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Discrepancies between paper and practice in policy implementation: Tajikistan's property rights and customary claims to land and water

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Abstract

Property rights granted by land and water policies are not always identical with the claims – meaning perceived rights - people base their actions on. A high discrepancy between both resembles an ineffective policy implementation and bears the risk of unsustainable decision-making. Furthermore, perceived rights to land and its corresponding resource water can vary significantly. In this paper, we operationalize the property rights concepts and empirically assess, by specifying and quantifying, the difference between property rights and farmers' customary claims to both, land and water resources. With regard to land, actors tend to base their decisions on customary claims, and override property rights. In contrast, regarding water, we find that the full benefits of property rights granted by a policy reform are often not recognized. Whereas in the first case political control and monitoring mechanisms seems to fail, in the latter a lack of information sharing let the farmers not exploit their full investment potential.

Keywords: land and water use, policy reform, property rights, customary claims, Tajikistan

1. Introduction

Across the globe water has become a contested resource and the availability of and access to water play a key role in agricultural land-use options in many arid areas. To ensure efficient and sustainable land and water use, specific policies addressing governance systems and property rights need to be well defined at the national, sub-national and farm level (Binswanger-Mkhize et al. 2011). Accordingly, for irrigated agriculture, farmers need to obtain, possess and maintain two sets of rights: one relating to their farmland and one to irrigation water. However, resource use, decision-making and alienation rights differ in their characteristics and in their (transparent) implementation (Bruns et al. 2005; Dinar 2012). Especially transparent implementation is difficult in countries undergoing economic and political reforms, such as transition countries, where rights on paper change more frequently. Illustrating the fact that the rule of law has changed in many transition countries considerably since 1990 (Feige 1997), the enforcement of policies and laws is often fragile. As a result, Verdery (1997) stresses that fuzzy property exists, where property rights are now often “indistinct, ambiguous and partial” (p.105). However, institutional change constitutes a complex and evolving system.

In the literature, property rights of natural resources are discussed from many perspectives and over time, different concepts have evolved. For instance, the property rights approach, as discussed by Bromley (1992), focuses on the analysis of protected claims to an income stream resulting from the use of a certain resource. Thus, a “right” as defined by Bromley (1992) requires sanctioning of violations either by public or communal authorities. In this respect, property rights are narrow and legally defined and some authors coined the term ‘de jure rights’ (Alston et al. 2009). However, observed use of natural resources in various contexts often refers to informal claims which are usually not fixed in a written form. As an example, in many African countries, the land tenure and use practices often remain outside the existing legal system which reflects “the gap between legality and legitimacy as a major source of friction” (Deininger 2003, xxiii). Chimhowu and Woodhouse (2006) argue that land under customary tenure is sometimes even recognized as a legal category, although it is not state-registered property. In a situation, where legal property rights are absent, not recognized (e.g. due to civil war), or abandoned, customary claims can fill the vacuum (Korf and Fünfgeld 2006). Thus, there is a continuum of expressions of institutions governing the access to land and water from clearly defined and enforceable to non-enforceable use. Similarly, case studies have shown, that one has to recognize land and water tenure as a pluralistic system, where legal and customary

rights overlap. This is for instance described as legal pluralism by Meinzen-Dick (2014). In order to be able to develop an initial operationalization in comparing these various sets, we focus on a) legally binding and formally defined property rights and b) customary claims, as two points along this continuum.

Here, customary claims are defined as informal, not necessarily old in the sense of traditional customs, but generally recognized rules. In contrast to property rights, they are not legally binding and written. Both concepts are further discussed in the following section. Discrepancies between property rights and claims may emerge and they are omnipresent, but may be of different degrees. One of the main problems we identified in the context of policy implementation is that discrepancies between paper and practice emerge, which in the long-run can lead to less investment and less engagement in sustainable management of the respective resource (see also Theesfeld 2018). We argue that the more customary claims are in line with property rights, or vice versa, perceived security of tenure will increase and farmers will invest more in resource management. With this, we do not argue that necessarily a formalization of property rights is needed for more sustainable resource use and productivity increase. Rather we assume that a transparent and congruent situation would have to be envisaged for more tenure security. To give policy guidance for effective implementation, we need a better understanding on which set of rights farmers base their decisions on, which we pursue to investigate in this paper.

