Deliverable n. 7

A compilation of water use for protected cultivation in the Mediterranean, water resources and economics of storing and upgrading water

March 2001

1. Introduction

Work package 3 deals with means to ensure that irrigation water of the lowest possible quality is used, within the constraints of an economic management of the farm. In fact, a grower must take "optimal" decisions about water management, within three time-horizons:

1. Long-term (strategic), that is to choose the fitting of his farm (such as rain collection; desalinisation, disinfecting), in view of local conditions;
2. Medium-term (one year: tactic), that is to select the cropping plan in view of the fitting of the farm and of the available water;
3. Daily management (operational), that is to select which (of possibly many) water sources to use to re-fill the irrigation tank.

In all cases, a cost-benefit analysis must be performed, accounting for: the quality, quantity and price of water; the cost of improving quality on-site and the costs (in term of yield loss) of applying water of poor quality.
This deliverable is meant to collect the information needed to determine cost-benefit of possible investments at farm level, such as rain harvesting, re-use of drain water, use of agricultural waste water, reverse-osmosis, disposal of residuals. In order to collect this information in a structured way, partners were asked to fill a questionnaire developed for this purpose.

2. Method

The questionnaire is split up in 7 sections:

1. Water use
For 5 main crops: tomato, sweet pepper, cucumber, roses and melon the monthly transpiration (mm m^{-2}) of these crops must be given as well as the monthly rainfall (mm m^{-2}) and the global (outside) radiation (MJ $m^{2}d^{-1}$). For countries with protected cultivation in various climatic regions, this was done for each region.

2. Cultivation period
Most crops are not cultivated year round. The cultivation period has an obvious bearing on water requirements.

3. Saline composition
The saline composition must be known of the water sources most commonly used for irrigation, with respect to the most important ions.

4. Storage
What kind of possible storage is available, and what are the most common capacities

5. Upgrading
The techniques used for upgrading and disinfecting recirculated and wastewater. The running costs of each of these techniques and their availability & penetration.

6. Closed-system
What are the extra investment costs of closed systems in comparison with open systems and a specification of the most common system(s) in each country, and their penetration.

7. Economics
Installation, running, maintenance and amortisation costs of the various fittings.
With respect to the capital costs, it was clear during the meeting in Cairo that there are huge differences among countries in accounting for them. In particular, there was no agreement on how to account for the cost of occupying (potentially profitable) land with a water storage facility. The less controversial option seems to estimate the cost of land through a "rental price" as prevailing in each region, summed to an estimate of the profit one could get from the ground.

Results

The answers of the partners have been compiled into an Excel worksheet that can be made available to the Commission. To facilitate analysis, values are compiled (itemised) in the following tables.

country	code	city/area
Netherlands	NL	Wageningen
Italy	IT	Tuscany
Spain	ES	Almeria
Greece	GR	Athens
Cyprus	CY	South Coastal Region
Egypt	EG	Cairo
Israel	IL	Bet Dagan
Palestine authority	PA	

* Missing value
- Non existing

Rainfall [mm]								
month/country	NL	IT	ES	GR	CY	EG	IL	PA
Jan	66	50	31	55	112	5	135	135
Feb	48	41	34	41	72	4	85	85
Mar	63	37	24	36	49	2	56	56
Apr	52	81	21	22	18	1	10	10
May	61	47	15	20	8	1	3	3
Jun	68	49	10	11	2	0	0	0
Jul	75	18	1	4	0	0	0	0
Aug	71	41	2	3	1	0	0	0
Sep	67	115	6	12	3	0	2	2
Oct	72	145	25	55	29	1	16	16
Nov	81	121	33	51	52	3	84	84
Dec	80	78	19	66	120	7	146	146
year sum	804	823	221	375	466	24	537	537

Standard deviation of Rain [mm]								
month/country	NL	IT	ES	GR	CY	EG [1)]	IL	PA
Jan	28	16	31	12	58	10	*	*
Feb	27	22	24	10	34	10	*	*
Mar	20	21	26	7	25	10	*	*
Apr	25	28	18	12	16	5	*	*
May	30	30	23	23	17	6	*	*
Jun	29	20	18	25	6	4	*	*
Jul	41	19	2	20	0	0	*	*
Aug	44	32	4	25	2	0	*	*
Sep	41	45	10	19	8	0	*	*
Oct	42	70	17	26	34	14	*	*
Nov	37	32	32	26	44	19	*	*
Dec	45	49	24	20	66	50	*	*
year	154	97	31	*	110	*	176	176

