The importance of irrigation water 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 has become an urgent priority for many developing and developed countries. More and more, the focus is placed on institutional reforms but evaluating institutional alternatives is a challenging task. This paper takes a comparative approach and confronts case study data from Tunisia and South Africa, highlighting the importance of water rights reforms for irrigators. Using contingent valuation methods, the benefits for water users of changes in water rights systems are quantified. In both countries, willingness to pay estimates reveal that, from the farmers’ perspective, significant improvements can be made to current water rights systems. This is valuable information for policymakers to guide institutional reforms.

Keywords: Irrigation; South Africa; Tunisia; Water policy; Water rights; WTP

1. Introduction

As competition for water grows across the globe, water users and water management organisations seek better institutional arrangements to coordinate use and resolve conflicts (Brennan, 2002; Bruns et al., 2005). In this context, there is a growing understanding 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 & Nkonya, 2005; Hodgson, 2006).

The theoretical rationale for installing water rights is based on arguments of efficiency, i.e., only when water rights are clearly defined are Pareto optimal outcomes possible (Araral, 2010). Sub-optimal irrigation water rights 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.


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(Randall, 1978; Ostrom, 2000; Heltberg, 2002; 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 focuses mainly on explaining the role and functioning of property rights over natural resources, and in part on 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 & Saleth, 2005; Linde-Rahr, 2008; Irimie & 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 McCann et al. (2005) contingent valuation surveys could be a useful approach to estimate willingness to pay (WTP) 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., 2010a, 2010b). Similarly Barton & Bergland (2010) and Rigby et al. (2010) use choice experiments to value irrigation water under different institutional settings.

This paper 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 1970s from a full individual property right towards a simple usage right for a given volume of water, generally in relation 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 was already started in the 1990s by creating Water User Associations (WUAs) which became the gatekeepers of the irrigation water rights at local levels. In South Africa both the shift to usage rights and the decentralisation of water management were only initiated by the 1999 Water Act. Furthermore, it 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.

Following this introduction, Section Two presents a literature review showing the importance of property rights and transaction costs theory for the evaluation of the irrigation water rights. Section Three provides a description of the current water rights systems in Tunisia and South Africa. Section Four presents the results of the valuation of changes in both systems. Section Five provides a discussion of those results whilst, finally, Section Six draws some valuable conclusions.

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 & 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 just bilateral but triadic, since an authority system (usually the state) is supposed to define and enforce the 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 & 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 & Essmann, 2009). The definition of the property rights system affects individual behaviour as well as the functioning and efficiency of the economic system. As early as 1967, Demsetz (1967) noted that the primary function of property rights is to guide incentives towards the achievement of better internalisation 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 can be used to analyze how different management approaches characterise 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 growing water scarcity worldwide, this makes the analysis of possible improvements in water rights systems a research priority.

From a new institutional economics perspective, the central issue when examining alternative institutional structures is that of transaction costs (Challen, 2002; McCann et al., 2005). Transaction 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 transaction costs and, according to the new institutional economics theory, the best governance structure is the one that minimises these transaction costs (Brennan, 2002; Challen, 2002). In this way, transaction costs determine the efficiency of the economic system and have to be considered while designing institutions for resource management. However, estimation of transaction costs for different institutional alternatives is challenging. For property rights, for example, competitive markets are mostly absent, and thus no revealed preference information is available to estimate the transaction costs under specific rights systems (Garrod & Willis, 1999).

McCann et al. (2005) therefore suggest that the methods used for non-market 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 & Willis, 1999; McCann et al., 2005). In this paper, two different contingent valuation methods are applied to different water rights systems to assess the importance of irrigation water rights: dichotomous choice contingent valuation (DCCV) and contingent
ranking (CR) (a type of choice experiment). Both methods are used for the estimation of the WTP of farmers for hypothetical changes in the current water rights system.