We aim to: 1) conceptualize and map property rights and customary claims from the perspective of various farm types, and; 2) analyze the land and water sectors jointly. In sum, this is an initial methodological attempt to make the “property rights approach”, as advocated by Schlager and Ostrom (1992) and here broadly understood as encompassing formal and de-facto, more operational. Our main research question is how do farmers identify their customary claims to land and water and to what extent do these match (or mismatch) with the formally specified property rights? More specifically we address the following questions:

- a. Are customary claims (always) less pronounced when property rights are defined?
- b. Can we identify differences between the land and water sector against the background of a differing degree of political reform processes with respect to land and water over the transition?
- c. Are there differences among farm types and which group of farmers is more powerful in executing rights and has better access to one of the two resources?

To date, especially for transition countries, most studies have dealt with land and water property rights separately. Furthermore, a systematic analysis of land and water property rights and claims has not yet been applied to the case of Tajikistan. We think that Tajikistan is well suited for the study of disentangling property rights and the discrepancies involved in practices of land and water use. Since 1990 many structural and institutional problems in the land and water sectors have hindered a more efficient and sustainable agriculture (Rowe 2010; Sehring 2009; Abdullaev and Atabaeva 2012). The continuous policy and legal changes and the expected discrepancy with perceived customary claims – which even differ among various farm types as we will show further below – indicate a puzzling reference system for the use of land and water.

The remainder of the paper is structured as follows: Section 2 explains the theory of property rights in its contrast to the customary claims approach. Further, the operationalization of the two concepts is presented. In Section 3, we describe the land and water legal frameworks and their reform paths in Tajikistan. After presenting the methodology and introducing the data (Section 4) we analyze the rights on paper and the practices in Section 5. Section 6 discusses the discrepancies also contrasting both resources and pointing to differences in customary claims among farm types. Section 7 concludes and draws policy guidance.

2. Bundles of Property Rights and Customary Claims

Neoclassical property rights approaches argue that traditional land-tenure systems, where property rights are not clearly defined, are inefficient (Barrows and Roth, 1990), mainly due to higher transaction costs. De Soto (2000) promoted as well the position that ambiguous customary tenure systems lead to low rates of productivity. Barrows and Roth (1990) underline the contrary argument, that customary rights or claims are economically efficient when governments allow them. Further, Greiner (2017) points out that theoretical shifts concerning land tenure systems in sub-Sahara and post-socialist Eurasia from neoclassical economic top-down approaches to the theory of autonomously evolving property rights “towards more exclusive forms of tenure” were accompanied by the recognition of the inefficiency of the formalization of titles. Chimhowu and Woodhouse (2006) say that “customary rights is thus not a source of insecurity, but a positive feature that ensures continuing access for the poor.” Irrespective of this partly normative debate about the superiority of one system over the other, the existence of such simple dichotomy can be questioned. Still, in the following we describe to some extent a dichotomous concept of property rights

and customary claims allowing us to operationalize the bundle of rights approach that make up the prevailing tenure systems for land and water.

2.1 Discrepancies between property rights and customary claims

Empirical studies have shown that secure property rights and their enforcement are important for agricultural growth and the welfare of rural households who depend on natural resource use (Bruns et al. 2005; Deininger 2003; Besley 1995; Arnot et al. 2011). The key role of strong property rights, as Alston and Mueller (2008) emphasize, is to empower individuals and provide incentives for investing in a resource to maintain its value and to decrease vulnerability. However, there are different concepts of property rights being discussed and analyzed across and within different disciplines.