[1)] deviation not available. The values given are the maximum observed rainfall during the month [mm]

global radiation [MJ/m^2/d]								
month/country	NL	IT	ES	GR	CY	EG	IL	PA
Jan	2.51	6.9	8.79	7.40	8.84	12.5	10.25	10.25
Feb	5.15	11.1	11.71	10.10	11.34	15.1	13.52	13.52
Mar	8.77	13.9	15.79	14.00	15.81	18.8	17.62	17.62
Apr	13.88	16.7	20.57	19.80	20.50	22.8	21.64	21.64
May	18.00	21.3	22.47	23.40	22.42	25.6	25.44	25.44
Jun	19.25	24.4	24.41	26.10	25.18	28.6	27.70	27.70
Jul	18.31	24.3	23.36	27.50	25.23	27.6	26.83	26.83
Aug	15.88	21.2	21.28	25.10	22.59	25.5	24.86	24.86
Sep	11.09	16.7	17.89	19.30	18.73	22.3	21.05	21.05
Oct	6.54	10.7	13.35	12.90	12.91	18.7	16.24	16.24
Nov	3.27	7.2	9.40	8.20	9.82	13.5	12.01	12.01
Dec	1.92	6.0	8.14	6.80	8.04	11.4	9.42	9.42
year sum	3798	5488	6005	6115	6136	7382	6901	6901

transpiration [mm] tomato								
month/country	NL	IT [1)]	ES	GR [1)]	CY	EG	IL	PA
Jan	27.7	-	32.7	28.0	40.0	71.9	56.0	56.0
Feb	45.5	**15.0**	37.8	28.2	60.0	87.9	55.0	55.0
Mar	74.8	45.0	**39.8**	39.9	85.0	213.9	89.0	89.0
Apr	86.1	77.0	**55.7**	82.0	120.0	243.0	106.0	106.0
May	105.9	105.0	**70.6**	123.1	180.0	285.2	140.0	140.0
Jun	102.9	123.0	-	**121.0**	-	**233.4**	151.0	151.0
Jul	105.9	-	-		-	-	-	-
Aug	76.2	-	-		-	-	150.0	150.0
Sep	75.4	15.0	30.5	-	-	30.6	124.0	124.0
Oct	54.2	36.0	73.1	20.5	-	56.1	98.0	98.0
Nov	**31.7**	31.0	52.1	27.4	**15.0**	57.6	72.0	72.0
Dec	**8.2**	29.0	32.6	28.8	20.0	66.3	59.0	59.0
year sum	794.4	476.0	424.9	498.9	520.0	1346.0	1100.0	1100.0

During part of month no cultivation
Cover is white washed
[1)] Two crops, spring and fall

transpiration [mm] sweet pepper								
month/country	NL	IT	ES	GR	CY	EG	IL [1)]	PA [1)]
Jan	22.0	-	29.9	33.2	30.0	68.8	*	*
Feb	33.0	-	33.9	29.1	50.0	87.1	*	*
Mar	66.4	12.0	-	44.8	70.0	209.9	*	*
Apr	77.2	30.0	-	92.3	100.0	237.0	*	*
May	101.3	72.0	-	112.8	140.0	275.9	*	*
Jun	97.3	95.0	-	140.7	**80.0**	228.0	-	-
Jul	98.8	132.0	**19.5**	-	-	-	-	-
Aug	69.9	-	**57.6**	-	-	-	*	*
Sep	72.7	-	118.9	-	-	30.0	*	*
Oct	54.7	-	78.9	22.1	-	53.0	*	*
Nov	**9.7**	-	45.5	32.5	**12.0**	56.4	*	*
Dec	8.7	-	30.9	35.3	18.0	65.4	*	*
year sum	711.6	341.0	415.1	542.8	500.0	1311.5	*1500.0*	*1500.0*

During part of month no cultivation
Cover is white washed
[1)] Total irrigation instead of total transpiration

transpiration [mm] cucumber								
month/country	NL	IT	ES	GR	CY	EG	IL [1)]	PA [1)]
Jan	33.7	-	27.4	35.1	40.0	74.7	*	*
Feb	43.9	-	**19.7**	44.9	48.0	93.0	*	*
Mar	82.8	15.0	-	66.5	72.0	223.5	*	*
Apr	99.9	31.0	-	121.5	120.0	249.0	*	*
May	88.9	54.0	-	224.6	205.0	291.4	*	*
Jun	119.4	84.0	-	-	-	243.6	-	-
Jul	128.3	95.0	-	-	-		-	-
Aug	59.0	-	-	-	-		-	-
Sep	89.8	20.0	**7.9**	-	-	33.0	*	*
Oct	65.9	26.0	29.9	-	-	58.9	*	*
Nov	**7.8**	30.0	38.7	13.4	**15.0**	63.0	*	*
Dec	**7.8**	25.0	24.5	17.5	20.0	71.3	*	*
year sum	827.3	380.0	148.1	523.5	520.0	1401.4	*1200.0*	*1200.0*

