measure the quantity of irrigation water supply to single field or crop are lacking.
- The water quantity provided to the crops is according to some personal experiences and to the visual control.
- Criteria such as water scheduling, crop coefficient, ET values, soil retention capacity and related available water quantity, are just about unknown.
- Out of two, all farms are provided by water basins. The reason being that water is supplied twice or 3 times weekly, for roughly 8 hours; hence the farmer needs reservoirs.
- Filters don’t equip Twenty three farms, over 41.
- Then farms only clean the filters according to pressure gauges, whilst fifteen farms clean the filter after any irrigation.
- Twenty five farms flush the whole main lines and dripping lines units after any irrigation.

- At a cost of about 400 JD/do, many farms replace the dripping lines yearly or every two years.

Many FTA's are clearly tampered: here, for instance, is to notice that there are two bolts only left - over 8 - for to fix respectively the water meter biflanged fitting (dark red), the flow limiter fitting (orange red) and the open pipe stub end (right).

b) Water quality

According to the farmer's perception and practice, the provided irrigation water appears to be of very low level, mainly due to

- *Turbidity* (silt and clay particles) and
- *Chemical pollution*.

c) Main critical points highlighted by farmers

- *Water quality/quantity and*
- *Marketing*

Both are hold in the same way responsible for the main constraints the farmer has to face.

d) Detrimental point highlighted by the enquiry

- *Very poor relationship between farmers and extension.*

The great majority of farmers don't have any connection or assistance from the public Extension Service.

TABLES

(See Annex 1 for full data).

TABLE 1: THE FARM - NUMBER OF UNITS AND TOTAL AREA

Technical data, relevant to the IRWA Project, are:

- Five farms only, over 41, have protected crops by plastic tunnels. This doesn't allow to perform the number of demonstration plots or hectares (30), planned by the IRWA Project.•

- Beside the number, the type of plastic tunnels used locally (single, 8-9 meters wide) doesn't allow their use as rainwater collector, necessary for to reload the small (about 35-40 m^3.) dismountable basins.

For to met this goal, multispan tunnels are required, equipped of collectors at the discharge points of the valleys, connected with the reservoir reloading pipe.

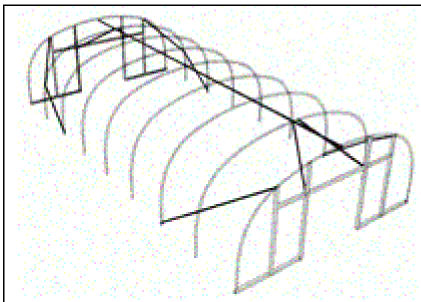


Fig. 1: traditional single tunnel

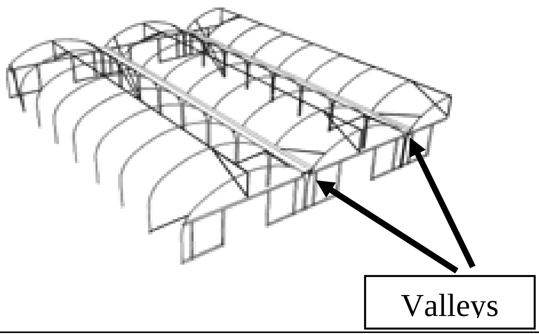


Fig. 2: multispan tunnel

- The total resulting declared area - 5.203 donums - doesn't match the one registered by JVA and exceeds it by 1.663 donums. On the contrary, the area goes enough with the one ascertained by GTZ (5.000 - Progress Report 2002-2003). The

• Among the activities of the IRWA Project, there was the establishment of 30 demonstration plots, each provided by rainwater mobile catchment basin, filtering unit and drip irrigation system.

exceeding number may be originated from some donums reclaimed and others laying outside Damiah, but cultivated by the same farmer.

- Farm surface: there are 22 farms between 30 and 60 do, 12 between 61 and 150 do, and three farms between 151 and 250do and 4 over 250 do.

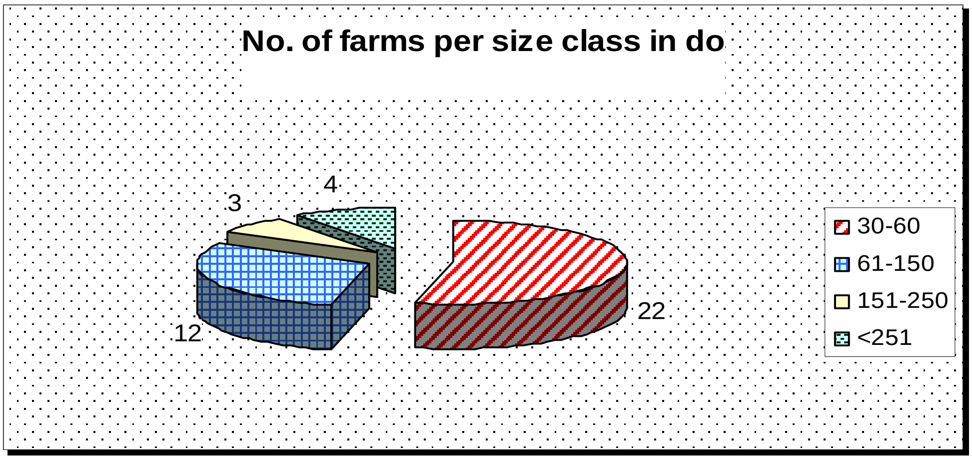


TABLE 2: THE FARM FAMILY

Those data are mainly related to social aspects.

