The importance of water property rights: lessons from South Africa and Tunisia

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The importance of water property rights: lessons from South Africa and Tunisia

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Abstract

With increasing water scarcity, research on policy options for improved water allocation and governance becomes an urgent priority for many developing and developed countries. Evaluating institutional alternatives is however a challenging task. This article takes a comparative approach and compares case study data from Tunisia and South Africa highlighting the importance of the water rights system for irrigators. Using contingent valuation methods the benefits for water users of changes in water rights systems are quantified. In both countries WTP estimates reveal that from the farmers' perspective significant improvements can be made to the current water rights systems. This is valuable information for policy makers to guide institutional reforms.

1 Introduction

As competition for water grows across the globe, water users and water management organizations seek better institutional arrangements for coordinating use and resolving conflicts (Brennan, 2002; Bruns et al., 2005). In this context, understanding is growing that irrigation water rights are important and that a lack of effective water rights systems creates major problems for the management of water supplies (Matthews, 2004; Bruns *et al*., 2005; Meinzen-Dick and Nkonya, 2005; Hodgson, 2006).

The theoretical rationale for improving water rights is based on arguments of efficiency, i.e., only when water rights are clearly defined, Pareto optimal outcomes are possible (Araral, 2010). Sub-optimal irrigation water right systems constitute a form of inefficiency, which, as indicated by Challen (2000, 2002) and Wichelns (2004), is linked to the transaction costs associated with the making of decisions over the use of the irrigation water. When property rights are ill-defined, this creates high transaction costs (information search, negotiation, monitoring) and limits the value people assign to a resource (Randall, 1978; Ostrom, 2000; Heltberg, 2002; Halsema and Withagen, 2008; Linde-Rahr, 2008). This confines the incentives for resource users to manage a resource sustainably (Yandle, 2007).

While empirical work related to property rights theory mainly focuses on explaining the role and functioning of property rights over natural resources, and in part their emergence, more research is needed to quantify the degree of efficiency of a prevailing institutional structure or the benefits of improving it (Brennan, 2002; Dinar and Saleth, 2005; Linde-Rahr, 2008; Irimie and Essmann, 2009; Araral, 2010). The theory of transaction costs can play an important role in this respect (Challen, 2002; Crase et al., 2002). As suggested by Mc Cann et al. (2005) contingent valuation surveys could be a useful approach to estimate willingness to pay to reduce transaction costs in contexts where respondents face policy related transaction costs. Applications of this approach to evaluate the degree of the efficiency of a prevailing institutional structure were recently developed by some authors for the case of water rights (e.g., Crase et al., 2002; Herrera et al., 2004; Frija et al., 2008; Speelman et al., 2010). Similarly Barton and Bergland (2010) and Rigby et al. (2010) use choice experiments to value irrigation water under different institutional settings.

This article takes a comparative approach and compares case study data from Tunisia and South Africa highlighting the importance of the water rights system for irrigators and showing how different contingent valuation methods can be used to quantify the benefit of changes in water rights systems. South Africa and Tunisia were chosen as case studies because on the one hand both countries face increasing water shortages and have an important irrigated agriculture sector, while on the other hand they are at different stages in the development of irrigation water rights: In Tunisia the irrigation water rights established during the French occupation were modified during the 70's from a full individual property right toward a simple usage right for a given volume of water, generally relative to the area of land owned (Al Atiri, 2007). All ground and surface water resources are thus currently considered as state-property. Moreover a process of irrigation water management transfer already started in the 90's by creating WUA, which became the gatekeeper of the irrigation water rights at local levels. In South Africa both the shift to usage rights and the decentralisation of water management are only initiated by the 1999 Water act. It furthermore also has to be noted that while the Tunisian case study involves market–integrated small and medium size farms, the study in South Africa focuses on the small-scale irrigation sector, which is largely subsistence-oriented. It will thus be interesting to see if these differences have an effect on the valuation of irrigation water rights.

The remaining of the paper is divided into three main sections. In the second one, we undertake a literature review showing the importance of property right and transaction costs theory for the evaluation of the irrigation water rights. The third section provides a description of the current water rights systems in Tunisia and South Africa and the results of the contingent valuation of changes in both systems. The fourth section of the paper discusses and confronts the results from both countries while the last section concludes.