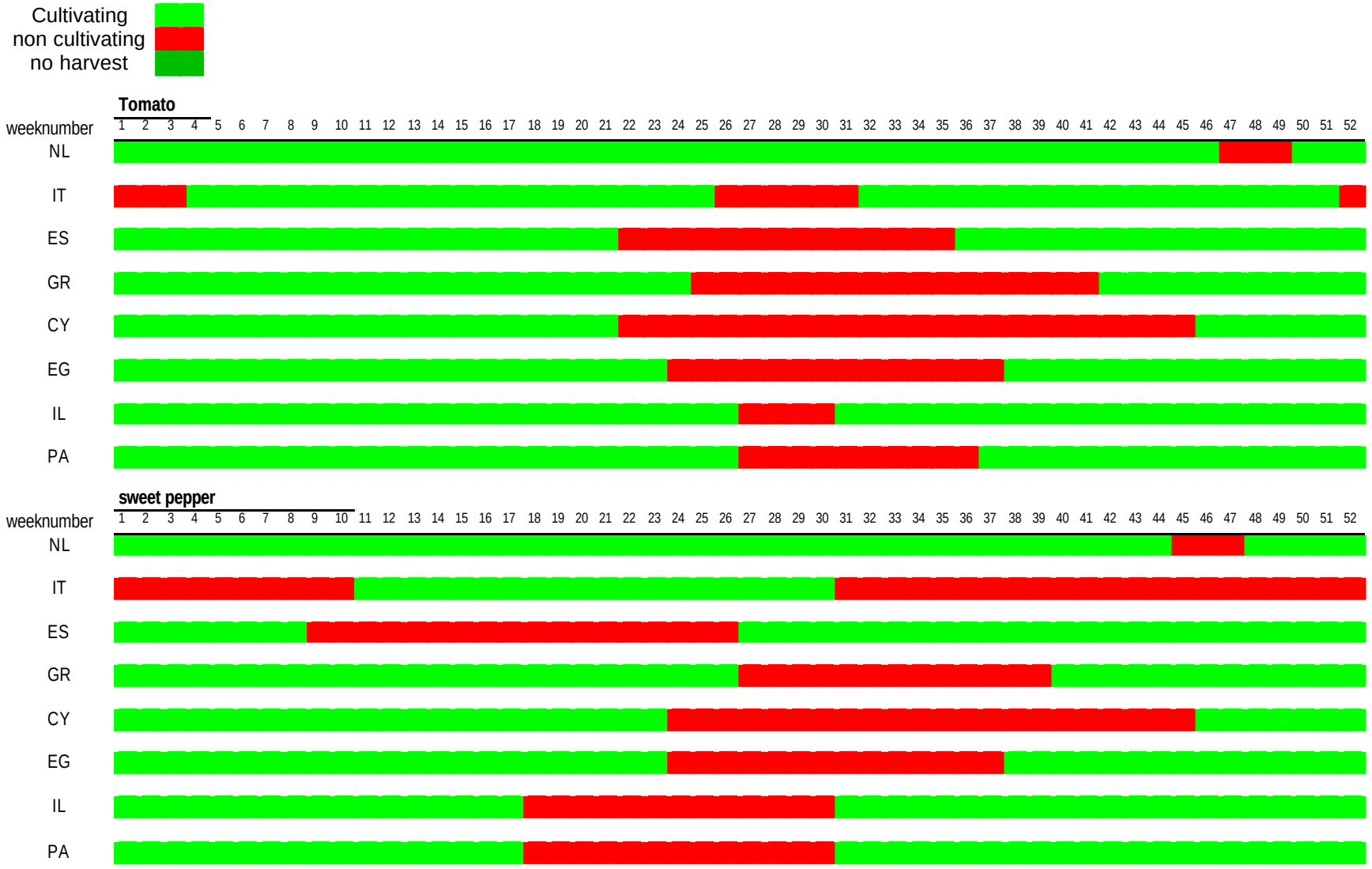
During part of month no cultivation
Cover is white washed
[1)] total irrigation instead of total transpiration

transpiration [mm] melon								
month/country	NL	IT [1)]	ES	GR	CY	EG	IL [2)]	PA [2)]
Jan	-	-	-	17.6	**15.0**	11.1	*	*
Feb	-	-	7.4	28.0	30.0	23.2	*	*
Mar	-	12.0	31.6	46.5	50.0	58.6	*	*
Apr	-	45.0	105.8	86.2	85.0	131.2	*	*
May	-	102.0	132.9	142.4	130.0	167.5	*	*
Jun	-	105.0	-	76.1	**70.0**	168.2	-	-
Jul	-	**12.0**	-	-	-	-	-	-
Aug	-	85.0	-	-	-	-	*	*
Sep	-	62.0	-	-	-	-	*	*
Oct	-	30.0	-	-	-	-	*	*
Nov	-	-	-	-	-	-	*	*
Dec	-	-	-	8.9	-	-	*	*
year sum	0.0	453.0	277.7	405.7	380.0	559.7	*1500.0*	*1500.0*