Relevant for the IRWA Project (especially for the extension approach) are some aspects like the age (11 only are under 30 years) and the number (35) of the ones occupied fulltime in the farm.

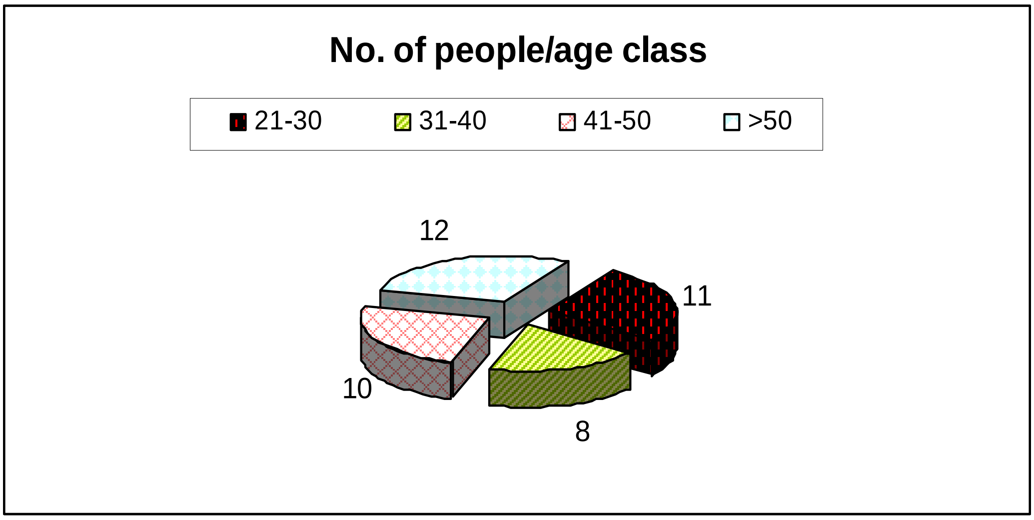


TABLE 3: WATER QUALITY

Question: *Which are the characteristics of irrigation water provided by King Abdullah Canal?*

3.1 General Appreciation

	Good	Bad	Fluctuating
No.	6	34	1

The few replies “Good” are actually not realistic, unless those people are getting water from somewhere else. The general opinion is unvaryingly opposite.

The unique “Fluctuating” is likely the most trustworthy. In fact, according to the season and the flow, the variation in water quality is wide.

NOTE: this reply “fluctuating” will be maintained coherently throughout this part of questionnaire.

3.2 Water Observed Characteristics

	Bad Smell	Bad Color	Turbidity	Chemical Pollution	Others
No.	15	23	30	25 *	2

* See the following table 4, where the chemical pollution from factories is uniformly pointed out by 34 people.

While it isn’t surprising the number related to the turbidity – 30 – (nor the one to the bad color – 23 -), it’s quite appalling the number – 25 – of the people perceiving chemical pollution, not in any case connected with the bad smell – 15- which is usually linked to the chemical pollution.

No needs of underlining this aspect, which, if demonstrated, will affect seriously the Jordan Valley vegetables industry.

3.3 Suggested/Adopted Solutions

	Change Source	Increasing Flow	Mixing Water	Requests/Suggestions
No.	10	6	24	Treatment Plants and efficient filtration main unit at the turnout

The most realistic behavior is also the most common concrete choice “mixing water”. In fact, many farmers buy drinkable water mixing it with the one provided by KAC. The call for suitable treatment plant, at the dam output, and for filtration unit at the turnout is common to any farmer: maybe people are not yet aware that chemical pollution of both surface and table water from factories can be cured by nothing but preventing factory’s discharge.

TABLE 4: PERCEIVED POLLUTANTS AGENTS

Questions: *do you feel presence of pollutants in the irrigation water?*
- If “Yes”, what’s the origin of pollutants?
- What will you do if pollution will increase?

	Presence of pollutants		Supposed origin of pollutants				If pollution will increase, do you will		
	Yes	No	Factory	Climate	Human activity	Other	Leave Agric.	Change crop	I don’t know
No.	35	3 *	34	2	15	1	7	21	11

* Also 3 “I don’t know”. The 6 people are the same who declared that water is good.

