

Irrigation Practice Survey for Crops and Urban Greenspaces at Northwest and West Greece and South-East Italy [†]

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Abstract: An analytical survey regarding irrigation practice for both crops and greenspaces at the Region of Western Greece and the Region of Epirus in north-west and west Greece respectively, and the Region of Apulia in south-east Italy was performed. On-site interviews (about 500 per region) regarded irrigation systems design, installation, and management. Good practices, problems and challenges that concerned irrigation management are pointed out. The need for a frequent, organized and coordinated by relevant organisations, survey of irrigation practice is underlined, as it could constitute a valuable tool for planning relevant strategies and practical actions.

Keywords: irrigation practice; irrigation water management; agricultural crops; urban landscapes

1. Introduction

Water scarcity is one of the main challenges that both agricultural crops and landscape works, face in many countries in the world, particularly in semi-arid and arid regions [1,2]. With the given infrastructure, agricultural (in open field and/or under cover) and landscape, irrigation and drainage systems efficiency could be increased promptly, if their design, installation, and maintenance received regular auditing procedures and more reasonable water management would be applied. Beyond generic statistical registration by international and national organisations and survey authorities, detailed surveys for irrigation practice could provide valuable information for planning relevant strategies and practical actions [3–5]. This study briefly presents the results of a survey regarding irrigation practice that concerned applied techniques, usage of new technologies on water irrigation management etc., for the Region of Western Greece and the Region of Epirus in Greece and the Region of Apulia in Italy.

2. Methods

On site interviews were performed using special questionnaires (see Supplementary Material) and relevant reports were produced (see Data availability Statement). The interviews concerned four categories of irrigation system management setups: (a) regional authorities that are responsible for irrigation water and municipalities that are responsible for irrigation of public urban greenspaces (including athletic facilities), (b) public organisations that manage participatory agricultural irrigation systems, (c) agricultural farms and (d) private touristic or leisure greenspaces and gardens. In this framework four questionnaires were formed depending on the special features of the setups they were addressed, but they all had common structure and a number of common questions. The questionnaires were divided in six sections as follows:

1. General information regarding organization/institution/farmer/Land Reclamation Consortium (name, age, address and gender)

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2. Information about crops/green areas, irrigation systems and water sources (crops, area and irrigation status)
3. Irrigation management information -Acceptance level of reclaimed water (for irrigation of several crops or for potable use)
4. Economic information— Effect of reclaimed water (plants, soil and productivity)
5. Environmental issues—Concerns regarding reclaimed water (fear factors, quality and treatment)
6. Other information—Pricing of reclaimed water (willingness to pay, price of water and investment in agriculture).

The research was conducted during 2013 and 2014, all-around the Region of Western Greece and the Region of Epirus in Greece and the Region of Apulia in Italy (Figure 1) for which 490, 500 and 449 interviews were per region were performed respectively (Table 1).



Figure 1. Area of the survey Region of Western Greece and the Region of Epirus in Greece and the Region of Apulia in Italy.

Table 1. Number of interviews that were performed per category of irrigation system management setups and region.

Category of Irrigation System Management Setups	Theme	Total Number of Interviews	Number of Interviews per Region		
			Apulia	Western Greece	Epirus
1. Public administration	Greenspaces	46	30	8	8
2. Local Organisations for Land Reclamation	Agriculture	61	19	24	17
3. Farm level	Agriculture	1037	270	329	438
4. Private landscape/Leisure irrigation system	Greenspaces	296	130	129	37
Total		1440	449	490	500

3. Results and Discussion

Selected topics that concern irrigation management are presented in Table 2 (for regional authorities that are responsible for irrigation water and municipalities that are responsible for irrigation of public urban greenspaces (including athletic facilities) and for public organisations that manage participatory agricultural irrigation systems) and Table 3 (for agricultural farms and for private touristic or leisure greenspaces and gardens).

Table 2. Replies (percentage of total) from (a) regional authorities that are responsible for irrigation water and municipalities that are responsible for irrigation of public urban greenspaces (including athletic facilities) and (b) public organisations that manage participatory agricultural irrigation systems, for selected topics that regard irrigation management (NA: no data available).