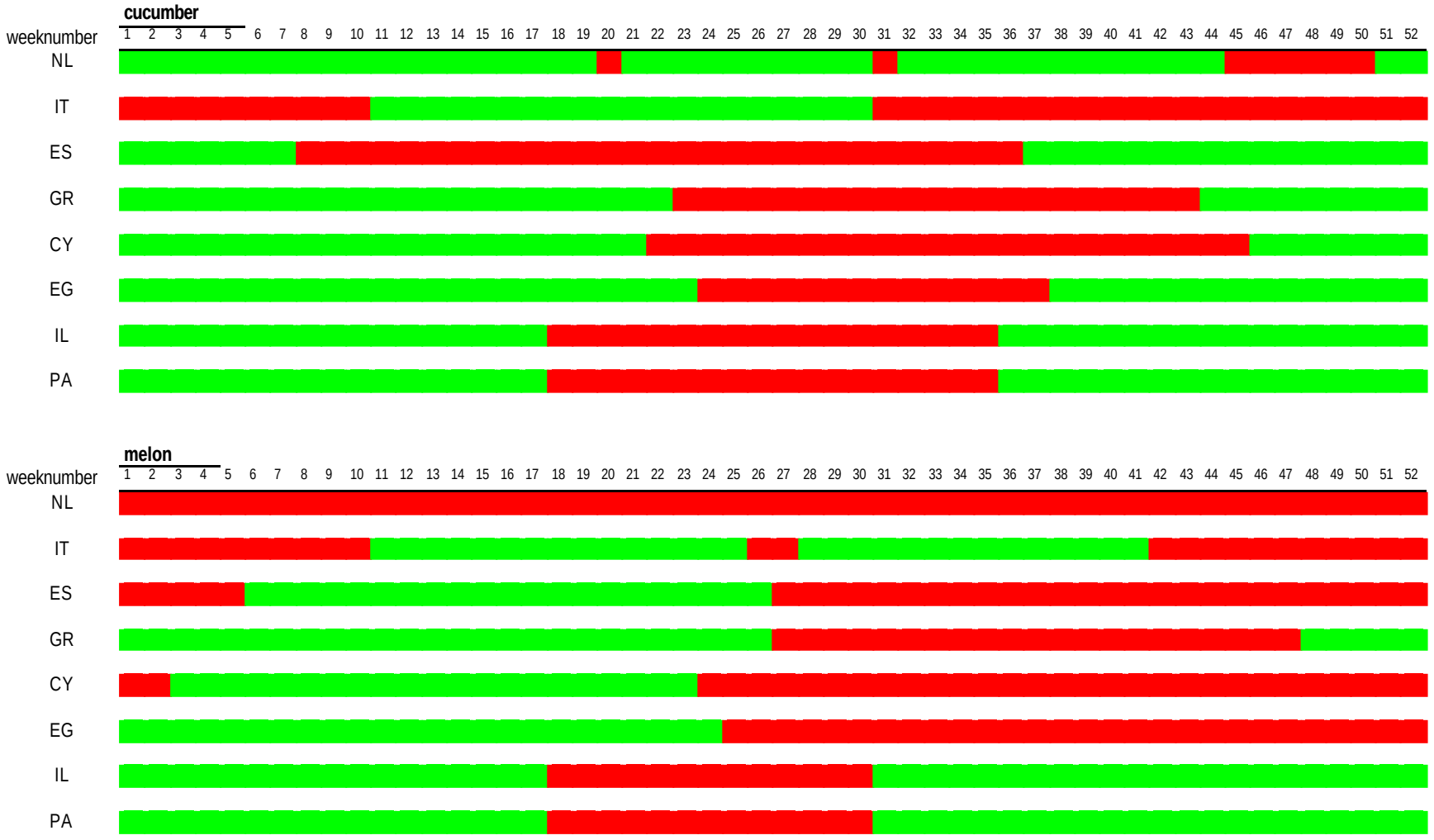
During part of month no cultivation
Cover is white washed
[1)] two crop cycles (spring and summer)
[2)] total irrigation in stead of total transpiration

