



## **Barriers to water markets in agriculture. Analysis of Southern Spain stakeholder attitudes**

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### **Summary**

*In Europe, Spain has been the pioneer in establishing the water market systems. Although the growing interest in water markets over the last number of years, transactions of water exchanges in Southern Spain have been scarce. This research aims at exploring barriers which might be refraining irrigation community in participating in water markets.*

*The research is carried out in the Guadalquivir river basin. Methodology is based on focus groups representing different stakeholders of irrigation community in this basin and in a simple questionnaire to obtain information about local perception of each member participating in these meetings. Results show that stakeholders think that water markets are good tools for water allocation. However, a number of barriers emerge in the context of water markets. Most of these are related to the farmer's cultural believes, the policy uncertainty, the access rights system, the types of existing infrastructure and, the legal and administrative aspects. It may seem obvious that water market participants care about non-monetary attributes of water leases. These results might be helpful to policymakers who are currently evaluating the potential for water markets in Europe and have little observable market data to work with.*

Keywords: water markets, focus groups, irrigation, stakeholder attitude

JEL Classification codes: Q15; Q25.

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## **1. INTRODUCTION AND OBJECTIVE**

Water markets can be seen as an instrument to improve water management in the case of scarcity, drought and water uncertainty. Water supply and demand might be regulated by market systems which in turn might offer more flexibility and economic advantages. A win-win outcome is usually expected by implementing water markets although some externalities should be considered.

In the last decades, several countries have reformed their legislative framework to activate some sort of water market. In Chile, Australia and the United States, water markets have already been activated for several years (Bjornlund and McKay, 2002), while in some other countries the process of reform started, but has not been completed yet, such as in the case of Canada (Horbulyk and Lo, 1998), Spain (Garrido, 1998), and South Africa (Armitage, 1999).

With regard to Europe, water markets are underdeveloped because they are difficult to implement within existing institutional constraints or inefficient from a transaction cost perspective (Zetland, 2011). In France the reform allowing the exchange of temporary water user rights has recently been promoted, with a strong emphasis on the principles of transparency, democracy, and solidarity, which reflect the consolidated cultural background of this country (Giannoccaro et al., 2011).

Spain has been the pioneer in establishing the water market systems in Europe. However, in spite of the growing interest in water markets over the last number of years, transactions of water exchanges at the country level and, mainly in the Southern part of Spain have been scarce.

The creation of a market of groundwater use rights is subject to some prerequisite, necessary to ensure that demand and supply occur within a juridical context where the rights of both parties are guaranteed, such as the open access to full information to all possible participants, and the ability of the potential participants to participate in the negotiation and the transaction, at accessible cost.

According to the experience accumulated in Chile during the 15 years since the establishment of the market of both temporary and permanent use rights, there is evidence

emerging that the exchange intensity appears rather different across regions, due to: (i) geographic characteristics and types of existing infrastructures; (ii) legal and administrative aspects; (iii) cultural factors and psychological attitude of local communities; (iv) prices and water value (Bauer 1997).

In light of this, our research aims at exploring barriers which might be refraining irrigation community in participating in water markets. If the market is believed to be the most efficient allocation system, what are the impediments that irrigators and other stakeholders are facing? The research is carried out in the Guadalquivir river basin, the largest irrigated area in the Spain where markets have only operated in drought years and, on limited volume.

Materials are based on focus groups representing different stakeholders of irrigation boards in the study area. These include members of various reclamation boards, as well as irrigators. For the latter category three different acts were performed, in order to separate potential sellers from permanent and annual buyers. In addition, a very simple questionnaire was applied in order to obtain structured information about local perception of each stakeholder. The survey included twelve 5-point Likert-scaled value statements. Statistics analysis is applied on the survey data.

The remainder of paper is set up as follows: the chapter 2 provides a short international review of barriers to water markets; description of materials and methods are reported in the section 3, then results and discussion are shown in the section 4. Finally, some concluding remarks are elaborated in the section 5.

## **2. BARRIERS TO WATER MARKETS IN AGRICULTURE: A SHORT INTERNATIONAL REVIEW**

From an institutional perspective, the number of buyers and sellers, the conditions of and constraint on entry and exit to the market, homogeneity of the product and market knowledge, are important determinants of a market's performance.