The great majority (35 over 41) denotes the presence of pollutants (yet again the 3 replies “No” are of thorny justification) and almost everyone (34 over 35) have the same opinion over the chemical origin.

To note that, in the previous Table 3.2, only 25 people declared this opinion.

Among them, 15 ascribe to the human activities component the polluted water.

Remarkable is the behavior of the farmer against any future increase of water pollution: only 7 will leave agriculture, while the majority - 21 -will change crop (mainly toward leafy vegetables).

The uncertain 11 people will likely join the major group, because those too are part of the people having no job choice, for economical, social or psychological reasons.

In any case, changing crop for to solve the pollution dilemma is clearly the worst option, at least beside the consumer health, but, in the market perspective, beside the good name of the whole vegetable production of the Jordan Valley.

TAB. 5: IN FARM BASINS

		Kind of Basin					
	Tot. No. of Basins	Plastic	Cement	Compacted bare soil (no plastic waterproof.)	Cost JD	Establish. date	Capacity MT
No.	84	76	6	2	500 *	**	***

* Averaged for plastic basin about 500 sq.m. by 3,5 m.
** Farmers started digging basins as early as 1975, but they are digging basins yearly or every 3 years.
*** The majority of farmers just ignore this information. Few of them (6 – all plastic basins) gave several digits, from where it had been possible to calculate an average capacity round 2.000 and 2.700 Mt.Tons.

Compacted soil basin, about 250 m^3, covered by algae. Hard maintenance

Cement basin, about 80 m^3, regularly cleaned

To note that the 6 cement basins too are of unknown capacity.

No. Basins/Farm	0	1	2	3	4	6	12	14	
No. of Farms	2	27	5	1	3	1	1	1	
No. Tot. Basins		27	10	3	12	6	12	14	84

The absence of basins in 2 farms is hardly comprehensible, unless they get water from elsewhere. The majority of farms (27) is of small size, equipped by one only basin. On the opposite, two farms are of large area, being equipped by 12 and 14 basins respectively.

TABLE 6: IN-FARM FILTERS

	Type of Filter		Cleaning controlled by Pressure Gauge			
	Screen	Sand	Yes	No	Cleaning after any Irrigation	Flushing lines after any irrigation
No.	9	17	10	9	15	25

	Both Screen and Sand	Screen only	Sand only	No filter
No.	8	1	9	23

18 farms over 41 are equipped by filters. Out of them, eight are equipped by both, sand and screen filters, nine by sand filter only and one by screen filter only.

Regarding the filters cleaning, it’s interesting to note that all farmers managing the filter back flushing by pressure meter proceed to clean the filter after any irrigation as well.

The same are doing seven farmers, not equipped by pressure meter, while the remaining two proceed to flush the whole irrigation system after any irrigation.

The filter not-equipped farms (23) proceed to flush the whole irrigation system after any irrigation.

As general comment, after inspecting several farms, we can conclude that the effectiveness of the in-farm filtration is very poor, due to two main reasons:

- the design of the filters is inappropriate and the media used as well
- the low profile of the maintenance

The ultimate result is that the dripping lines last at least two years.

About sand filter: see note in ANNEX 4

DRIPPING LINES - IN-FARM WATER DISTRIBUTION

NOTE: ***there is any water scheduling procedure: water is provided following the "experience".***

No table is reported, because the spacing, length and sometime the type of lines are different from one farm to the other and from a crop to another.

After inspection, the following picture of the issue "as it is" can be done, keeping in mind that winter/springtime vegetables are grown and the water drip-distribution system is placed at the beginning of the season (September/October) and dismantled at the end (May/June).

The system is set up roughly, without any calculation, as follows:

- The pipes material: PE, usually not indelibly labeled with specifications, useful for to identify his technical characteristics, like density (HD or BD), the pressure supported (PN) and the manufacturer.
- Dripping lines: mainly GR type (16 mm∅, built-in dripper 40 cm apart, declared flow/hour 8 liters at 1 bar). Line length around 35-40 m.
- This very short length is for to counteract the rough shaping of the irrigation system (lack of proper calculation of head, flow and related diesel/pump).

- Secondary lines (if any): ∅ 80-100 mm.

- Main line: usually ∅ ND100 - 125 mm, doesn't matter the length.

	
Diesel powered centrifugal pump - no filter	Previous year dripping lines, set away for to be reutilized next season

	
Drip lines layout, about 1,50 x 40,0 m. , settled before planting	Uneven water distribution, due to unbalanced distribution pipe system

TABLE 7: WATER COST

	Do you think that the cost Of water is			If balanced with the advantage, will you share the cost of improved water?		
	Cheap *	Right	High	Yes	No	Maybe
N.	4	10	23	23	13	5

* 4 declared to be in between cheap and right

Not surprisingly, the majority think that the cost of water is high, but the same number – 23 - is also accepting to share the cost of improved water.