transpiration [mm] roses								
month/country	NL	IT	ES	GR	CY	EG	IL	PA
Jan	33.4	40.0	-	44.4	24.0	-	55.0	55.0
Feb	39.3	72.0	-	67.4	35.0	-	56.0	56.0
Mar	74.7	87.0	-	90.4	36.0	-	87.0	87.0
Apr	89.4	105.0	-	132.2	**60.0**	-	90.0	90.0
May	116.5	168.0	-	195.4	**96.0**	-	91.0	91.0
Jun	114.4	**129.0**	-	**146.5**	**132.0**	-	138.0	138.0
Jul	116.5	**99.0**	-	**115.6**	**132.0**	-	177.0	177.0
Aug	85.3	**75.0**	-	**91.6**	**120.0**	-	166.0	166.0
Sep	77.8	70.0	-	83.5	**96.0**	-	138.0	138.0
Oct	51.3	54.0	-	67.0	**60.0**	-	64.0	64.0
Nov	37.0	63.0	-	74.2	35.0	-	52.0	52.0
Dec	29.0	40.0	-	46.4	24.0	-	54.0	54.0
year sum	864.6	1002.0	0.0	1154.6	850.0	0.0	1168.0	1168.0

During part of month no cultivation
Cover is white washed



CULTIVATING PERIOD


cucumber
weeknumber
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melon
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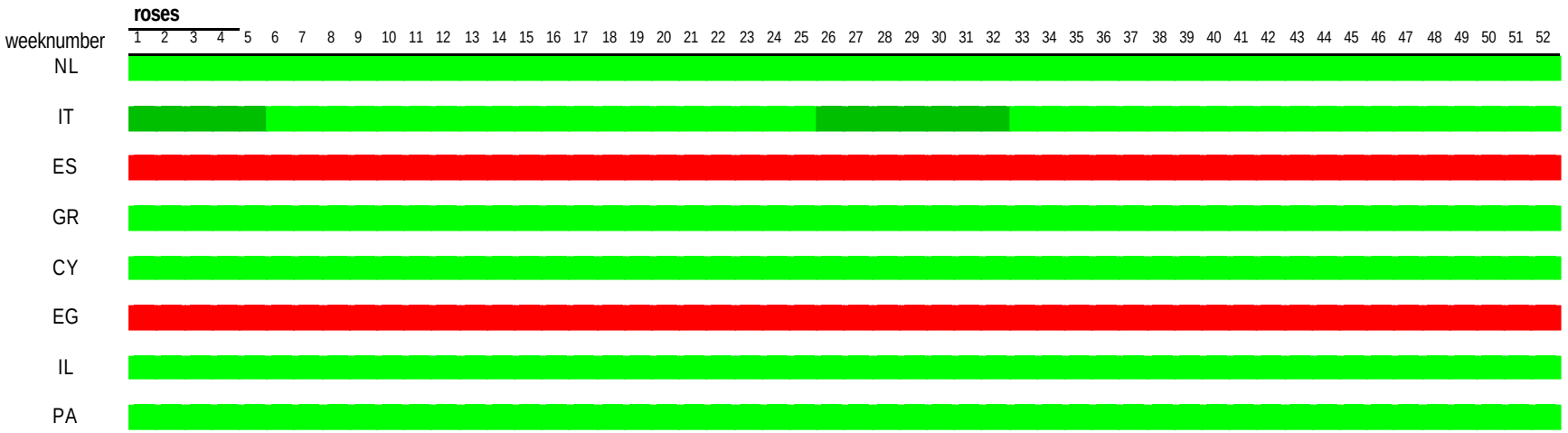

CULTIVATING PERIOD

		Rain water							
unit\country		NL	IT	ES	GR	CY	EG	IL	PA
PH		5.0	5.1	-	7.0	-	6.9	-	-
EC	$MS.cm^{-1}$		Negligible		0.1		0.3		
Ion									
Ca^{2+}	$Mmol.l^{-1}$	<0.01			0.7				
Mg^{2+}	$Mmol.l^{-1}$	<0.01			0.0				
Na^{+}	$Mmol.l^{-1}$	0.0			0.2				
K^{+}	$Mmol.l^{-1}$	<0.01			0.0				
$SO4^{2-}$	$Mmol.l^{-1}$	0.0							
$CO3^{2-}$	$Mmol.l^{-1}$								
$HCO3^{-}$	$Mmol.l^{-1}$				0.7				
Cl^{-}	$Mmol.l^{-1}$	<0.01			0.3				
$NO3^{-}$	$Mmol.l^{-1}$	0.0							
Si									
Fe-tot	? $mol.l^{-1}$	<0.01							
Mn	? $mol.l^{-1}$								
Zn	?$mol.l^{-1}$								
B	?$mol.l^{-1}$								
Cu	?$mol.l^{-1}$								