Early cases in the US, Chile and Australia report that, any limitation in the ability to trade water spatially or between different user groups impedes water markets. This limitation refers to physical constraints (Bauer, 1998) and supply reliability and flexibility of the delivery systems. In other words, all of facilities required in order to manage water supply and demand under a market framework. These embrace interconnected dams, which creates a high level of supply reliability and flexibility, which provides greater variety of user groups (Colby et al. 1987; Bjornlund, 2002b), and with a system of flexible gates to control irrigators' access to water, which in turn makes adjustments quick and cheap (Bjornlund, 2002a).

Existing delivery systems constrains and poor functioning infrastructure in the case of already irrigator users are recognized as primary barriers to hinder water markets. In addition, lack of infrastructures in the event of new irrigation commitments may impede buyers to catch new water access via markets. The larger the trading area the greater potentially market activity

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(Bjornlund, 2002b). Indeed, a widespread irrigation delivery increase variety of user groups which in turn may facilitate water for moving from lower to higher economic value.

As Tisdell and Ward (2003) pointed out, how well the market will achieve expectations depends in part on farmers' perceptions and attitudes to water trading in general and their perceptions of the structure and conduct of the market. The issues of culture and tradition as impediments to trade have also been discussed either in the US, Chile and Australia. Bauer (1997) also identified cultural and psychological attitudes as impediments to more active markets in Chile despite potential significant financial gains for poorer inefficient peasants. Bjornlund (2002a) described Australian farmers' reticence to enter already established water markets. In his survey, 92.5% of the respondents still preferred the traditional rights ownership and very few expressed an interest for individual rights. While there is general consensus among policy makers of the notion of breaking the nexus between land and water, the main perceived reason why farmers do not trade, is that they see their own entitlement as an integral part of their farm (Tisdell et al., 2001). Institutionally breaking the nexus between land and water will not lead to trade unless farmers see water entitlements as a tradable asset.

Impediments to water markets can arise from how law is set up. The number of buyers and sellers in the market will in part depend on who is allowed to trade. Constraints on such rights may be spatial, sectoral or use related. For instance, to trade out irrigation sector is often not allowed, as well as transfers between different basins are restricted. A couple of examples are reported in the case of the Murray's Water Regulation where no more than 2% of the total area entitlement at the beginning of the year can be traded out during the year (Bjornlund, 2002a).

In addition, poor defined water rights, is an important cause of impediments. Secure property rights are mentioned by Australian farmers as important impediments to the further adoption of water markets both permanent and temporary (Bjornlund, 2002a). In Europe, where the water markets are still promising phenomena, the water rights can be unilaterally redefined or revoked by the issuing authority. Trades can be challenged by third parties, restricted to certain buyers, or redirected to the State. If the farmer's feeling is very strong towards water rights uncertainty (i.e. possible revision of water access and allotment) water markets will not strongly run. In the same way, farmer's attitudes could lead to strategic behavior under a policy uncertainty if they feel to get water freely.

Other relative issues, which are largely mentioned in the literature on barriers to water markets, are administrative issues (Tisdell et al., 2001, Bjornlund and McKay 1999, 2001). The issues arise from the uncertainty of the outcome of the process and the time it takes. The perception of the process, the quality and accessibility of market information and, lack of market proficiency are also claimed as important elements that may delay water trading. Most of these issues emerge when there is not at all or at least little water exchange operating and therefore no public access to information about supply and demand.

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### 3. MATERIALS AND METHODS

#### 3.1. Study area: The Southern Spain

The research focused on the Southern Spain and covered one out of five Andalusian water districts, namely called Guadalquivir river basin (CHG).

The Guadalquivir basin covers 51.900 km<sup>2</sup> and flows through the eight provinces of Andalusia, mainly within the territory of Seville, Jaén, Córdoba and Granada. The average rainfall is approximately 590 mm per year, with potential evapotranspiration close to 790 mm per year. The water resources available in 2007 amounted to 3.362 Hm<sup>3</sup>/year and net demand rose to 3.578 Hm<sup>3</sup>/year, of which more than 80% comes from agriculture. This represents an overall deficit for the entire basin of 216 Hm<sup>3</sup>/year (IMA, 2007).

According to the official data (CAP, 2011), in 2008 the irrigated area in the Guadalquivir basin reached 838.232 ha, being olive oil the main irrigated crop cropped in the upper side of the Guadalquivir valley; extensive and semi-extensive crops such as corn, cotton and sugar beet are mainly farmed in middle and lower side of the valley. Citrus and orchard fruits are mainly concentrated in Sevilla and Córdoba provinces. Finally rice systems are in the end of river, so called 'Las Marismas de Sevilla'.

