WILLINGNESS TO PAY FOR MORE EFFICIENT IRRIGATION TECHNIQUES IN THE LAKE KARLA BASIN, GREECE

Nikitas Mylopoulos and Chrysostomos Fafoutis*

Department of Civil Engineering, University of Thessaly, Pedion Areos, 38334 Volos, Greece

Abstract. Thessaly, the second largest plain of Greece, is an intensively cultivated agricultural region. The intense and widespread agriculture of hydrophilic crops, such as cotton, has led to a remarkable water demand increase, which is usually covered by the overexploitation of groundwater resources. The Lake Karla basin is a prominent example of this unsustainable practice. Competition for the limited available freshwater resources in the Lake Karla basin is expected to increase in the near future as demand for irrigation water increases and drought years are expected to increase due to climate change. Together with the Unions of Agricultural Cooperatives, the Local Organizations of Land Reclamation is planning to introduce more efficient, water saving automated drip irrigation in the area among farmers who currently use non-automated drip irrigation, in order to ensure that these farmers can better cope with drought years and that water will be used more efficiently in crop production. A general choice experiment with face-to-face interviews was conducted, using a random sample of 150 open field farmers from the study area. The farmers, who use the non-automated drip irrigation method and their farms are located within the watershed of Lake Karla, were interviewed regarding their willingness to switch to more efficient irrigation techniques, such as automated and controlled drip irrigation. The most important benefits of automated drip irrigation are an increase in crop yield, as plants are given water in a more precise way (based on their needs during the growing season) and a saving in water use. The choice experiment displays to the farmers two possible options for automated drip irrigation, described in terms of expected increase in crop yield, expected water saving, the duration of the restoration of Lake Karla to its original state before it was drained in the 1960s and the corresponding investment cost. The survey results show that socio-demographic factors and the average annual income influence the criteria and the views of farmers on a possible investment in the new method of automated drip irrigation. Moreover, there is a positive demand and willingness to pay for automated drip irrigation from the farmers in order to increase crop yield and speed up restoration of Lake Karla, considering that they are highly dependent on it.

Aim of the study

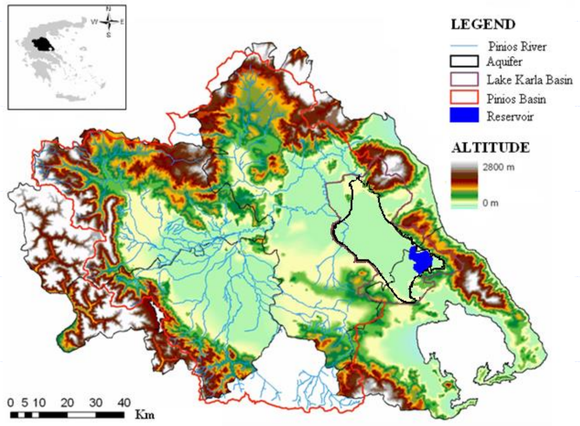
The aim of this study is:

- to understand and record the farmers' opinions regarding the use of irrigation water and the restoration of Lake Karla, and to extract valuable conclusions and perform detailed analysis of the criteria for a new irrigation method.
- to estimate the farmers' willingness to pay for more efficient irrigation techniques, such as automated and controlled drip irrigation, in the Lake Karla basin.

The study area

The watershed of Lake Karla is located in the eastern part of Thessaly in central Greece. The natural basin of Karla had a total extent of 1,663 km^2 but after the construction of complimentary works, the drainage area of the restored lake Karla will be 1,171 km^2. Karla's aquifer area is about 500 km^2. Thessaly plain is traversed by Pinios River and its waters are used primarily for irrigation. Lake Karla basin is an intensely cultivated agricultural region.

The intense and extensive cultivation of water demanding crops, such as cotton, resulted to a remarkable water demand increase, which is usually covered by the over-exploitation of groundwater resources. Thus, the overexploitation has led to the deterioration of the already disturbed water balance and the degradation of the water resources.



Three irrigation methods are used in Lake Karla's watershed: sprinkler irrigation (60% of the area), drip irrigation (37%) and flood irrigation (3%). Together with the Unions of Agricultural Cooperatives, the Local Organization of Land Reclamation of Lake Karla is planning to introduce more efficient, water saving automated drip irrigation in the area among the farmers who currently use non-automated drip irrigation.

Methodology

A general choice experiment with face-to-face interviews was conducted, using a random sample of 150 open field farmers from the study area. The farmers, who use the non-automated drip irrigation method and their farms are located within the watershed of Lake Karla, were interviewed regarding their willingness to switch to more efficient irrigation techniques, such as automated and controlled drip irrigation.