		Tap water							
unit\country		NL [1]	IT [2]	ES	GR	CY	EG	IL [3]	PA [3]
PH		7 – 9.5	7.5		6.6		6.9	7.9	7.9
EC		< 1.25	0.7		0.3		0.3	1.0	1.0
Ion									
Ca^{2+}	$Mmol.l^{-1}$	>1.5 < 3.75	1.5		1.6			1.5	1.5
Mg^{2+}	$Mmol.l^{-1}$	< 2	0.5		0.1			1.2	1.2
Na^{+}	$Mmol.l^{-1}$	< 5.2	0.5		0.3			4.4	4.4
K^{+}	$Mmol.l^{-1}$	< 0.3	<0.2		0.1			0.1	0.1
$SO4^{2-}$	$Mmol.l^{-1}$							0.1	0.1
$CO3^{2-}$	$Mmol.l^{-1}$								
$HCO3^{-}$	$Mmol.l^{-1}$		4-8		2.7			4.6	4.6
Cl^{-}	$Mmol.l^{-1}$	< 4.4	0.5		3.2			5.5	5.5
$NO3^{-}$	$Mmol.l^{-1}$	<0.8						0.1	0.1
Si									
Fe-tot	? $mol.l^{-1}$	< 4						0.0	0.0
Mn	? $mol.l^{-1}$							0.0	0.0
Zn	?$mol.l^{-1}$							0.8	0.8
B	?$mol.l^{-1}$							14.8	14.8
Cu	?$mol.l^{-1}$							0.0	0.0
Price of water	€/m^3	1 – 1.5			0.4		0.3	0.22 [4]	0.22 [4]

1) Minimal quality according to official standards, this is also used for human consumption
2) Growers are not allowed to use tap water for cultivation.
3) This is water from the National Carrier. This is the major supplier of water. Composition varies because pumping is from a mixture of wells from different aquifers and the sea of Galilee.
4) This is the price paid by farmers. The actual cost is € 0.376. The latter amount is charged only for the last 20% of the annual water quota. If a farmer exceeds his quota he pays a fine and water supply is shut off.

		Well water							
	Unit\country	**NL**	**IT**	**ES**	**GR**	**CY [1)]**	**EG**	**IL**	**PA**
PH		6.9	7.1	7.1	7.7	7.7	7.1		
EC	$MS.cm^{-1}$	0.4	1.3	2.1	0.7	5.5	0.7		
Ion									
Ca^{2+}	$Mmol.l^{-1}$	1.2	2.7	2.1	1.5	19.4			
Mg^{2+}	$Mmol.l^{-1}$	0.3	0.7	2.4	1.3	7.6			
Na^{+}	$Mmol.l^{-1}$	0.8	4.2	12.7	1.7	16.5			
K^{+}	$Mmol.l^{-1}$	0.1	0.0	0.3		0.3			
$SO4^{2-}$	$Mmol.l^{-1}$	0.5	0.2	4.5	1.4	18.7			
$CO3^{2-}$	$Mmol.l^{-1}$		0.0	0.0	0.0	0.0			
$HCO3^{-}$	$Mmol.l^{-1}$	0.7	6.3	6.4	4.1	0.8			
Cl^{-}	$Mmol.l^{-1}$	0.8	0.0	6.9	0.3	32.5			
$NO3^{-}$	$Mmol.l^{-1}$	1.2	0.0		0.0	0.2			
Si					0.1				
Fe-tot	$\mu mol.l^{-1}$	0.2	3.4		6.0				
Mn	$\mu mol.l^{-1}$	0.1	1.8						
Zn	$\mu mol.l^{-1}$	1.2	0.1						
B	$\mu mol.l^{-1}$	<1.0		51.9		56.0			
Cu	$\mu mol.l^{-1}$	<0.1		0.2					
Price of water	$€/m^3$	0.00	0.02	0.18	0.05	0.00			

1) Worse-case quality. Quality of water has a year cycle due to depletion of the aquifer in the summer season