3. Introduction to case studies in South Africa and Tunisia

3.1. South Africa

3.1.1. 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 had been based on the ownership of riparian land, with a new system of administrative limited-period and conditional authorisations 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 fully operational, several authors have already identified shortcomings. Backeberg (2006) stated that the five year review period for licenses is short and will have a negative effect on farmers’ investment decisions. This review period was installed to allow the 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, conditions attached to licenses may change at each review (for instance the volumes and timing of abstractions, or the volume that may be stored etc.), which gives farmers the impression that licences are insecure (Nieuwoudt & Armitage, 2004). The same authors furthermore point out that the reliability of allocation is impeded because there is no guaranteed supply; although quantities are specified in the license, they are not guaranteed or enforced (Republic of South Africa, 1998). Louw & Van Schalkwyk (2002) criticised 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 & McKay, 2002; Nieuwoudt & Armitage, 2004; Bruns & Meinzen-Dick, 2005; Zekri & Easter, 2007; Brooks & Harris, 2008) but over-regulation of transfers reduces the efficiency gains (Rosegrant et al., 1995; Shi, 2006; Donohew, 2009). In South Africa, trade in water use authorisations is treated in a similar way as new license applications. This means that a water management agency has to approve each transfer. For transfers of water rights between irrigators in the same irrigation scheme, possible externalities of the transfer are limited (Donohew, 2009) and thus the type of administrative procedure proposed appears to create unnecessary transaction costs, limiting efficiency gains from water right transfers.

3.1.2. Analysis of improvements. To analyze the water rights system in South Africa, a choice experiment was developed (Speelman et al., 2010a). The technique, which originates from marketing and transportation science, has proven to be useful in valuing multi-dimensional interventions in a system (Hanley et al., 2001; Bateman et al., 2006; Burton et al., 2007; Rigby et al., 2010). The technique enables both entire interventions and their individual components to be valued. In this way, WTP for improvements in the water rights system can be determined. An advantage of the CR approach, as used in this case study, is that it avoids an explicit elicitation of the respondents’ WTP but relies instead...
on the ranking of a series of alternative packages of characteristics. This has proven to be a more reliable way of eliciting willingness-to-pay values (Foster & Mourato, 2002; Bateman et al., 2006).

Based on a literature review (Louw & van Schalkwyk, 2002; Nieuwoudt, 2002; Perret, 2002; Nieuwoudt & Armitage, 2004; Backeberg, 2006; Pott et al., 2009) and on expert knowledge, three characteristics of property rights were examined for the South African case. These did not consist of operational-level rights but instead focused 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 were duration, transferability and quality of title. 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. Finally, the quality of the title dimension describes the capacity of the title to adequately define the resource and how much of a resource rights holders may extract. Specification of the attributes of the CR experiment also comprises the stipulation of the attribute levels used in the experiment. For duration, two levels (5 years and 10 years) were included. For transferability the levels considered were no transfer; agency-based transfer and market transfer, and for quality of the title, two levels were 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 random utility. For a detailed description of the experiment and the econometric model, see Speelman et al. (2010b).

3.1.3. Data. The data were collected in April 2008 in the Limpopo province of South Africa. A sample of typical South African smallholder irrigation schemes 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 ensured 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 farmers were randomly selected from a list of active farmers. As well as covering the CR experiment, questionnaires also captured 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

3.2.1. 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’. The water access

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1 Operational level rights determine the actions a property rights holder must, may, or can not take with regard to a resource.
2 This distinction between ‘water access right’ and ‘water delivery right’ is also used in the Australian Water Act 2007 (Australian Government, 2007) and was used by Shi (2006).
right mainly concerns the security of the water right and specifies the ownership, tenure and the quantification of the right. It also includes the legal definitions in relation to the abstraction or use of water. In contrast, the water delivery right is defined as the right to have water delivered via an infrastructure operator. This component therefore relates more to water supply reliability and to WUA performance, WUAs being the active infrastructure operators in Tunisia.

The water access right changed in the mid 1970s from a full property right to a simple usage right for a certain volume of water linked to land ownership (Al Atiri, 2007). This institutional change happened during a period of fundamental institutional reforms in the Tunisian water sector. The objective of this first reform was to give public authorities decision powers over water resources and over water allocation between users. After a period of central water resource management, a second shift occurred moving towards decentralised allocation by WUAs. 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 decentralisation process.

Based on a review of empirical studies concerning the irrigation water sector in Tunisia (Chraga & Chemakh, 2003; Ben Salem et al., 2005; Makkaoui, 2006; Chebil et al., 2007, Frija, 2009), we found that the instability of irrigation water supply (due to water scarcity and technical problems in the irrigation network) is an important factor affecting the perception and behaviour of farmers. In addition, in most cases farmers are ignorant about the total quantity of water allocated to them at the beginning of an agricultural season. Furthermore, the water access right is not transferable between farmers, or between farmers and the WUA. Irrigators have to use their rights themselves, or lose them. Given the water shortages being faced by the country, the possible benefits of a more flexible transferable quota system was investigated.