2 Theoretical background for analysing irrigation water rights

It is a core assumption of the theory of New Institutional Economics that institutions shape the conduct of policy and economic actors (Irimie and Essmann, 2009). According to North (1990), institutional arrangements and economic organisations are key factors of socio-economic development, explaining the different paths of growth and development throughout

the world. Two key theories within the New Institutional Economics framework are property rights theory and transaction costs theory. Both theories are useful for understanding the importance of irrigation water rights.

Property rights are social relationships established between an entity (owner) and other entities (non-owners) with respect to a resource. In many cases these relationships are not mere bilateral though, but triadic, since an authority system (usually the state) is supposed to define and enforce these rights (Bromley, 1991). Property rights can be defined as "the claims, entitlements and related obligations among people regarding the use and disposition of a scarce resource" (Furubotn and Pejovich 1972). The whole structure of rights and duties characterising the relationships between entities with regard to a specific resource is called a property rights system or regime (Irimie and Essmann, 2009). The definition of the property rights system affects individual behaviour as well as the functioning and efficiency of the economic system. Already back in 1967, Demsetz (1967) noted that the primary function of property rights is to guide incentives towards the achievement of better internalization of externalities. Where incentives are absent, or not well defined, uncertainty arises, and this affects decision making by the property right holder. In general, the importance of the definition and enforcement of property rights increases in relation to the scarcity of a given resource. As a resource becomes scarcer and competition increases, property rights can clarify expectations and thereby reduce conflict and interaction between users over a resource (Bruns et al., 2005).

Property rights theory may be used to analyze how different management approaches characterize property rights and distribute pieces of the property rights bundle. Conflicts and ambiguity in resource use arise when property rights or institutional arrangements are incompletely defined or are distributed in ways that create mismatches (Yandle, 2007; Amacher et al., 2009). Libecap (2009) even claims that most problems of overexploitation of natural resources are in one way or another linked to incompletely defined or enforced property rights. Given the growing water scarcity worldwide, this renders the analysis of possible improvements in water rights systems a research priority.

From a new institutional economics perspective, the central issue in examining alternative institutional structures is that of transaction costs (Challen, 2002; McCann et al., 2005). Transactions costs involve those costs associated with making decisions about resource use, including the cost of administering and enforcing rules, and the costs of making decisions about the reallocation of usage rights. Different allocations of decision-making power, different levels of uncertainty and other rules governing resource use generate different transactions costs and, according to the new institutional economics theory, the best governance structure is the one that minimises these transactions costs (Brennan, 2002; Challen, 2002). In this way, transactions costs determine the efficiency of the economic system and have to be considered while designing institutions for resource management. However, estimation of transaction costs of different institutional alternatives is challenging. For property rights for example mostly competitive markets are absent, and thus no revealed preference information is available to estimate the transaction costs related to specific rights (Garrod and Willis, 1999).

McCann et al. (2005) therefore suggest that the methods used for nonmarket valuation of environmental goods may also have potential for the measurement of transaction costs in the evaluation of alternative policy options since many of the challenges faced are similar. These methods rely on hypothetical markets and allow various types of values to be measured separately or all together based on stakeholder preferences (Garrod and Willis, 1999; Mc Cann et al., 2005). In this article two different contingent valuation methods will be applied to different water right systems to assess the importance of irrigation water rights: dichotomous choice contingent valuation and contingent ranking, a type of choice experiment. Both methods will be used for the estimation of Willingness to Pay (WTP) of farmers for hypothetical changes in current water rights system.

3 Introduction to case of South Africa and Tunisia

3.1 South Africa

Description of the water rights system in South Africa

In South Africa the National Water Act (Republic of South Africa, 1998) replaced the previous system of water rights and entitlements, which was based on the ownership of

riparian land, with a new system of administrative limited-period and conditional authorizations to use water (Nieuwoudt, 2002). This change was part of the efforts of the new democratic government to overcome the legacy of the apartheid system by restructuring the constitution, legal system, policies and administration (Wester et al., 2003). It has to be noted that this new system only concerns usufruct right, while ownership of the water is held by the state.