		Rhine water	waste treated water			dam water	Nile water	tertiary treated effluent	
	Unit\country	NL	IT [1)]	ES	GR	CY [2)]	EG	IL	PA
PH		7.7		8.3	7.3	8.2	7.6	8.1	8.1
EC	$MS.cm^{-1}$	0.8		1.4	0.3	0.9	0.5	1.4	1.4
Ion									
Ca^{2+}	$Mmol.l^{-1}$	2.0		1.4	1.0	2.2	3.0	4.2	4.2
Mg^{2+}	$Mmol.l^{-1}$	0.5		0.9	0.5	4.2	3.0	0.5	0.5
Na^{+}	$Mmol.l^{-1}$	3.5		6.7	0.7	3.7	1.1	6.0	6.0
K^{+}	$Mmol.l^{-1}$	0.2		0.5	0.0	0.1	0.1	0.5	0.5
$SO4^{2-}$	$Mmol.l^{-1}$	0.6		1.0	0.1	2.0	-	0.5	0.5
$CO3^{2-}$	$Mmol.l^{-1}$			0.6		0.8	0.0		
$HCO3^{-}$	$Mmol.l^{-1}$			4.8		4.1	1.1	19.7	19.7
Cl^{-}	$Mmol.l^{-1}$	3.9		5.5	0.3	3.3	2.5	8.5	8.5
$NO3^{-}$	$Mmol.l^{-1}$			0.4		0.2	0.4	0.1	0.1
Si									
Fe-tot	$\mu mol.l^{-1}$			3.6					
Mn	$\mu mol.l^{-1}$			0.7				1.1	1.1
Zn	$\mu mol.l^{-1}$			1.2				2.6	2.6
B	$\mu mol.l^{-1}$			148.0		18.5			
Cu	$\mu mol.l^{-1}$	80.0							
Price of water	$€/m^3$	0.00		0.18		0.10	0.08		

1) The use of waste treated water is negligible and not allowed for vegetable crops.

2) This is water from large government water dams storing millions of cubic meters of water during winter.

	type of storage and common volume m^3/ha							
country	NL	IT	ES	GR	CY [1)]	EG	IL	PA
tank	300		100	100		20	125	125
basin	2000	200	1000	1000	2500		250	250

[1)] This is used only for storage of rain water during the winter and is used directly for irrigation without any pre-treatment or mixing.

	country	NL			IT			ES			GR		
	Technique	Capacity [m³/h]	Running costs [€/m³]	% used [1)]	Capacity [m³/h]	Running costs [€/m³]	% used	Capacity [m³/h]	Running costs [€/m³]	% used [2)]	Capacity [m³/h]	Running costs [€/m³]	% used
Disinfection	Drain water heater (pasteurisation)	2.5	0.08	35	0.6	1.7	-	-	-	-	-	-	-
	Ozone	2.5	0.06	35	0.6	1.8	-	0.9	0.18	8	-	-	-
	UV radiation	2.5	0.1	15	0.6	1.1	50	-	-	-	-	-	-
	Biological slow sand filtration	2.5	0.04	15	0.6	0.3	50	-	-	-	-	-	-
Desalinisation	reverse osmose										2	1.47	100
	ultra filtration	-	-	-	0.6	1.9	-	-	-	-	-	-	-

	country	CY			EG			IL			PA		
	Technique	Capacity [m³/h]	Running costs [€/m³]	% used [1)]	Capacity [m³/h]	Running costs [€/m³]	% used	Capacity [m³/h]	Running costs [€/m³]	% used [2)]	Capacity [m³/h]	Running costs [€/m³]	% used
disinfection	Drain water heater (pasteurization)	-	-	-	-	-	-		0.13			0.13	
	Ozone	-	-	-	-	-	-	-	-	-	-	-	-
	UV radiation	-	-	-	-	-	-		0.37			0.37	
	Biological slow sand filtration	-	-	-	-	-	-	-	-	-	-	-	-
desalinisation	reverse osmoses	-	-	-	-	-	-	-	-	-	-	-	-
	ultra filtration	-	-	-	-	-	-	-	-	-	-	-	-

1) about 80% of the recirculating growers has disinfecting equipment

2) this is a central ozone installation for waste water with a capacity of 1800 m³/ha, which delivers to 2000 ha

3) in Cyprus recirculated water is not used

country	System	construction	investment (€/ha)
	Drainage profiles	milling profiles, foil and drain tubes	7000
NI	Gutters on the soil:	pvc drain gutter	12000
	Hanging gutters	iron	30000 - 40000 (if movable)
	Growing gutters		20000 - 50000
IT	Substrate	30-60 €/m^3 or 2€ /slab	20000 - 30000
	Drip fertigation	includes controler, mixing pump etc.	30000
ES	Gutter on soil (styrofoam drain gutter)	total price	9000
GR	Drainage profiles	plastic	10000
CY [1)]			
EG [1)]			
	Substrate		30000
IL	Container		16300
	Fertilizer pumps,drippers and accesoires		13300
	Substrate		30000
PA	Container		16300
	Fertilizer pumps,drippers and accesoires		13300