With regard to the water delivery right, several authors (Chraga & Chemakh, 2003; Ben Salem et al., 2005; Makkaoui, 2006; Frija, 2009) show that technical and organisational problems still occur in Tunisia and that these affect the perceptions of the irrigators. We therefore believe that an improved reliability of supply will have an effect on irrigation water use efficiency.

### 3.2.2. Analysis of improvements

In the Tunisian case study, as for South Africa, it is again assumed that the opportunity for water rights system enhancements can be evaluated by non-market methods and that it can be assessed by estimating and aggregating individual preferences. Contingent valuation, with a single bounded dichotomous choice format, is used to assess farmers’ WTP for improvements. Three scenarios were identified (Table 2), making assumptions concerning the water access right and the water delivery right. For the water delivery right, improvements in water supply reliability were assessed, while in terms of the access right the introduction of quotas and transferability was analysed. Supply

### Table 1. Attributes and levels used in the choice sets in South Africa.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transferability</td>
<td>not transferable</td>
</tr>
<tr>
<td></td>
<td>agency based transfer</td>
</tr>
<tr>
<td></td>
<td>market transfer</td>
</tr>
<tr>
<td>Duration</td>
<td>5 year</td>
</tr>
<tr>
<td></td>
<td>10 year</td>
</tr>
<tr>
<td>Security</td>
<td>guaranteed quantity</td>
</tr>
<tr>
<td></td>
<td>no guaranteed quantity</td>
</tr>
<tr>
<td>Price*</td>
<td>0.06 R/m³</td>
</tr>
<tr>
<td></td>
<td>0.09 R/m³</td>
</tr>
<tr>
<td></td>
<td>0.12 R/m³</td>
</tr>
</tbody>
</table>

*The average exchange rate at the time of data collection was 1R = 0.13US$
reliability could, for example, be enhanced through improvements in WUA efficiency and functioning. The supply reliability scenario, in which a more reliable water supply was proposed to the farmers, is relevant because most farmers are worried about irregularities in water delivery, especially at times when they need water urgently. The second scenario (clarity scenario) explicitly quantifies the water access right by defining quotas. This explicit quantification ensures better security of farmers’ current water entitlements. By introducing quotas, farmers know the quantity of water available to them during the coming irrigation season in advance (Hodgson, 2006). Finally, the third scenario relates to the transferability of the water access right. However, since transferability requires that the right is quantified (Matthews, 2004; Bjornlund, 2006), the third scenario was constructed by adding transferability to the second scenario. This scenario is therefore called the ‘clarity + transferability’ scenario. For each scenario, different price bids were proposed to the farmers, who had to accept or reject them. For a detailed description of the experiment, see Frija et al., 2008.

3.2.3. Data. The study area was the region of Cap Bon in the North Eastern part of Tunisia. This region is one of the important areas for irrigated agriculture in Tunisia. The dataset used in this paper was collected in 2007 from farmers of the Fondok Jedid (FJ) and Lebna Barrage (LB) areas. The dataset included 18.7% (30 farmers) and 30% (32 farmers) of the farmers of the FJ and LB WUA, 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 parts: (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 DCCV experiment.

4. Results

4.1. 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. Conversely, a higher water price decreased the choice probability.

Table 3 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, 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 the mean WTP for each scenario to be calculated, which is also reported in the table.

Table 4 shows that the WTP for an improvement of the reliability of irrigation water provision in the study area is about 0.0143 Tunisian Dinar (TND)/m³. This corresponds to 29.7 and 21%, respectively, 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 the price originally 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 decentralisation and water management transfer is still an ongoing process in South Africa, the case study in Tunisia shows that farmers’ opinions of local water governance strongly affect 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 work to increase the trust of farmers in these institutions, because this will increase their WTP for the proposed interventions in the water rights.

For 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 & Harris, 2008). Another potential advantage is that markets empower individual users to manage supply uncertainty by incorporating decentralised information (Hadjigeorgalis, 2008). This allows them to control the risks through formal business planning techniques (Hadjigeorgalis, 2008). In South Africa, Nieuwoudt & Armitage (2004), using actual trading data, 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. They found 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 also 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, this 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.