Although the new water rights system is currently still not made fully operational, several authors have already identified shortcomings. Backeberg (2006) predicts how the short review period of licenses of five years will have a negative effect on farmers' investment decisions. This review period is installed to allow government to take timely measures to maintain the integrity of the water resource, achieve a balance between available water and water requirements, or accommodate changes in water use priorities (DWAF, 2004). However, that conditions attached to licenses may change at each review (for instance the volumes and timing of abstractions, the volume that may be stored etc.) gives farmers the impression that licences are insecure (Nieuwoudt and Armitage, 2004). The same authors furthermore point out that the reliability of allocation is impeded because there is no guaranteed supply. Although quantities will be specified in the license, they are not guaranteed (Republic of South Africa, 1998). Louw and Van Schalkwyk (2002) finally have criticized the provisions regarding transferability made in the National Water Act. Transferable water rights and water markets are generally believed to improve water productivity through the transfer of water from low value users to high value users (Bjornlund and McKay, 2002; Nieuwoudt and Armitage, 2004; Bruns and Meinzen-Dick, 2005; Zekri and Easter, 2007; Brooks and Harris, 2008), but over-regulation of transfers will reduce the efficiency gains (Rosegrant et al., 1995; Shi, 2006; Donohew, 2009). In South Africa trade in water use authorizations, will be treated similarly as a new license application. This means that a water management agency has to approve each transfer. For transfers of water rights among irrigators at a same irrigation scheme possible externalities of the transfer are limited (Donohew, 2009) and thus the type of administrative procedure proposed seems to create unnecessary transaction costs, limiting efficiency gains from water right transfers.

Analysis of improvements

For the analysis of the water rights system in South Africa a choice experiment is developed (Speelman et al., 2010). The technique, which is originating from marketing and transportation science, has been proven to be useful in valuing multidimensional interventions in a system (Hanley et al., 2001, Bateman et al., 2006; Burton et al., 2007; Kanyoka et al., 2008; Mondelaers et al., 2009; Do and Bennett, 2009). The technique enables to value both entire interventions as their individual components. In this way willingness to pay for improvements in the water rights system can be determined. An advantage of the contingent ranking approach used in this case study is the avoidance of an explicit elicitation of the respondents' willingness to pay by relying instead on the ranking of a series of alternative packages of characteristics (Foster and Mourato, 2002; Bateman et al., 2006).

Based on literature review (Louw and van Schalkwyk, 2002; Nieuwoudt, 2002; Perret, 2002; Nieuwoudt and Armitage, 2004; Backeberg, 2006; Pott et al., 2009) and expert knowledge, three characteristics of property rights are examined for the South African case. It does not consist of operational-level rights[1] but instead the focus is on so called "property rights dimensions". According to Yandle (2007) these dimensions can be used to assess the quality of the property right. The dimensions examined for South Africa are duration, transferability and quality of title. The duration refers to the period of time for which the operational-level rights are guaranteed or the time until the rights regime is renegotiated. This aspect is important because for rights holders to have the incentive to use a resource sustainably, they must be confident in the time period over which their rights to the resource will not be diminished (Backeberg, 2006; Yandle, 2007). Transferability considers if transfers of water rights are allowed and which procedures are used for transfers. The quality of the title dimension finally describes the capacity of the title to adequately define the resource and how much of a resource rights holders may extract. Specification of the attribute space of the contingent ranking experiment also comprises the stipulation of the attribute levels used in the experiment. For duration two levels are included 5 years and 10 years. For transferability the

[1] Operational level rights determine the actions a property rights holder must, may, or can not take with regard to a resource

levels considered are no transfer; agency based transfer and market transfer and for quality of the title, two levels are used in this study: no guaranteed supply and guaranteed supply.

An overview of the different attributes and levels used in the CR experiment is provided in table 1. The econometric analysis of the data collected in the CR experiment is based on the rank-ordered logit model (Beggs *et al*. 1981), which as an extension of the basic conditional logit model of McFadden (1974) is grounded in the random utility. For a detailed description of the experiment and the econometric model see Speelman et al.(2010).