[1)] closed systems for irrigation are not used

investments				prices								
		area (m^2)	volume (m^3)	NL	IT	ES	GR	CY	EG	IL	PA	
storage	BASINS	200	200		10000							€
		500	500	6800		5000						
		850	1000	9000		6500	8200					
		1350	2000	12500								
		1500	2500					2600				
		2000	3000	15900								
		2500	4000	19200								
	TANKS	4	10	770								€
		11	25	1450								
		22	50	1800								
		43	100	2500			5000					
		85	200							6400		
		215	500	6800								
		425	1000	13600								
	Concrete reservoir	200	500	42500		18000	25000					€
												€
water treatment	drain water heater 2.5 m^3/h			19000								
	Ozone 2.5 m^3/h			27500								
	Osmose 8 m^3/h			34000	20000		17600					
	de ironing 8 m^3/h			8100	2500							
	UV radiation 2.5 m^3/h			11000						8100		
	Biological slow sand filtration 2.5 m^3/h			5000	750					4500		
	Cloride injection				2500							

		life cyclus (years)							%
depreciation (amortization)	Land	>100	0.0	0.0	0.0	0.0	0.0		0.0
	well	15	6.7	5.0	5.0	4.0			0.0
	Greenhouse	15	6.7	6.7	6.7	6.7	6.7		10.0
	tank	10	10.0	10.0		10.0			6.7
	Heater	6	16.7	10.0	10.0	16.7			10.0
	Osmose	6	16.7	10.0		16.7			10.0
	Bassin	6	16.7	10.0	10.0	16.7			6.7
	Concrete reservoir	10	10.0	10.0	5.0	6.7			6.7
									%
maintenance	well		1	1	1	1			
	greenhouse		0.5	1	1	8	1		
	tank		2			3			
	heater		5		5	5			
	osmose		5			6			
	bassin		5	4	2	7			
	concrete reservoir		2		2	2			
									€
water	well (20 m deep) pump & pipes included		5000			4000	6000		
	tap water (€/m^3)		1	0.8	0.18	0.05	0.1		

								€
land	buy	price /ha	10000-40000	30000-70000	60000-120000	3000-10000	8000-20000	
		average (€/m^2)	2.5	5	9	0.65	1.4	
		capital costs	0.15	0.25	0.54	0.04	0.11	

investments		area (m^2)	volume (m^3)	prices NL	IT	ES	GR	CY	EG	IL	PA	
	rent	price /ha						500-1200				
		average (€/m^2)						0.09				
		capital costs						0.007				
operating profit				6	3	2	4.4	5				(€/m^2)
interest				6	5	6	6	8				%

4. Conclusions

In the following table we give an example of the fraction of water requirements of tomato culture that can be covered under three different scenarios in Holland, as calculated on the basis of the previous information.

volume	base area		water use covered
m³	iron silo	basin	%
500	225	500	60
1000	450	850	70
1500	675		75
2000	900	1350	80
2500		1850	83
3000			86
4000		2300	95

Example 1. *Statistics about rain storage in Holland. The fraction of water use covered is calculated on the basis of mean monthly rainfall and water use, accounting for the capacity of the storage.*

In the next example, on the other hands, the unitary price of water is calculated (again for greenhouse tomato in Holland), for three capacities of the rain collection basin, the fraction not covered by rain being in all cases being drawn from the public supply system. It can be easily deduced from this example that the way capital cost are accounted for, greatly influences the estimate of costs (and the consequent choices).

	example 1		example 2		example 3	
total investment		14000		7600		7500
depreciation (15%)		2100		1140		1125
maintenance (5%)		700		380		375
interest (3.5%)		490		266		263
area 18€ 6% depreciation	1850 m^2	1998	850 m^2	918	225 m^2	243
total use of water	7030 m^3		7090 m^3		7125 m^3	
added tap water 0.75 €	984 m^3	738	2127 m^3	1595	2850 m^3	2138
total yearly costs		6026		4299		4143
cost / m^3 (total used m^3)		0.86		2.02		1.45
if useless area is included						
total yearly costs		6026		4299		4143
lost profit m^2 * 7€		12950		5950		1575
total		18976		10249		5718
cost / m^3 (total used m^3)		2.70		4.82		2.01

Example 2. *Unitary price of water for greenhouse tomato in Holland, in three cases: example 1=rain collection basin of 3000 m^3; 2=1000 m^3; 3=500 m^3. In all cases the fraction not covered by rain is assumed to be provided by the public supply.*

From these examples it is clear that the information as collected can be usefully applied to determoine strategies. It is also clear that the way capital costs are accounted for must be adapted to the economic/financial conditions typical of a given region.