Reply	Public Administration			Organisation of Irrigation Water Management		
	Apulia	Western Greece	Epirus	Apulia	Western Greece	Epirus
Awareness of the local water management plan which is applied in the framework of 2000/60/EC	66%	90%	62%	100%	44%	20%
A straightforward strategy regarding irrigation management in the area has been formed	40%	0%	50%	NA	63%	75%
There is efficient irrigation management at basin level	90%	94%	63%	NA	74%	79%
Use of special IT tools and databases for irrigation management	3%	0%	0%	25%	0%	0%
Interest to use special IT tools and databases for irrigation management	75%	13%	9%	NA	7%	5%
Drought is the most significant problem regarding water in the area	50%	46%	50%	NA	57%	50%
Desertification is the most significant problem regarding water in the area	20%	8%	50%	NA	29%	3%
Salinization of underground aquifers is the most significant problem regarding water in the area	23%	45%	0%	NA	14%	4%
Climate change is the most significant problem regarding water in the area	13%	21%	20%	NA	22%	15%
Provide guidance and rules regarding water distribution are helping to mitigate water shortages in the area	50%	55%	50%	NA	80%	65%
The main cause for water shortages in the area is excessive consumption of water for irrigation	19%	21%	12%	NA	38%	42%
There is inefficient water management at end user level	33%	22%	50%	NA	58%	52%
There is lack of training of end users	60%	58%	50%	16%	84%	76%
The organisation provides end users with advice regarding irrigation, drainage, fertilisation management	100%	53%	87%	50%	0%	53%

Most of the organisations that regard irrigation management are aware of local water management plans but there are not convinced that there is a straightforward strategy regarding irrigation water management in the area, although irrigation water management is performed efficiently (Table 2). Probable drought is reported as the most significant concern regarding water availability in the area (Tables 2 and 3), while the setting of rules and the provision of guidance regarding water distribution are regarded helpful as

means to mitigate water shortages in the area (Tables 2 and 3). The organisations do not blame excessive consumption of irrigation water as the main cause for water shortages in the area, they generally do not think that there is adequate irrigation water management at end user level, they agree that there is lack of training of end users and in general they provide them with advices regarding irrigation, drainage and fertilisation management (Table 2).

End users generally agree that there is efficient water management at basin level, the provided rules and guidance regarding water distribution are helping to mitigate water shortages in the area and that support is provided from relevant public authorities (Table 3). Farmers are typically informed regarding agricultural issues, including irrigation, by agronomic consultants, they do not think that they need special training regarding irrigation management / scheduling and consequently the majority have not attended educational/training sessions specialised in irrigation (Table 3).

For greenspaces, the provision by the irrigation system’s designer/contractor with irrigation scheduling plan, and the request for professional assistance regarding the irrigation schedule, is something common, but for crops is very rare (Table 3). The use of special IT tools for irrigation management is low to very low for organisations and farmers, but high for managers of greenspaces (Tables 2 and 3). While organisations showed low interest to adapt such tools (Table 2), both categories of end users are quite interested in doing so (Table 3). A significant percentage of both categories of end users believes that using electronics or IT technologies for irrigation management could lead to water conservation and the main drawbacks are the complexity of those systems combined with the lack of training and support (Table 3).

Table 3. Replies (percentage of total) from (c) agricultural farms and (d) private touristic or leisure greenspaces and gardens for selected topics that regard irrigation management (NA: no data available).