TABLE 8: INCREASED WATER COST IMPACT

Question: *Do you think that the impact of increased water cost on the following factors will be positive, negative or neutral (no impact)?*

There were no positive answers.

	Productivity		Exp. Increase		More crops (rotation)		Summer crops (more)		Increase of cultivated area		Inputs Use	
	Neg.	Neutr.	Neg.	Neutr.	Neg.	Neutr	Neg.	Neutr.	Neg.	Neutr.	Neg.	Neutr.
N.	41	0	39	2	41	0	41	0	34	7	22	19

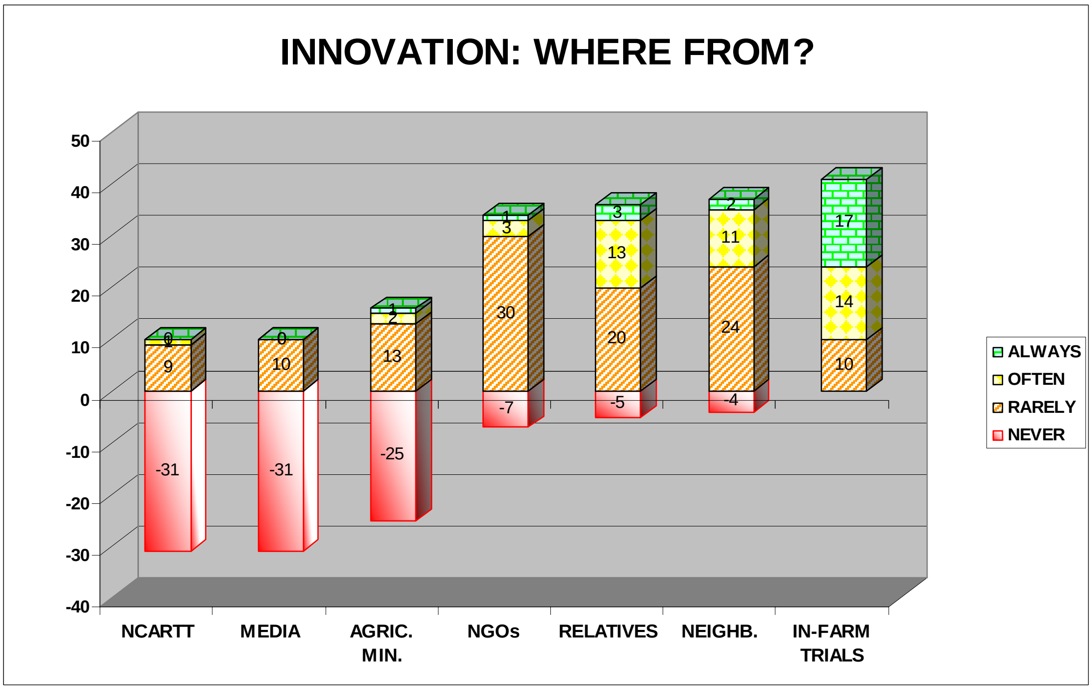
The interesting item is the one related to the inputs use, because about 40% among the farmers think that they will not reduce the actual amount of inputs, even at higher water cost.

TABLE 9: EXTENSION

Question: *Where and how are you getting information from, for innovative technology?*

		Table 10: Where and how are you getting information for innovative Technology?					
	NCARTT	MEDIA	AGRIC. MIN.	NGOs	RELAT.	NEIGHB	In-farm trials
Never	31	31	25	7	5	4	
Rarely	9	10	13	30	20	24	10
Often	1	0	2	3	13	11	14
Alw.	0	0	1	1	3	2	17

Any comment to those data is quite problematic: there is a clear fracture between the head and the end of the chain “applied research-field practice”.



The subject must be assessed deeply and at proper level:

- ***How to best be in touch between researchers and farmers?***

Which means, basically,

- ***What’s the best way for to give impact to the research effort?***

Wrapping up:

- ***How to establish an efficient extension service?***

ANNEX 1 - Questionnaire

The original copy is in the NCARTT computer

ANNEX 2 Tables

ANNEX 3

Outline of the main Problems and Suggestions emphasized by Farmers

MAIN PROBLEMS MENTIONED	NUMBER OF MENTIONS
Marketing	23
Water quality and quantity	23
Inputs cost	8
Processing factory	3
Prevent external buyers - farmers	2
No problem	2
Frost weather warning	1
I don't know	1

REMARKS:

Marketing: the best annotations would be to quote Mr.J.C.Montigaud and others: [*]

*"The objective of the work (*market investigation) *is to locate along the fresh fruit and vegetable commodity system the main technical and economical constraints, the possibilities of change and the correspondent stakes…**The main outcome is a decreasing competitivity for the Jordanian products both on domestic and foreign***