Bromley (1992; 2006) stresses that *property* is a benefit stream. The related *property right* is defined as “a claim to a benefit stream that some higher body – usually the state – will agree to protect through the assignment of duty to others” (p.2). A resource user holding property rights has duties and enjoys protection. Hodgson (2014) supports the definition of property rights from a legal perspective, too, where legal instruments of decision-making and enforcement are approved and granted by an authority. In the following conceptualization we follow this definition to describe property rights.

However, the term *right* is also commonly accepted and associated with the term de facto right (Schlager and Ostrom 1992), which is not a right from the legal perspective (Hodgson 2014)¹. We agree with Hodgson (2014) that the term de facto right is thus somewhat misleading. However, people do also act, invest, and protect a resource due to informal but well-established and widely-accepted rules in use (Ellickson 1986; 1991) and these actions might or might not contravene the law. We propose the notion of *customary claims* to indicate that the regulations “outside” the law are not a right per se. We define customary claims as informal, not necessarily old in the sense of traditional customs, but generally recognized rules. We want to differentiate clearly between property rights, that are legally defined, and customary claims that are perceived as a reference system by the user. The latter can be congruent with the legally defined rules or not. Customary claims can even fill in a vacuum, where no rights have been regulated formally before. Both forms of access to land and water can co-exist and can be more or less congruent (Schlager and Ostrom 1992; Ellickson 1986, 1991; Alston et al. 2009).

¹ For Hodgson (2014) the term de facto right is misleading, and “it obscures the nature and role of real rights in legal and economic systems” (p. 4).

We assume that a mix of customary claims and property rights determines the “habituated actions or “domains of choice” (Bromley 2006, p.44; p.50). Figure 1 illustrates possible stages of this mix. The resource users’ social context, and endogenous and exogenous influences generate subjective assessments and form their customary claims (Deininger 2003; Wilusz 2010). In addition, formal property rights generate perceptions and affect the customary claims. The latter are often the perceptions people would refer to if they were asked what backs up their actions. Further, the perception of an actor’s characteristics or another actor’s resource or rights often produces an action (Theesfeld 2011). The customary claims can either match or mismatch with property rights. We identify three possible relations between rights on paper and in practice. First, we argue that property rights and customary claims can overlap exactly (see Figure 1 Match: $PR = CC$). In this case, the system is more robust and bears fewer risks for farmers than in a conflicting situation. In an overlapping situation, farmers’ customary claims are conform to property rights and can be safeguarded by state legislations (Schlager and Ostrom 1992). Hence, farmers are more willing to invest in sustainable resource use and can increase productivity (Schlager and Ostrom 1992; Gibson et al. 2002). In contrast, also a mismatch can arise, leading to a non-compliant behavior toward rights stated in the law and promoted by current policies. A discrepancy may be e.g. a result of missing legal knowledge and knowledge transfer (Ellickson 1986). But it can also be a deliberate infringement due to stronger adherence to customs and customary resistance or a lack of trust in government. Non-compliant behavior is assumed to increase insecurity and monitoring costs (Leitzel 1997). The mismatch can have two different specifications: a) either customary claims can be overvalued and more pronounced than property rights (depicted in Figure 1 as $PR < CC$), or b) undervalued and less pronounced (depicted in Figure 1 as $PR > CC$).

The first mismatch situation is characterized by property rights that are not officially provided to farmers but farmers perceive strong customary claims. Consequently, their actions would not be backed up by the law. This can also indicate a certain level of resistance towards formal rules and the missing acceptance of local authorities implementing national policies. As Broegaard (2005) shows in the case of Nicaragua, missing enforcement of the legal land reform and distrust in property rights limit sustainable investments in resource management. Potentially, discrepancies could further result in conflicts and, if farmers were disadvantaged, their preferences for short-term benefits from resource use would increase. In the second mismatch situation, where property rights are undervalued and where customary claims are at a minimum ($PR > CC$), we do not assume a complete lack of (all) perceived bundle claims, rather that claims are less pronounced while rights are well-defined. This situation can also indicate that land and water reforms are not well implemented at local level. Well implemented land policies can lead to productivity increase, as

discussed by Roudart and Dave (2017) using different land policy scenarios or Lawry et al. (2016) reviewing several cases in developing countries. In contrast, as Pritchard (2016) shows, the missing (implementation) of land reforms, mainly due to missing information of farmers, leads to land disputes and conflicts between different groups of the rural population. Here, farmers do not exploit their full potential to increase productivity (Barsimantov et al. 2011; Bellemare 2013). This is similar to the case where duty bundles are less pronounced, for instance if water management claims are not being perceived as a duty. In this case actual management activity is minimized.