Table 1 Attributes and levels used in the choice sets

Attributes	**Levels**		
Transferability	not transferable	agency based transfer	market transfer
Duration	5 year	10 year	
Security	guaranteed quantity	No guaranteed quantity	
Price*	6 c/m³	9 c/m³	12 c/m³

*The average exchange rate at the time of data collection was 1R=0.13US$

Data

The data were collected in April 2008 in the Limpopo province of South Africa. A sample exemplary for the situation of smallholder irrigation schemes in the rural areas of South Africa was established. Both larger irrigation schemes with over 100 farmers and smaller schemes with only 30-40 farmers were included in the sample. Furthermore it was also assured that differences in cropping patterns reflecting varying degrees of water scarcity were covered. In total, seven irrigation schemes were identified from the national database of small-scale irrigation schemes. Within the schemes about 30% of the farmers were randomly selected from a list of active farmers. Besides the CR experiment, the questionnaires also included detailed information regarding farming activities, alternative income sources and other relevant institutional aspects of water management. In total 134 questionnaires were completed, which provided 402 choice sets for analysis.

3.2 Tunisia

Water rights in Tunisia

In the study of Tunisia two main components of the water rights system are distinguished: the "water access right" and the "water delivery right" [2]. The "water access right" is defined at the constitutional level, it relates water property to the public authority. From an individual perspective, this component mainly concerns the security of the water right (e.g. ownership, tenure, quantification of the right, etc.). It also includes the legal definitions in relation to the abstraction or use of water. The "water delivery right" on the other hand is defined as the right to have water delivered via an infrastructure operator. We therefore assume that this component relates to water supply reliability and WUA performance, which are the active infrastructure operators in Tunisia.

The water access right changed in the mid seventies from a full property right to a simple usage right for a certain water volume linked to the size of land owned (Al Atiri, 2007). This institutional change happened during a period of fundamental institutional reforms in the Tunisian water sector. The objective of this property right shifting was to give the public authorities full rights over the water resources and over water allocation between users. After a period of central water resource management, a second shift occurred moving towards decentralized allocation through local decisions made by WUAs. Water rights are hereby typically transferred from the public to the local level, and then to the individuals who use water for irrigation. It is clear from the above that in contrast to the South African case, in Tunisia the process of property right change started earlier than the decentralization process.

Based on a review of empirical studies concerning the irrigation water sector in Tunisia (Chraga and Chemkh, 2003; Ben Salem et al, 2005; Makkaoui, 2006; Chebil et al, 2007, Frija *et al.*, 2009), we found that instability of irrigation water supply due to water scarcity and technical problems in the irrigation network, is an important factor affecting the perception and behavior of farmers. In addition, in most cases farmers are ignorant about the total quantity of water allocated to them at the beginning of the agricultural season. Furthermore,

[2] This terminology on "water access right" and "water delivery right" is acquired from the Australian Water Act 2007 (NO. 137, 2007) - SECT 4: available on line on http://www.austlii.edu.au/au/legis/cth/num_act/wa200783/s4.html . The terminology is also used by Shi (2006).

the water right is not transferable among farmers or among farmers and the WUA. Irrigators have to use their rights themselves otherwise they will lose it. Given the water shortages being faced by the country and taking into account the benefits (economic and environmental) of secured rights under the format of quotas or transferable entitlements in markets, the possible benefits of a more flexible transferable quota system was investigated.

Concerning the water delivery right, several authors (Frija, 2009; Makkaoui, 2006; Ben Salem et al., 2005; Chraga and Chemakh 2003) show that technical and organizational problems still occur in Tunisia and that these affect the perceptions of the irrigators. An improved reliability of supply is supposed to have an effect on the irrigation water use efficiency.