[*] "**The Fruit and Vegetable Commodity systems in Jordan: a rapid View on the Structures, Functioning and Perspectives".**
Authors: Jean-Claude Montigaud, INRA-MOISA, ENSA, 34060 Montpellier Cedex 1 (France), Julien Guillaud, Rèmy Courcier et Adrien Peyre, MREA, Ambassade de France, PO Box 35287, 11189 Amman – Dec. 2004

***markets**. The reasons are numerous: shortage and high prices for water, competition of neighbouring countries (specially through GAFTA), process of mondialisation set up by multinational companies located outside, hard to please consumers and an archaic marketing system (non competitive wholesalers markets, poor standardisation and lack of directory prices).”*

Water quality and quantity:

- quality, it is just uncertain to adopt modern and costly filtration systems: they can provide (given that proper maintenance is granted) clean water regarding the absence of physical pollutant agents, but not of chemical or organic ones. The chemical pollutants are removed only preventing them to be discharged by the factories, while the organic ones need special recycling apparatus well sized and very well maintained.
- For to prevent silt and clay entering the lines, sedimentation of the particles is required, which can be obtained by two in-farm basins: one, located in higher position, utilized as sedimentation basin (which, in turn, needs to be regularly cleaned out). A second basin, at a lower elevation, connected by siphon to the upper one, which the in-farm irrigation system would start from.

By now, it is largely practiced the regular lines flushing, including the main ones and the filters, if present, after any irrigation, with great time waste.

  - Regarding the chemical pollution, which is largely perceived by the majority of the farmers, there is the opinion that better, or new, water treatment plant is necessary, downstream the King Talal Dam. Nobody is aware that the only way for to get rid of this kind of pollution is to prevent factories leakage.

Processing factory (for tomato): this request is coming from a fundamental misunderstanding. In fact, the farmers think that this factory would be necessary for to discharge into it the tomato fruits when and if the market price for fresh tomato is very low.

This way of thinking is founded on the unawareness of what is a tomato processing factory (at least an economically one, as it should be): it needs huge quantities and regular daily programmed intake of product along 1,5 - 2 months. Clearly, it is exactly the contrary of what the Jordan Valley tomato producer believes.

In addition: whatever would be the final processed product (peeled tomatoes, concentrate, slices etc.), no doubt that, being those commodities in competition on the world market, the factory must produce top quality items at the lowest cost.

Therefore are used particular varieties of processing tomato, which provide high return and are originated from special breeding programmes, so that they have special technological properties (acidity, sugars, low presence – absence - of seeds, low water content, toughness etc.), which are scarcely all together pooled in the tomato for fresh consumption.

Last, the processing plant must run as long as possible throughout the year, thus must be shaped as multipurpose and flexible processing plant for other fruits or vegetables as well.

It means that the crop rotation of the interested area must be programmed according to the processing plant intake needs.

ANNEX 4

Sand filter

Theoretically, it is the best solution for the farms lying under the KAC water discharge, because it is able to block almost any impurity, including the organic one. For instance, this kind of filtration is preferred for drinkable water in many countries, if any filtration is required.

Unfortunately, the sand filter is the most costly and the most water wasting for back flushing, compared to other category of filters, like screen or discs.

In addition, this filter must be assembled following very strict rules, like:

- The design of the container must permit regular and uniform top-bottom stream and same regular back-flow.
- The correct shaping against the flow, for to allow a stream speed round 2,5 cm/sec.
- The media used (which is the actual filter) must be sand - silica or quartz - calibrated between 0,5 and 1,5 mm, thickness round 35-40 cm.
- The backflushing tools must allow high flow and low pressure.
- Two pressure gauges must be present on the inlet and outlet, for to measure the pressure variation in-between, in order to proceed to backflushing, when the difference rises above the value indicated by the manufacturer.
- Regular maintenance, finally, is of the same importance as the previous points.

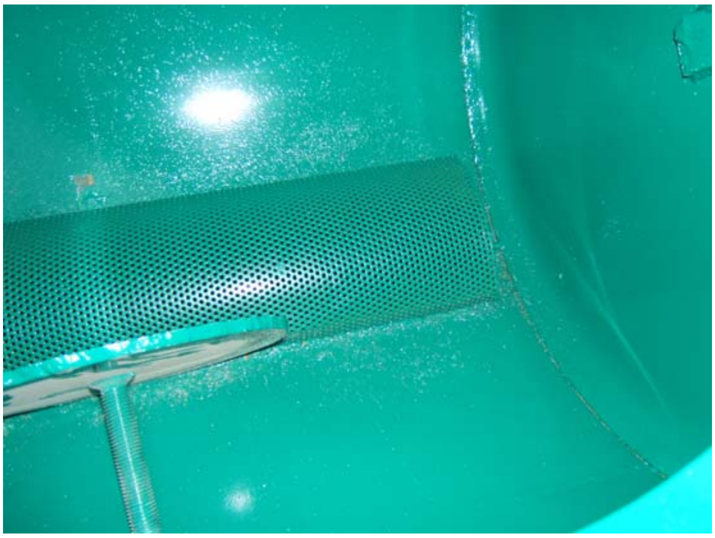
The most popular sand filters used since many years in the Jordan Valley are the cheapest ones, horizontal type, divided into two internal chambers, which can run together as filter or - alternatively - as filtering unit and under back flushing unit.