As regards to water right entitlement, under the old legal framework, landowners received water use rights (i.e. access to water as a 'license of use' for 75 years) by a system coupled with their own land, for an overall amount of water rights which was proportional to the land served by the infrastructure. In addition, the water right allotment was defined according to a crop-specific irrigation coefficient. Only temporally water markets were permitted while permanent water market ran jointly to land markets (i.e. land + water use right). Recently, the new Andalusian Water Law (2010), so called 'Ley del Agua' has broken the link with land and, farmers have been also enabled to trade permanently their water rights separated from land. In addition, license of use are released for a limited temporal horizon of 20 years. Finally, a Water bank system has been empowered. However, trading out the agricultural sector has not been allowed. Irrigators are now enabled to exchange their water rights among each others, but agents from other sectors are excluded.

Up to now, a number of inter-basin water transferences have been performed on the basis of market system in Andalusia. This occurred in the period from 2006 to 2008 between the Guadalquivir basin and the Mediterranean basin.

In the years 2006-2008 less than 50 hm<sup>3</sup> were transferred from the CHG to the province of Almería by means of water markets, at a price of 0.18 €/m<sup>3</sup>. As a whole, around 2% of water irrigation uses in the Guadalquivir basin was traded. Table 1 shows the overall operations in Spain as well as the Guadalquivir ones. It should be remarked as a single buyer such as 'Agua del Almanzora' worked while various sellers sold their water. In addition, since under previous water right framework, the permanent water markets were not allowed, Agua de Almanzora had to buy water rights jointly to the land, in order to start with water entitlement trading. Indeed,

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Aguas del Almanzora purchased 1500 ha of land in the CHG and then was enabled to transfer the associated water rights to Almeria. In 2007 the sellers were four and only seasonal water markets ran.

**Table 1:** Water trade in the Guadalquivir (2006-2008)

Year	Seller		Buyer		Volume (m <sup>3</sup> )
2006	Guadalquivir	Aguas del Almanzora SA	Aguas del Almanzora SA		8,479.673
	Total Spain	-	-		75,048.408
2007	Guadalquivir	Bembezar MD			35,315.378
		Guadalmellato	Aguas del Almanzora SA		
		Genil Cabra			
		Bembezar MI			
	Total Spain	-	-		102,393.891

Source: DGA, MIMAM, 2008

These formal operations define a market characterized by monopsony (one buyer) of demand and a more fragmented supply, if even limited to a narrow number of operators. In this context, water market in Spain appears too distant of the known cases in the world (i.e. California, Australia, Chile), especially in what is known as 'market depth' that is, number of operations and operators (Berbel, 2010).

Although the applicability of this instrument to ease the problems of drought years are similar to those of other developed economies in arid or Mediterranean climate, data for the south of Spain show a small size of observed markets in dry periods.

### 3.2 Survey and focus groups

This paper aims to underline stakeholder's perceptions and preferences towards water markets in agriculture, focusing on the likely market barriers that might be related to the low number of exchanges of water resources. To do so, quantitative and qualitative analysis was carried out based on data collected by means of a survey and focus group technique. Two different stakeholders of irrigation community in the Guadalquivir river basin were canvassed namely managers of irrigation boards and irrigators. Interviews were conducted from December 2011 to February 2012 to 47 participants. Simple structured questionnaire to both stakeholders including twelve 5-point Likert-scaled statements was applied.

A similar questionnaire was firstly applied by Bjornlund (2002a) for the permanent market in Australia and, in our case, adapted according to the Spanish institutional market framework, which shows slight differences. In addition, survey structure was drawn taking into account the available international literature.

On the one hand, the questionnaire was sent to a group of 60 irrigation board communities. Managers were asked to reply the questionnaire according to their point of view as members in charge of irrigation boards. At the moment of writing this paper, only 28 questionnaires were sent back. Two of these were not fulfilled.

On the other one, three focus groups with the irrigators were carried out, respectively in the provinces of Córdoba, Jaén and Sevilla. The three different acts were performed in order to separate potential sellers from permanent and annual buyers of each member participating in these meetings. The participants were asked to fulfil the same questionnaire above mentioned. As a whole, 19 irrigators were canvassed previously to the focus groups. Afterwards, an open discussion on the water market issue took place among the participants.