Analysis of improvements

Also in the Tunisian case study it is assumed that the opportunity for property rights enhancements can be evaluated by non-market methods and can be assessed by estimating and aggregating individual preferences. Contingent valuation, with the single bounded dichotomous choice format, is used to assess farmers' WTP for improvements. Three scenarios have been identified (table 2), making assumptions concerning the water access right and the water delivery right. In practice, for the water delivery right improvements in the water supply reliability are assessed, while in terms of the access right the introduction of quotas and transferability is analysed. The reliability could be enhanced through improvements in WUA efficiency and functioning. This characteristic is formulated in the supply reliability scenario in which a more reliable water supply is proposed to farmers. This scenario is relevant as most farmers are worried by irregularities in water delivery at times when they need water urgently. The second scenario quantifies the water access right in terms of a quota. This will ensure better security of farmers' current entitlements to water. By introducing quotas farmers in advance have an idea as to the quantity of water available to them during the irrigation season (Hodgson, 2006). Finally, the third scenario relates to the transferability of the access right. However, transferability requires that the right is quantified (Matthews, 2004; Bjornlund, 2006). For this reason, in the third scenario we add a transferability option to the second scenario. It will therefore be called the "clarity + transferability" scenario. For each scenario, different price bids are proposed to the farmers,

who have to accept or reject them. For a detailed description of the experiment see Frija *et al.*, 2008.

Table 2 Property rights and attributes used for building CV scenarios

Water right components	Attribute of the component	Name of the scenario
Water access right	security of the entitlement	clarity
	transferability of the entitlement	clarity + transferability
Water delivery right	supply reliability	Supply reliability

Data

The experiment was done in the region of Cap Bon in the North Eastern part of Tunisia. This region is one of the important irrigated agriculture areas in Tunisia. The dataset used in this paper is collected in 2007 from farmers of the Fondok Jedid (FJ) and Lebna Barrage (LB) areas, managed by two different WUAs. The dataset includes 18.7 % (30 farmers) and 30 % (32 farmers) of the total adherent farmers to FJ and LB WUAs respectively. When deriving the WTP values for institutional changes, the responses of the 62 farmers interviewed were considered together. The questionnaire used in the LB and FJ irrigated areas consisted of the following sequences: (i) farmer identification (socio-economic and demographic characteristics); (ii) farm identification (cultivated crops, quantities and costs of inputs; quantities and values of outputs, etc.); (iii) identification of water use, source and quality; (iv) evaluation of farmers' attitudes and perceptions concerning local irrigation water governance (functioning of their WUA); and finally the contingent valuation experiment.

4 Results

4.2 South African case study

Table 3 presents the rank ordered logit estimates for the South African case study. All the coefficients are significantly different from zero at the 5% significance level, meaning that they all are significant determinants of choice. The signs of the attribute parameters are as expected. Guarantee of water supply, increased duration of the license and improvements in

transferability all increased the probability that an option was chosen. Oppositely, a higher water price decreased the choice probability.

Table 3 Rank ordered logit results: determinants of ranking

Attribute	**coefficient**	**SE**	**p-value**
Duration	0.0957	0.0136	0.000
Quality of title	0.6284	0.0382	0.000
Price	-0.0478	0.0147	0.001
Agency based transfer	0.2300	0.0496	0.000
Market transfer	0.3598	0.0514	0.000
Model statistics			
LogL(initial)	-1277.58		
LogL(final)	-1051.47		
Pseudo R^2	0.177		
Attribute change	**Implicit WTP**		
No transfer to agency based transfer	14.6 c/m³		
Agency based transfer to market transfer	2.4 c/m³		
No secured supply to secured supply	12.6 c/m³		
5 years to 10 years	9.7 c/m³		

The table also presents the estimates of the implicit prices for individual attribute changes. These results indicate that the opportunity to transfer water licenses is highly valued. However, the move from a system of administrative transfer to water markets does not seem to add much value. High importance is furthermore attached to guaranteed water supply.

Finally the results suggest that increasing the review period of the licenses is an interesting intervention, since apart from the economic gain perceived by the farmers, which are reported in table 3, this would certainly decrease administrative costs.

4.2 Tunisian case study

For the Tunisian case a dichotomous choice model was estimated. Table 4 shows the coefficients of the estimated Hanemann models (Hanemann, 1984). The coefficients of the constant and of the bid price permit to calculate the mean willingness to pay for each scenario, which is also reported in the table.