Some constraints of the most popular horizontal sand filters

1. In general they appear undersized to face the flow they have to filter. This forces excessive speed of water, thus reducing dramatically the filtering efficiency.

2. The reduced diameter of the backflushing outlet, compared with the opposite inlet diameter, is a wrong construction conception.

In fact, it means lower flow and higher pressure for the backflush water: that is the contrary needed for efficient backflushing



3. Further critical point appears in this picture: the bottom diffuser isn't the suitable one for to uniformly backflush the sand bed.
The backflushing water will clean vertically the central layer of sand only, and not the layers closer to the container curved walls.

4. Very often inappropriate media are used.

Here coarse sand (gravel mainly) set inside the container. In this case, the media filter is useless and causes head loss only.

5. Proper under-drain diffusers, which improve a lot the efficiency of backflush, thus the filter efficiency.

6. This picture shows a vertical sand filter, considered the best efficient solution for sand filtering.

This filter is made in Jordan and is provided by under-drain diffusers.

ANNEX 5 - Subjects for training courses

1 - Soil-water relationships

2 - Soil-plant-water

3 - Irrigation water scheduling

4 Others regarding irrigation materials and tools

IRWA PROJECT

IRRIGATION PRACTICES

Date: ____

Survey agent: ____

IDENTIFICATION

Name: ____

Phone: ____

Age: ☐ 20-30 ☐ 31-40 ☐ 41-50 ☐ 51 and above

Farm Unit: ______________ DA _____________ Area _______Du

Number of Years working in farming in general:

☐ 1-5 years ☐ 6-10 ☐ 11-15 ☐ More

A. WATER RESOURCES AND IRRIGATION DESIGN

1) What is the irrigated area of your farm? _________________________

2) How often you are entitled to irrigation water per week?

☐ Once ☐ Twice ☐ Three ☐ Four ☐ Five and more

3) Do you know how much water do you receive per season: YES NO

If yes how much ________________________m3

- **WATER Supply (seasonal from network -** m³/year **):**
  - Length of run (hours)………..h
  - Irrigation interval (ex. every 3 days)………..d
  - Flow rate…………. m³/s

4) Is the amount you receive:

☐ Enough ☐ Not enough

5) Have you got a flow meter along the network?

☐ Yes……Where they are located ?
☐ after the filter station
☐ at inlet to of each subunit
☐ Other:…….

☐ No

B. IRRIGATION MATERIAL AND O & M PRACTICES

a. Pump characteristics

1) What kind of pump do you have? ☐ Electric ☐ Diesel

2) When and where did you buy it?

---

3) Do you know the hydraulic characteristics of your pump? ☐ Yes ☐ No

Flow rate (m^3/hr)**:**____________,$\mathbf{P_{max}}$ (Bar)**:** ____________,$\mathbf{P_{operational}}$(Bar): ____________

4) How often is the maintenance of the pump ? ☐ Regular ☐ Irregular

☐On a weekly basis ☐ Every month ☐Every 3 months ☐ Every 6 months ☐ Every year

☐ more ☐ never

5) Explain how you check your pump:

____

____

____

☐ Good ☐ Bad

- Power (Kw)……..
- Average seasonal consumption of gasoline (liters/year)…….
- Hours of annual operating (h/year)……..
- RPM……….

b. Filtration Characteristics

1) What kind of filtration you have in the farm?

☐Sand ☐ Screen ☐ Disc

2) What type of sand filters do you have? ☐Vertical ☐Horizontal

3) Where, when did you buy it?

4) If you don't have Sand filters explain why?

☐Clean Water ☐Other filters enough ☐ Too expensive ☐ Other

5) What kind of media you use in the sand filters?

☐Gravels ☐Silica

6) How regular do you clean the sand filter?

☐ Regular ☐ Irregular ☐ depending on pressure variation

Where do you measure these pressures?

☐ inlet of filter statio ☐ outlet of filter station ☐ both

8) How often?

☐Every week ☐ Every 2 weeks **(Maybe too low)** ☐ Every month

☐Every 3 month ☐ Every 6 month ☐ Every year ☐ more

Could you elaborate on how do you proceed?

____

____

____

____

☐ Good ☐ Bad

c. Lateral and Drippers

1) What kind of drippers do you have in the farm?

☐GR ☐T Tape ☐Other

☐1l/hr ☐2l/hr ☐4l/hr ☐8l/hr ☐ don't know!