For both stakeholders, sampling procedure was based on the geographic distribution across Guadalquivir basin of irrigation sub-districts and farmer's features.

Afterwards, the characteristics of surveyed stakeholders are reported. In the case of members of irrigation boards, the sample covered a land amount of 94,754 ha, of which 90% is irrigated area. The average size is 6768 ha with annually volume of water used being of 6769 m<sup>3</sup>/ha. Essentially, the water prices consist of a tariffs ranging from 57 to 166 €/ha. Main irrigated crops are citrus, rice, cotton, maize and olive oil.

As regards to irrigators, the focus groups were carried out respectively among a group of farmers that currently do not account for water rights; a second group that covered irrigators who currently account for poor water entitlements with both low water allotments and supply security. Finally, a third group accounted for irrigators with higher water right allocations (6000 m<sup>3</sup>/ha). In addition they have already sold water in 2007.

In the first act there were 11 farmers coming from Puente Genil (Córdoba). They are seen as potential buyers given that their farms currently do not rely on water entitlements. Farms average is 48 ha, traditional olive oil is the main crop, and farmer's age is on average 52 years.

Secondly, a focus group among olive oil producers in a small village called Cambil in province of Jaén took place. This group can be also seen as potential buyers given that uncertainty of water supply both in term of supply security and annual availability are common issues. Only 3 people attended to this focus group, 60 years was the average age and, 16 ha the farm size. Finally, less than 1000 m<sup>3</sup>/ha is the annual water allowance for which a water tariff of 0.08 is paid.

In the third act there were 5 farmers. The act was performed in a small town called Lora del Río (province of Sevilla). This focus group embraced potential sellers of seasonal rights since they were one of the four sellers who sold their water allowance to the Aguas del Almanzora. As a whole, an amount of 12 hm<sup>3</sup> accounting for 1000 m<sup>3</sup>/ha was sold in 2007. They show larger average farms (336 ha) and higher average allocations (6000 m<sup>3</sup>/ha). The main irrigated crops are citrus, cotton and corn.

### *3.3 Methods for data analysis*

The data obtained through the survey was analyzed by statistical tools. The 5-point Likert scaled responses were analyzed by a T test that is used in statistics for population samples that follow a Student's t distribution. This type of distribution occurs when the population is expected to follow a normal distribution, but the sample size is small, such as in our case. In addition, the Mann-Whitney U test was used to test for differences between two independent samples which came from populations with the same mean. The MW-U test assumes that the variable you are testing is at least ordinal and that its distribution is similar in both groups. Finally, two-sample Kolmogorov-Smirnov test was used to validate the assumption of similar distributions whether populations differ in their rankings of statements on the basis of the maximum difference in cumulative relative frequencies.

Firstly, the T test was performed in order to prove the normal distribution of overall responses. This analysis was carried out on the survey as a whole. Secondly, a comparative analysis of the responses obtained by the two selected stakeholders, namely managers of irrigation boards and irrigators, was performed.

## **4. FINDINGS AND DISCUSSION**

### *4.1 Questionnaire results.*

Firstly, the overall responses to the survey statements are shown in the Table 2. According to a 5-point Likert scale values (from 1= strongly disagree to 5 strongly agree), Tables 2 reports the frequency of respondents for each statements about water markets.

Results show that the majority of stakeholders think that water markets are good tools for water allocation (39% agree and 18% strongly agree). On the contrary, only 20% of interviewed were not in agreement with that statement. Among those who declared a disappointment about the market idea, the smallest frequency is reported for the class of 'Strongly disagree'. As a whole, the market idea as a good tool for water management is seen positively from the irrigation community in the Guadalquivir basin.

The following next five questions in the Table 2 are related to likely motivations that may explain the agreement or the opposition to water market idea. Stakeholders were asked to rank these statements according to their personal point of view. Findings in the Table 2 show that irrigation community is neutral (46%) with respect to second statement. On the one hand, they believe that market is a good idea give that it allows farmers who want to abandon irrigation to facilitate exit through permanent water sale (32% agree and 41% strongly agree). On the other one, they accept to trade water temporally as water rights remain linked to the land. Finally, while statement of 'Permanent water right trade is necessary to allow long term planning' is equally ranked, general criticism towards water market arises because many respondents believe that water should not be traded as a commercial good.