Table 4. Estimation of the Hanemann model with the bid price as independent variable

Dependent Variable: Willingness to pay (binary choice)				
	Constant		Bid price	
Models (scenarios)	**Coefficient**	**P-Value**	**Coefficient**	**P-Value**
Supply reliability model (1)	0.7677	0.305	-53.66	0.004
Clarity model (2)	0.3426	0.648	-50.4143	0.012
Clarity + transferability model (3)	1.6661	0.011	-45.7663	0.000
Models Statistics				
Log-likelihood (model1)	-25.80			
LR (model1)	11.37***			
Log-likelihood (model2)	-23.40			
LR (model2)	9.66***			
Log-likelihood (model3)	-34.39			
LR (model3)	17.40***			
Scenarios	**Implicit WTP (TND[3])**			
Scenario1	0.0143			
Scenario2	0.0068			
Scenario3	0.0364			

*, **, *** = significant at 10%, 5%, and 1% level respectively.

[3] 1TND= 0.67 US$ at time of data collection

Table 4 shows that the WTP for an improvement of the reliability of irrigation water provision in the study area is about 0.0143 TND/m3. This corresponds to respectively 29.7% and 21% of current water prices charged to farmers in FJ and LB and suggests that water delivery reliability is an actual problem that affects farmers in the studied areas.

Quantification of the water access rights at the beginning of the irrigation season does not appear to be a priority for farmers. The recorded WTP for this scenario was positive but very low (0.0068 TND/m3). Under this scenario the new aggregated irrigation water prices would become 0.054 TND/m3 and 0.074 TND/m3 in the FJ and LB areas respectively, corresponding to an increase of 14.1% and 10% of current price charged to farmers. Adding the transferability option to the second scenario increases WTP substantially. WTP for the third scenario was around 0.0372 TND/m3 or 77.5% of the current price in FJ and 54.7% of current prices charged in the LB area. This indicates that transferable quotas would considerably increase the utility of the farmers.

5 Discussion

The WTP estimates of the case studies reveal that from a farmers' perspective significant improvements can be made to the current water rights systems in both South Africa and Tunisia. Irrigators in these countries are prepared to pay higher water prices under specific institutional improvements, if they believe that such improvements will decrease their transaction costs. While decentralization and water management transfer is still an ongoing process in South Africa, the case study in Tunisia already showed that farmers' opinion concerning the local water governance strongly affects their WTP (Frija, 2009). This implies that it is important for the governments in South Africa and Tunisia to enhance performance of water management institutions and to increase the trust of farmers in these institutions, because this will increase their WTP for the proposed interventions in the water rights.

In both countries the results show that making the water rights transferable has a large effect on farmers' WTP for water. Theoretically water transfers are expected to facilitate water reallocation from low to high valued uses at low cost. This creates surpluses both for sellers and buyers (Brooks and Harris, 2008). Another potential advantage is that markets empower

individual users to manage supply uncertainty incorporating decentralized information (Hadjigeorgalis, 2008). In South Africa, Nieuwoudt and Armitage. (2004) were able to statistically demonstrate the move from low to high value users in irrigated agriculture in the Lower Orange basin, where water markets had developed, using actual trading data. They found however that the difference in profitability between willing buyers and sellers should be large enough for water markets to function well. Based on interviews with farmers in different regions in South Africa, Pott et al. (2009) concluded that farmers see market transfers as a potential way of ensuring access to water supply. Given the recurrent water scarcity that occurs in the study area and the similarity in production characteristics of the small scale farmers in the sample, the second effect is more likely to explain the high WTP for water under a transferable water rights regime in the South African case study. This could be further investigated in follow-up research. In Tunisia previous studies on the benefits of water markets have presented mixed results. While Zekri and Easter (2005) predicted that water trading would have only a minor effect on farmers' income, Bachta et al (2004) forecasted that water trading between farmers resulted in significant improvements in the productive efficiency of water and therefore in higher overall revenues. Hamdane (2002) also argued that water markets would be beneficial for Tunisia because of the water shortages and the high demand. In line with Bachta et al. (2004) and Hamdane (2002) the WTP results presented in our study also suggest that the transferable quotas would considerably increase the utility of the farmers. It furthermore needs to be noted that whereas in South Africa land and water rights are already decoupled in Tunisia this would be a de facto consequence of introducing tradable quota's. While both case studies focus on farmers' preferences clearly the introduction and the nature of tradable water rights also has an impact on the transaction costs borne by government (Mc Cann et al., 2005). These costs should also be taken into account when deciding upon the desirability of introducing markets. Hamdane (2002) suggests that in Tunisia introducing a water market would require fundamental and costly institutional reforms. In South Africa, where administrative transfers are foreseen to be introduced following the National Water Act (1998), Louw and van Schalkwyk (2002) plead for water markets because they claim that the excessive transaction costs related to an administrative approach will erode the advantages of trade. Thus, although farmers' WTP to go from administrative transfers to water markets is relatively small in our case study, it should be

investigated to which extent water markets can decrease the administrative burden and associated costs of the agency based transfer system.