The choice experiment displays to the farmers two possible options for automated drip irrigation, described in terms of:

- the expected increase in crop yield (5, 10 or 20%)
- the expected water saving (5, 10 or 20%)
- the additional technical advice (1, 2 or 3 times per crop season)
- the duration of the restoration of Lake Karla (5, 10 or 15 years)
- the investment cost (1000, 2000 or 3000 € per ha)

The choice experiment consists of:

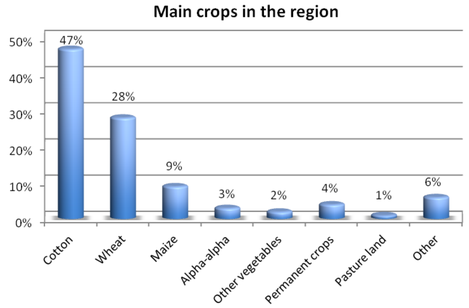
- 30 choice sets of 8 cards
- choice sets randomly allocated to farmers
- each choice set used 5 times (5*30=150)
- each farmer answered 8 choice cards

Example choice card

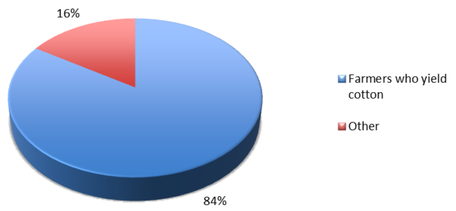
	Automated irrigation Option A	Automated irrigation Option B
Increase in crop yield	5%	15%
Reduction in irrigation water use	5%	20%
Additional technical advice	1 time/year	3 times/year
Restoration Lake Karla	in 15 years	in 10 years
Investment cost (€/ha)	€1000	€3000
Which option do you prefer?	A	B

Results

Main crops in the region

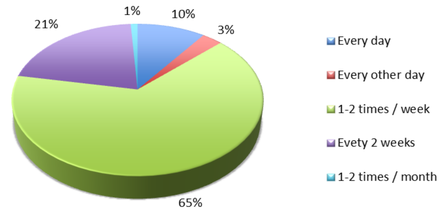


Percentage of farmers who yield cotton

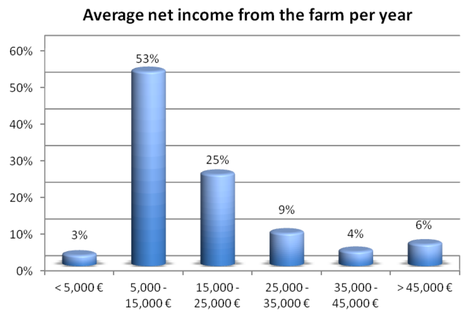


Results

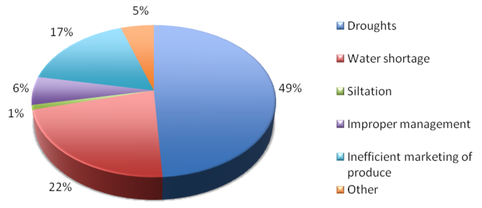
How often do you irrigate your land per cropping season?



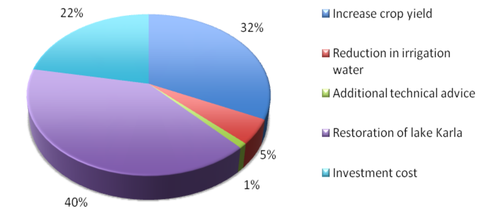
Average net income from the farm per year



What is the most important challenge in your area related to farming?



Which feature was most important each time you made a choice?



Results

Estimated choice model

Variable	Coefficient estimate	Standard error	t	Sig.
Increase crop yield	0.074	0.036	2.065	0.039
Water saving	0.039	0.035	1.115	0.265
Technical advice	0.003	0.034	0.085	0.932
Restoration LK	-0.033	0.037	-0.904	0.366
Farm income	0.013	0.013	0.976	0.329
Error component	1.428	0.144	9.937	0.000
R^2	0.010			
N	744			

Willingness to pay (per ha) for automated drip irrigation

- Average WTP: €1,673
- WTP for 1% increase in crop yield: €74
- WTP for 1% water saving: €39
- WTP for additional technical advice: €3
- WTP for early restoration of Lake Karla: €33

Conclusions

- Droughts and water scarcity are identified as most important problems by majority of the farmers
- Because of over-extraction, lack of allocation rules and regulations, the farmers drill private bore holes
- Drip irrigation is already the most common technology
- > 40% indicate that if they face water scarcity, they drill new or deeper boreholes
- Positive demand and WTP for automated drip irrigation in the Lake Karla basin
- The most important factors for the farmers:
  - ✓increase crop yield (32%)
  - ✓speed up restoration of Lake Karla (40%)
- Future research question: institutional-economic conditions needed to be in place to facilitate transition.

Acknowledgements

The present research is part of the project "HYDROMENTOR", which is co-funded by the European Union - National Strategic Reference Framework (NSRF) 2007 -2013 and National fund.

ΥΔΡΟΜΕΝΤΩΡ

ΕΥΡΩΠΑΪΚΗ ΕΝΩΣΗ · ΕΠΑΝ ΙΙ · ΕΣΠΑ 2007-2013

* Correspondence to: fafoutis@uth.gr, Tel: +302421074153