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**Table 2:** Statement responses according to the 5-point Likert scale values

Statements	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Water market is a good idea	9%	11%	23%	39%	18%
Water market is NOT a good idea because it increase water use as water that is sold is exclusively water that was not going to be used anyway, reducing the resource available	21%	17%	46%	0%	17%
Water markets are good because they allow farmers who want to abandon irrigation to facilitate exit through permanent water sale	3%	9%	16%	32%	41%
I agree with seasonal water sales as the water rights remain linked to the land	2%	4%	11%	46%	36%
Permanent water right trade is necessary to allow long term planning	21%	18%	35%	12%	14%
Water trade is NOT a good idea because water cannot be a commercial good and trade should not be allowed	0%	0%	46%	8%	46%
In future I would be interested in buying seasonal water rights	14%	18%	19%	44%	5%
In future I would be interested in buying permanent water rights	12%	21%	26%	32%	9%
In future I would be interested in selling seasonal water rights	9%	19%	19%	44%	9%
In future I would be interested in selling permanent water rights	22%	29%	21%	21%	7%
I would not sell it because in the future it is likely that Government reduce my allocation	5%	21%	24%	33%	17%
I would not buy it because I believe that I will get it free in the future	23%	38%	31%	5%	3%

Source: Own elaboration (N= 47; surveyed from December 2011 to March 2012)

Following the statements order in the Table 2, there are four declarations about the intention on selling and buying water in the next years both temporally and permanently. Essentially, respondents show similar attitudes towards water markets.

Finally, the two last statements are related to stakeholder's perceptions towards policy uncertainty. In this regard, results point out that many of respondents have fear in the reduction of water allocation in the event of water selling. However, they recognize as unrealistic expectation to get water freely.

Afterwards, results of the statistical analysis are reported. The analysis was carried out in order to prove statistically the degree of agreement or disagreement to the statements about the mean response whose value on the 5-point Likert scale is 3. Put in other way, the significance of tests stress the divergences of ranking with respect to the neutral value, namely 3 in the the 5-point Likert scale. Findings are shown in the Table 3.

**Table 3:** Statistical analysis of responses

Statements	Mean of overall stakeholders	Mean of irrigators	Mean of managers	Mann-Whitney U test	Kolmogorov-Smirnov two-sample test
Water market is a good idea	3.44*	3.37	3.50	247.00	0.44
Water market is NOT a good idea because it increase water that was not going to be used anyway	2.78	3.11	2.54	219.00	1.22
Water markets are good because they allow farmers who want to abandon irrigation to facilitate exit through permanent water sale	3.93**	4.37	3.61	157.50*	1.18
I agree with seasonal water sales as the water rights remain linked to the land	4.04**	3.89	4.15	235.00	0.52
Permanent water right trade is necessary to allow long term planning	2.80	2.68	2.88	233.50	1.09
Water trade is NOT a good idea because water cannot be a commercial good	3.95**	4.53	3.53	116.00**	1.89**
I would buy seasonal water rights	3.13	3.05	3.19	236.00	0.33
I would buy permanent water rights	3.11	3.26	3.00	206.50	0.77
I would sell seasonal water rights	3.26	2.78	3.61	148.50*	0.95
I would sell permanent water rights	2.66	2.26	2.96	168.50	0.82
I would not sell it because Government will reduce my allocation	3.44*	3.37	3.50	238.50	0.39
I would not buy it because I will get it free	2.31**	2.05	2.50	183.50	0.78

Source: Own elaboration

Note: \*significant at 0.05; \*\*significant at 0.01

As the Table 3 shows the mean is statistically greater than 3 in the following statements: ‘Water market is a good idea’, ‘Water markets are good because they allow farmers who want to abandon irrigation to facilitate exit through permanent water sale’, ‘I agree with seasonal water sales as the water rights remain linked to the land’, ‘Water trade is NOT a good idea because water cannot be a commercial good’ and, ‘I would not sell it because Government will reduce my allocation’. Only for the last statement, namely ‘I would not buy it because I will get it free’, the mean is lower than 3 with a 99% of significance. All of other statements show a normal distribution of rank values.

When the mean of rank is higher than three, it is assumed that frequency distribution of responses concerning the market statements is skewed to the left, therefore the bulk of the values lie to the right of the mean. As a consequence, the respondent’s agreement with the relative statement is significant. On the contrary, when the mean of rank is lower than three, it is

assumed that frequency distribution of responses concerning the market statements is skewed to the right therefore respondents are not in agreement with the relative statement.