Reply	Agricultural Farms			Private Greenspaces		
	Apulia	Western Greece	Epirus	Apulia	Western Greece	Epirus
Drought is the most significant problem regarding water in the area	55%	50%	83%	40%	36%	94%
Desertification is the most significant problem regarding water in the area	19%	26%	5%	38%	12%	3%
Salinization of underground aquifers is the most significant problem regarding water in the area	26%	24%	1%	12%	35%	3%
Climate change is the most significant problem regarding water in the area	35%	11%	15%	45%	9%	1%
The main cause for water shortages in the area is lack of guidance and rules regarding water distribution	28%	16%	14%	24%	0%	22%
Provided guidance and rules regarding water distribution are helping to mitigate water shortages in the area	70%	88%	95%	84%	100%	87%
There is efficient water management at basin level	NA	77%	96%	81%	95%	93%
Support is provided from relevant public authorities	86%	85%	81%	NA	NA	NA
Typically informed regarding agricultural issues, including irrigation by agronomic consultant	95%	85%	95%	NA	NA	NA
Need for training regarding irrigation management / scheduling	32%	28%	6%	NA	NA	NA

Attended at least one educational/training session specialised in irrigation	1%	4%	2%	NA	NA	NA
Provided by the irrigation system's designer/contractor with irrigation scheduling plan	NA	6%	5%	37%	83%	84%
Asked for professional assistance regarding the irrigation schedule	18%	60%	10%	NA	74%	84%
Uses special IT tools and databases for water management	11%	9%	17%	NA	5%	3%
Uses some kind of electronics or IT technology for irrigation management (controllers, sensors etc)	NA	7%	6%	49%	71%	57%
Using electronics or IT technologies for irrigation management could lead to water conservation	48%	19%	23%	NA	82%	70%
Willing to use an IT advice service regarding irrigation scheduling	NA	70%	35%	NA	99%	78%
The main drawback when using electronics or IT technologies for irrigation management in complexity	28%	82%	65%	NA	92%	83%

4. Conclusions

An analytical survey revealed good practices and problems regarding design, construction, maintenance and management for the Region of Western Greece and the Region of Epirus in Greece and the Region of Apulia in Italy. The summarized results that concerned irrigation management for both agricultural and urban greenspaces irrigation systems were presented. The supervisors of irrigation systems welcomed this initiative. Good practices, problems and challenges were pointed out. The development of a practical surveying / auditing guide, approved by the relevant stakeholders, could be a very useful tool for planning relevant strategies and practical actions aiming to continuous improvement of irrigation systems efficiency. The role of international irrigation stakeholders like the European Irrigation Association could be crucial in this effort.

Supplementary Materials: The questionnaires that were used for the survey can be downloaded from: <https://www.irrigation-management.eu/deliverables/Questionnaires.rar>.

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Data Availability Statement: Full reports of the data presented in this study are available at: <https://www.irrigation-management.eu/tools/survey>.

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References

1. Nikolaou, G.; Neocleous, D.; Christou, A.; Kitta, E.; Katsoulas, N. Implementing Sustainable Irrigation in Water-Scarce Regions under the Impact of Climate Change. *Agronomy* **2020**, *10*, 1120. <https://doi.org/10.3390/agronomy10081120>.
2. Reyes-Paecke, S.; Gironás, J.; Melo, O.; Vicuña, S.; Herrera, J. Irrigation of green spaces and residential gardens in a Mediterranean metropolis: Gaps and opportunities for climate change adaptation. *Landsc. Urban Plan.* **2019**, *182*, 34–43. <https://doi.org/10.1016/j.landurbplan.2018.10.006>.
3. Fernández-Cañero, R.; Ordovás, J.; Machuca, M.A.H. Domestic Gardens as Water-wise Landscapes: A Case Study in Southwestern Europe. *HortTechnology* **2011**, *21*, 616. <https://doi.org/10.21273/HORTTECH.21.5.616>.
4. Tindula, G.N.; Orang, M.N.; Snyder, R.L. Survey of Irrigation Methods in California in 2010. *J. Irrig. Drain. Eng.* **2013**, *139*, 3. [https://doi.org/10.1061/\(ASCE\)IR.1943-4774.0000538](https://doi.org/10.1061/(ASCE)IR.1943-4774.0000538).
5. Incrocci, L.; Thompson, R.B.; Fernandez-Fernandez, M.D.; De Pascale, S.; Pardossi, A.; Stanghellini, C.; Rouphael, Y.; Gallardo, M. Irrigation management of European greenhouse vegetable crops. *Agric. Water Manag.* **2020**, *242*, 106393. <https://doi.org/10.1016/j.agwat.2020.106393>.

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