Both case studies also included an assessment of the importance that farmers attach to knowing how much water they will receive. Previous studies in the South of Spain by Alcon et al. (2008) and Rigby et al. (2010) suggest that generally farmers highly value certainty of supply. While in South Africa this appears to be the case and high importance is attached to guaranteed water supply, in Tunisia the clarity model hardly increased WTP for water. A larger variation in supply in South Africa might lie at the origin of this difference, but also the relatively high WTP for the supply reliability scenario, which suggests that reliability of supply is a real problem in the Tunisia, could explain this. Clearly the importance of knowing the size of one's water allocation is reduced if that person is uncertain to get the right amount of water at the time when he needs it. Furthermore about half of the farmers in the Tunisian case study owns a well and therefore also has access to groundwater. This probably reduces the average WTP both for the stability and clarity scenario because conjunctive use of surface and groundwater can ensure guaranteed supply and increase reliability. This role of groundwater was also reported by Marquez et al. (2005).

In South Africa the impact of the duration of the right was also assessed because the current short review period of five years was seen as a critical issue by several sector experts (Backeberg, 2006, Nieuwoudt and Armitage, 2004). Results show that a longer duration is clearly preferred by the farmers. Moreover increasing the time between the review periods of the license will also decrease administrative costs. These positive effects should be weighed against the loss in flexibility to adjust water policy when long-term licenses are in place. Hodgson (2006) discusses this trade-off in more detail. In Tunisia duration is not seen as a problem, since licenses are perpetual. Therefore it was not included in the analysis.

In terms of methodology, both methods (contingent valuation and choice experiments) seem useful to evaluate preferences for alternative policy options. The use of the choice experiment methodology however seems to have some specific advantages: it allows to control multiple dimensions of the water right simultaneously and hence implicitly enables one to explore a wide range of the preference space (Rigby et al., 2010). When using the dichotomous contingent valuation only the scenarios actually presented to the farmers can be assessed and the effect of individual dimensions can no longer be distinguished. Furthermore the use of choice experiments allows one to easily explore heterogeneity in preferences either through inclusion of individual or farm characteristics or through the use of random parameters. This opportunity is used in the articles by Rigby et al. (2010), Barton and Bergland (2010) and Speelman et al. (2010).

6 Conclusions

Research on the performance of water-policy reform, and on policy options for improved water allocation and governance, is an urgent priority for many developing and developed countries. It inherently is a difficult task, since it involves estimating the trade-offs between the benefits and costs of alternative institutional arrangements (Brennan, 2002). From a new institutional perspective, the central issue in examining alternative institutional structures is that of transaction costs (Challen, 2002).

Following the suggestion of Mc Cann et al. (2005) and in line with earlier work by Herrera et al. (2004) and Crase et al. (2003) we use contingent valuation methods to examine transaction cost borne by farmers in Tunisia and South Africa under alternative water rights systems. Overall the estimations of WTP indicate that significant inefficiencies exist in the current water rights system in both countries. Tackling these inefficiencies will not only be favorable for the efficiency of water use of smallholder irrigators, but given the size of the benefits can also add significantly to the government objective of cost recovery, which like in many developing countries is a hot issue in Tunisia and South Africa. With a higher WTP for water there is also more scope for government to increase water prices for irrigators and to reach high cost recovery rates.

While the results presented in this paper offer valuable insights to policy makers to guide water right reforms, the approach also has its limitations. The current analysis should always be part of a broader framework. Besides the transaction costs borne by the farmers, which are estimated here, there is also another type of transaction cost, namely the costs of establishing and maintaining institutions, and the costs of institutional change itself (Challen, 2002, McCann and Easter, 2004). Of course these costs should also be taken into account by policy makers when examining alternative institutional structures for water management.

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