According to the results barriers to water markets emerge. Statistical analysis reveals the stakeholder's perception of water right as a private asset. Indeed, they are in agreement with the permanent market in order to receive some compensation. Put in other words, they are disposed to leave irrigation, hence the water right, but they would earn money from the right even if actually they do not own the right. In the same direction goes the following statement about the seasonal water market. Respondents are in agreement with the in short-term water mechanisms as the water rights remain linked to the land. In addition, perception of water markets is negative because water is seen as a no commercial good. This aspect is recognized among the cultural issue that can refrain water trading.

Statistical analysis reveals also other important aspect that may be related to the barriers towards water markets. This refers to the policy uncertainty and property rights security, give that respondents are in agreement with the statement of 'I would not sell it because Government will reduce my allocation'.

Basically, preferences analysis indicate that stakeholders in the Guadalquivir basin are not significantly willing to participate in water market mechanisms in the future neither in the seasonal market, such as spot water markets, or in permanent transfer mechanisms.

If we turn now on the comparative analysis between managers and irrigators views, findings in the Table 3 show significance for the Mann-Whitney and Kolmogorov-Smirnov two-sample tests, in the case of statement concerning the appointment towards water trade because water cannot be a commercial good. In this context, results point to the farmer's cultural believes as a barrier to the water market, while managers of irrigation boards are unbiased.

#### *4.2 Main results of the three focus groups*

Meetings with farmers reveal the existence of various different perceptions and preferences, as well as barriers according to each group.

One of the most stressed problems by participants was lack of information reliability provided by the public institutions. For the first group, lack of information about the procedure for obtaining entitlements, the access to rights system and the way to assign entitlements, emerge among the most important issue to buy a permanent right. In addition, according to the current market framework, exchanges are allowed exclusively within the irrigation areas, therefore new access are refrained. This aspect was largely mentioned as an impediment to permanent trade in this Focus Group.

A second problem discussed was types of existing infrastructures. Farms are not everywhere collected to delivery systems on the territory managed by the CHG. As a consequence, potential buyers are excluded to a water markets. The existence in the area of the

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upper Guadalquivir basin (mainly Jaén) of a surface extension supplied with unregulated resources makes difficult to use market for this farmers. Moreover, for inter-basin trade the channel capacity is the major impediment. Finally, technical-administrative restrictions to the inter-basin transfer operations from the CHG to the Agua de Almanzora makes additional barrier to water market. Indeed, the inter-basin transfers are regulated under a national law<sup>1</sup> with a maximum volume of 50 hm<sup>3</sup> per year.

A third problem identified is the asymmetry of information. Indeed, significant differences in the level of information about water market between areas where the focus groups were carried out have been found. On the one side, awareness of the farmers who have already sold in the 2007 contrasts to the disinformation and distrust that farmers who were not involved in water markets. These latter irrigators are stand out by the entrenched cooperative well-established and solidarity with irrigators of the same irrigation boards, unwilling to give up water to another irrigator in exchange for money and presenting a strong attachment to their land as they never cease in rain fed crops to receive compensation.

## 5. CONCLUSIONS

In this research barriers to water markets in the Guadalquivir river basin has been analyzed. Irrigation community and relative stakeholders were asked to rank twelve 5-Likert scale statements concerning to water markets issues.

Quite apart from the different nature of the Spanish barriers, stakeholder's perceptions and preferences cannot be regarded as a particular behaviour since they happened pretty similarly in other studied area where similar researches have been realized.

The existence of cultural barriers has been largely recognized in Bjornlund (2002a) and Tisdell et al. (2001) for Australian farmers. Similarly, irrigation community in Southern Spain are reluctant to water trade. Irrigation community perceives the water rights as a farm asset pointing to the nexus between land and water.

On the other hand, legal and administrative issue promote fear and uncertainty among the stakeholders. The lack of information about the procedure for obtaining entitlements, the access to rights system and the currently entitlements allocation by the public authority inhibits the activation of water rights market. At last, types of existing infrastructures act as a physical barrier to the water markets operations.

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<sup>1</sup> Ley 55/1999, de 29 de diciembre, de Medidas fiscales, administrativas y del orden social. Disposición adicional vigésima segunda (1999). Transferencia de recursos entre el Negratín y el Almanzora. Available on: [www.boe.es/boe/dias/1999/12/30/pdfs/A46095-46149.pdf](http://www.boe.es/boe/dias/1999/12/30/pdfs/A46095-46149.pdf)

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From the findings barriers to develop a profuse water markets in agriculture have been found. Most of these have been already recognized where water markets have been longer working, such as in Australia, Chile and USA. However, this study could be useful to European policy makers who are currently evaluating the potential for water markets and have little observable market data to work with.