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

<table>
<thead>
<tr>
<th>Models (scenarios)</th>
<th>Constant Coefficient</th>
<th>P-Value</th>
<th>Bid price Coefficient</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply reliability model (1)</td>
<td>0.7677</td>
<td>0.305</td>
<td>-53.66</td>
<td>0.004</td>
</tr>
<tr>
<td>Clarity model (2)</td>
<td>0.3426</td>
<td>0.648</td>
<td>-50.4143</td>
<td>0.012</td>
</tr>
<tr>
<td>Clarity + transferability model (3)</td>
<td>1.6661</td>
<td>0.011</td>
<td>-45.7663</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Models Statistics

<table>
<thead>
<tr>
<th>Models Statistics</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Log-likelihood (model1)</td>
<td>-25.8</td>
<td></td>
</tr>
<tr>
<td>LR (model1)</td>
<td>11.37*</td>
<td></td>
</tr>
<tr>
<td>Log-likelihood (model2)</td>
<td>-23.40</td>
<td></td>
</tr>
<tr>
<td>LR (model2)</td>
<td>9.66*</td>
<td></td>
</tr>
<tr>
<td>Log-likelihood (model3)</td>
<td>-34.39</td>
<td></td>
</tr>
<tr>
<td>LR (model3)</td>
<td>17.40*</td>
<td></td>
</tr>
</tbody>
</table>

Scenarios

<table>
<thead>
<tr>
<th>Implicit WTP (TND)</th>
</tr>
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<tbody>
<tr>
<td>Scenario1</td>
</tr>
<tr>
<td>Scenario2</td>
</tr>
<tr>
<td>Scenario3</td>
</tr>
</tbody>
</table>

* = significant at 1% level.

1TND = 0.67 US$ at time of data collection.
In Tunisia, previous studies on the benefits of water markets have presented mixed results. While Zekri & Easter (2005) predicted that water trading would have only a minor effect on farmers’ income, Bachta et al. (2004) forecast that water trading between farmers results 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. Furthermore, it needs to be noted that whereas in South Africa land and water rights are already decoupled, in Tunisia that would be a de facto consequence of introducing tradable quotas.

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 (McCann et al., 2005). These costs should also be taken into account when deciding upon the desirability of introducing markets. Hamdane (2002) suggested 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 (Republic of South Africa, 1998), Louw & 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, the extent to which water markets can decrease the administrative burden and associated costs of the agency based transfer system needs to be investigated.

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, in general, farmers value certainty of supply very highly. 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 farmers’ WTP for water. A larger variation in supply in South Africa might lie at the origin of this difference, but it could also be explained by the relatively high WTP for the supply reliability scenario, which suggests that reliability of supply is a real problem in Tunisia. Clearly the importance of knowing the exact volume of water allocated is reduced if it is uncertain whether the delivered volume will match the allocation or whether the timing of the delivery will be adequate. Furthermore, about half of the farmers in the Tunisian case study own a well and therefore also have access to groundwater. This probably reduces the average WTP, both for the stability and clarity scenarios, because conjunctive use of surface and groundwater can ensure a guaranteed supply and increase reliability. This role of groundwater was also reported by Marques 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 (Nieuwoudt & Armitage, 2004; Backeberg, 2006). Results show that a longer duration is clearly preferred by the farmers. Moreover, increasing the time between the review periods for 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 (DCCV and CR) 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 multiple dimensions of the water right to be controlled...
simultaneously and hence implicitly enables one to explore a wide range of the preference space (Rigby et al., 2010). When using DCCV 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 heterogeneity in preferences to be easily explored, either through inclusion of individual or farm characteristics or through the use of random parameters. This opportunity is used in the papers by Rigby et al. (2010), Barton & Bergland (2010) and Speelman et al. (2010a, b).

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 is an inherently 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 arrangements is transaction costs (Challen, 2002).

Following the suggestion of McCann et al. (2005), and in line with earlier work by Herrera et al. (2004) and Crase et al. (2003), we have used contingent valuation methods to examine the transaction costs borne by farmers in Tunisia and South Africa under alternative water rights systems. The WTP estimates for changes in the water rights system measured by these techniques are a reflection of the differences in transaction costs. 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 favourable for the efficiency of water use of smallholder irrigators but, given the size of the benefits, could also add significantly to government objectives of cost recovery, which as in many other developing countries is a hot topic 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 rights reforms, the approach also has its limitations. The current analysis should always be seen as part of a broader framework. Besides the transaction costs borne by farmers, which have been 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 & 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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