☐20 cm ☐40cm ☐ 60 cm

Flow for meter of lateral …………..l/m

Classification of Lateral:

☐Light ☐Middle ☐Heavy

- Common classification of drip line depending on the lines thickness (more thickness more cost *more "length of life*")

*You can compare the "length of utilization declared **(Ask3)"** with "dripper length of life"*

2) Do you know the operational pressure that should be delivered at the Dripper?

☐ Yes ☐ No

If yes, what is it? ___________ (Bar)

3) How many years do you keep your lines of drippers? ___________ (year)

4) Do you face any problems of clogging?

5) How do you solve this issue?

☐ C**hange the dripper lines** ☐ **Uses of acid, how often which concentration**

C. IRRIGATION UNIFORMITY ASSESSMENT

1) How did you plan your irrigation design?

☐ **Personal experience Describe** ________________________________

☐ **Technical advice: From whom?** ________________________________

☐ **Others** ____

2) How did you make the selection of pipes diameters? Choose of the followings:

☐**Pump Capacity** ☐**Pipe Lengths** ☐**Block Sizes**

☐**Type of Drippers** ☐**All** ☐ **Not of all**

3) Do you think the head losses will be increased if you use pipes with?

☐ **Large Diameter** ☐**Small Diameter**

4) Are your fields homogeneous? ☐ Yes ☐ No

5) Where do you find irrigation problems?

____

____

____

____

6) In your opinion, what are the reasons of this problem?

☐ Type of drippers (4l/hr, 8l/hr) ☐ Length of dripper lines.

☐ Pipes diameter (Laterals, manifold or mainlines)

☐ Low pressure ☐ Old equipment ☐ All ☐Others

7) Do you know what a collecting pipe is? ☐ Yes☐ No

8) Do you have pressure gauges in the farm? ☐ Yes☐ No

9) IF yes, do you use them? ☐ Yes ☐ No

10) Where are they situated?

☐ **Before and or After Filters** ☐ **On manifold** ☐ **On the dripper lines**

11) Do you know the pressure at the end of the dripper lines? If yes, could you give us estimation?

____

D. TIMING

1) How frequent do you irrigate?

☐ Daily ☐ Once a week ☐ Twice a week ☐ Other

2) How do you decide when to irrigate

☐ Fixed interval ______________________________

☐ Field observation ______________________________

☐ Soil dryness ______________________________

☐ Plants status ______________________________

☐ Technical advice: from whom? ____________________

☐ Water availability ______________________________

☐ Specific tools _______ Specify: __________________

☐According to the climate __________________________

☐ Others ____________________________________

3) Do you change the quantity per each irrigation?☐ Yes☐ No

According to the stage growth ______________________

According to the climate __________________________

Other ______________________________________

4) How do you decide the quantity to be delivered in each irrigation?

☐ Personal experience Describe __________________________

☐ Technical advice: From whom? _________________________

☐ Others ____

E. LEACHING PRACTICES

1) Do you use water for leaching? ☐ Yes ☐ No

2) When do you apply it?

Describe:______________________________________

3) How do you decide that leaching is needed?

☐ Personal experience _______________________________

☐ Technical advice: From whom? _________________________

☐ Others ____

4) On what basis do you decide the time and quantity of water for the leaching?

☐ Personal experience ____

☐ Technical advice: From whom? ______________________________

☐ Others ____

F. WATER QUALITY MONITORING

1) Did you ever analyze the irrigation water? ☐ Yes ☐ No

2) Do you analyze water on regular basis? ☐ Yes ☐ No

If yes, please specify kind of analysis _____________________________

3) Who provides you with water analysis?

Where do you take the sample of water?

When do you take the sample of water (which season)?

4) Do you think that water analysis would be useful?

☐ Yes ☐ No

5) What for?

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<u>G- Irrigation Scheduling</u>

Crop

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Cultivation time: start/end												
Irrigation interval (days)												
Irrigation duration (hours)												
Number of irrigation/half month												
M3/ha/half month												

The final water consumption will be calculated depending on irrigation uniformity % and irrigation Scheduling

Coefficient of Uniformity Measurement

Introduction

A virtue of a pressurized irrigation system is its ability to deliver a uniform amount of water to each location it serves, so that, water is applied evenly over the field, but only if it is operated and maintained properly. Because of pressure differences throughout the system and variability in emitter manufacture, even new systems may not apply water completely evenly. While a well-designed system can deliver water with a high degree of uniformity, the system must be properly maintained to keep the application uniform. The principal cause of non-uniformity in such irrigation systems is emitter clogging by particulate or organic matter, lime precipitates, or iron precipitates.

Irrigation Emission Uniformity (EU) is a measure of the evenness of the water application for good irrigation water management. An irrigation system with uniform water application means each plant will receives nearly the same amount of water during the irrigation process. As higher uniformity of application is achieved, variation in the depths applied at different points in the field differ less from the average depth. This can be an important factor, particularly for high value crops, where small variations in irrigation uniformity can cause declines in crop quality. An irrigation system with good uniformity of application saves water, because it allows you to avoid over-irrigating parts of the field while concentrating on putting adequate water on dry or other problem areas.