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#### REFERENCES

- Armitage, R.M. (1999). An Economic Analysis of Surface Irrigation Water Rights Transfers in Selected Areas of South Africa. *Water Research Commission*: Pretoria, South Africa.
- Bauer, C.J. (1997). Bringing Water Markets Down to Earth: The Political Economy of Water Rights in Chile. *World Development*, 25(5): 639-656.
- Bauer, C.J. (1998). *Against the Current: Privatization, Water Markets and the State in Chile*. Kluwer Academic Publishers, Boston.
- Berbel, J. (2010) Presentation of case study: Water markets in Guadalquivir. CAP-TRADE. Paper presented in Montpellier Jan 2011.
- Bjornlund, H. (2002a). What impedes water markets. Paper to be presented on the fourth Australasian Water Law & Policy Conference, Sydney 24 to 25 October, 2002.
- Bjornlund, H. (2002b): Signs of Maturity in Australian Water Markets. *New Zealand Property Journal*, July, 31–46.
- Bjornlund, H. and McKay, J. (1999): Water Markets: Buyers and Sellers Perception. *Water* 26(2): 41–45.
- Bjornlund, H and McKay, J. (2001). Operational Aspect of Water Markets. Proceedings from the 3rd Australasian Natural Resources Law and Policy Conference, Adelaide, March, 50–59.
- Bjornlund, H and McKay, J. (2002). Aspects of water markets for developing countries experiences from Australia, Chile and the US. *Int. Environ. Affair*. 7: 767-793.
- CAP – Consejería de Agricultura, Pesca y Medio Ambiente de la Junta de Andalucía, 2011. Inventario de regadíos 2008 y su evolución en la última década. Available on: <http://www.juntadeandalucia.es/agriculturaypesca/portal/areas-tematicas/infraestructuras-agrarias/regadios-e-infraestructuras-agrarias/sig-de-regadios/evolucion>
- CHG–Confederación Hidrográfica del Guadalquivir, 2010. Available on: <http://www.chguadalquivir.es/opencms/portalchg/index.html>
- Colby, S.B. Bush, D.B. Martin, W.E. and Brown, T.C. (1987). Do Water market Prices Appropriately Measure Water Values? *Natural Resources Journal* 27: 617–651.

Garrido, A. (1998). Economic analysis of water markets in the Spanish agricultural sector: Can they provide substantial benefits. In *Markets for Water-Potential and Preferences*; Easter, K.W., Rosegrant, M.W. Dinar, A., Eds.; Kluwer Academic Publishers: Boston, MA, USA; pp. 223-240.

Giannoccaro, G., Prosperi, M., Zanni, G. (2011). Economic Effects of Legislative Framework Changes in Groundwater Use Rights for Irrigation. *Water* 3, 906-922. doi:10.3390/w3030906

Horbulyk, T.M. Lo, L.J. (1998) Welfare gains from potential water markets in Alberta, Canada. In *Markets for Water-Potential and Preferences*; Easter, K.W. Rosegrant, M.W. Dinar, A. Eds.; Kluwer Academic Publishers: Boston, MA, USA. pp. 241-258.

IMA- Consejería de Medio Ambiente, 2007. Available on:

<http://www.juntadeandalucia.es/medioambiente/site/portalweb/menuitem.6ffc7f4a4459b86a1da5c105510e1ca/?vgnnextoid=8305fd3ed55f4310VgnVCM2000000624e50aRCRD&vgnnextchannel=4ab0bf3a50842310VgnVCM10000055011eacRCRD>.

Tisdell, J.G, Ward, J., Grudzinski, T. and Earl, G.(2001): Irrigator and Community Attitudes to Water Allocation and Trading in the Goulburn Broken Catchment. Technical Report 01/3, *Cooperative Research Centre for Catchment Hydrology*. Griffith University, Queensland.

Tisdell, J.G. and Ward, J.R. (2003). Attitudes Towards Water Markets: An Australian Case Study. *Society and Natural Resources* 16(1):61-75.

Zetland D. (2011). Water markets in Europe. *Water Resources IMPACT*. Volume 13(5).