Procedure

The EU can be easily determined in the field by the following procedure:

1. Select a submain the represent the average operating conditions in all submains.
2. Locate 3 laterals along an operating submain; one lateral near the inlet, one lateral near the middle, and one lateral at the far end.
3. Measure, under normal operating conditions, the pressures at the inlet, near the middle and at the far end of each lateral. This will produce 9 pressure readings.
4. On each lateral, select 2 adjacent emitters at 3 different locations, at the inlet, in the middle and at the end point.
5. Measure the discharge from the selected emitters. Collect the volume for a certain time (10 min) this will produce 18 discharge readings.
6. Enter the information collected in the data sheet
7. Use the average of the lowest 4 discharge rates of all readings as the minimum rate $\mathbf{q}_4$
8. The average of all the readings is the average rate of discharge per emitter $\mathbf{q}_{av}$.
9. Calculate the EU use the following equation

$$\mathbf{EU\ \% = (q_4 / q_{av})*100}$$

High EU is achieved by maintaining a limited variation in discharge rate among system emitters. Proper maintenance of filters is vital for preserving system EU, because emitter clogging and uneven pressure distribution are the major factors contributing to disparity in discharge rate and poor uniformity. Upgrading EU could save water, power and fertilizer bills, improve irrigation efficiency and crop yield, preserve the environment, and enhance grower's net profit. Periodic evaluation of EU is recommended for monitoring system performance and pinpointing problems. It is also advisable to evaluate newly installed systems to establish a baseline for future evaluations. A simple method for the evaluation of emission uniformity is described below. The equipments needed are readily available on most farms.

Drip or trickle irrigation systems can be evaluated by using a graduated cylinder or measuring cup and measure the time it takes to catch a certain volume of water from each of several emitters throughout a system.

An evaluation of irrigation system will provide the necessary information for scientific irrigation scheduling. It will also tell if you are experiencing excessive application losses (that is, runoff, deep percolation, wind drift) or if the irrigation system needs service or improvement to increase application uniformity. The end result is water savings. Stated in a slightly different context, evaluating and improving your system will help to stretch available water further. Operate irrigation systems near their design limits to achieve peak efficiencies and uniformities.

EQUIPMENT NEEDED

1. Pressure gauge.
2. Stop watch or a watch with a second hand.
3. Plastic cup about 250 ml.
4. Plastic graduate cylinder, 100-500 ml capacity.
5. Measuring tape 100 feet long.

Uniformity Testing Data Collection Form

Part I: Personal Information

Date: ……………………….

Farmer Name: ………………………………………… **FU/DA**: ……………..

Name of Evaluator: ………………

Part II: Irrigation System Information

- **Age:………**
- **Emitters: Type………… Discharge:………….. Spacing:………**
- **Laterals: Type…………. Diameter:…………… Spacing:………**
- **Filter: Type……………. Capacity:…………… Age:………**
  Type…….........…. Capacity:…………… Age:………
  Type……………. Capacity:…………… Age:………
- **Pump: Type……………. Capacity:…………… Age:………**

- **Tentative System Layout and Measurement Locations**:

Part III: Results:

Location of Emitters on the Lateral		Inlet		Middle		Far End	
		Volume Collected ml	Discharge l/h	Volume Collected ml	Discharge l/h	Volume Collected ml	Discharge l/h
Inlet	**A**						
	B						
	Pressure						
	Time (min)						
Middle	**A**						
	B						
	Pressure						
	Time (min)						
Far End	**A**						
	B						
	Pressure						
	Time (min)						

Calculations:	
q_4	
q_{av}	
EU %	

Result interpretation for the irrigation group:

Part One: Filtration System

Part Two: Irrigation Practices

Part Two/1: Irrigation Scheduling

Part Two/2: Leaching Requirements.

Part Three: Operation and Maintenance.

Part Three/1: Filtration System Maintenance.

Part Three/2: irrigation Network Maintenance.

Classification of irrigation management

Management Level	
Very low	- No filtration or using only traditional sand filer or screen filter - No scheduled back wash - Always apply the same amount of water - No leaching is done - Changing the irrigation network every year
Low	- Traditional Sand Filter - Scheduled back wash - The amount is depending on plant behavior and climatic conditions - Leaching during the solarization process - Changing the irrigation network every 2 years
Intermediate	- Using Combination of the three types of filters - Every irrigation - The amount is depending on plant behavior, climatic conditions, and growth stage - Leaching during the solarization process and between cropping season - Changing the irrigation network every 3 years
Advanced	- Sand filter with adapted media with disc filter - Using the pressure gage reading as indicator - Using soil moisture measurements - Leaching depending on EC analysis - Changing the irrigation network over 3 years or more