On the long run, the congruency between property rights and perceived customary claims leads to more sustainable resource use. Further, we assume that a congruent and transparent situation results in higher perceived tenure security. However, this does not mean, that property rights defined by law are always desirable as such or a formalization of property rights is necessarily needed for more sustainable resource use and productivity increase. For instance, Murtazashvili and Murtazashvili (2016) show for the case of Afghanistan, that so-called community based land adjudication and registration has better effects on tenure security than national legal titling reforms, however this would require a long-standing and accountable system of local customary governance. Further, the outcomes of very strong customary claims can vary. In the future, they could be completely disregarded by policy makers or even lead to institutional change. The implementation of land and water reforms will be always accompanied by the presence of customary claims, which was also shown by Lambrecht and Asare (2016) for the case of land tenure in Ghana.

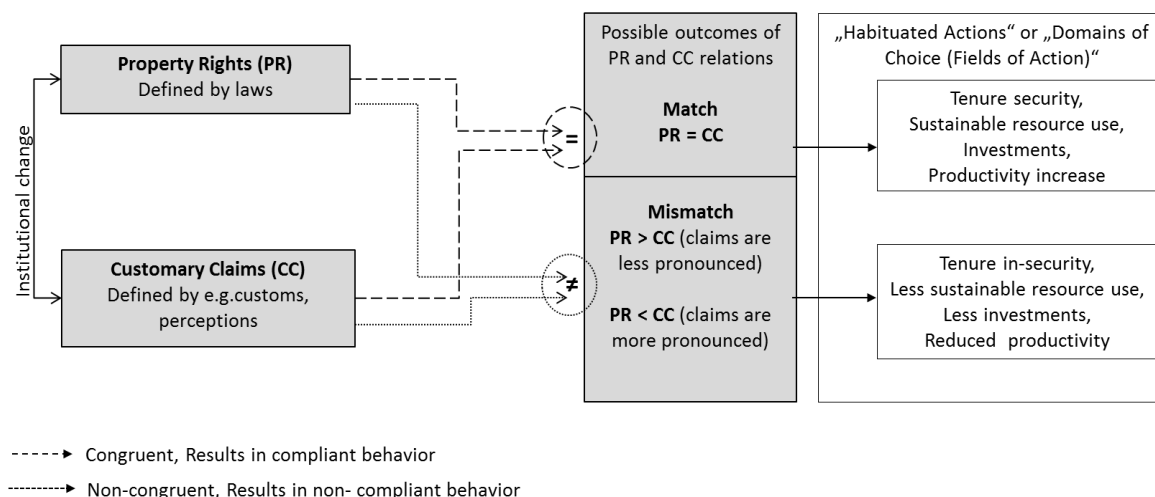


Figure 1 Evolution and Impact of Discrepancies between Property Rights and Customary Claims

Source: Own Figure

The theoretical focus on claims so far neglects the physical characteristics of the two resources. Analyzing property rights and customary rights, different characteristics can emerge between the resources. Land and water governance share similarities in that their institutional environment can be dynamic, especially under resource scarcity and the influence of exogenous pressures on the resources such as population growth, technology development, and political and economic reforms (Alston and Mueller 2008). However, water and land resources differ in their physical characteristics which lead to different institutional requirements. Due to the dynamic physical nature and mobility of water resources it is more difficult to define concrete property rights (Garrick et al. 2013). The high water variability within and between the seasons makes it more complex for users to define rules either on paper or in practice (Bruns et al. 2005). The reasons for this are enforcement and recognition problems (geographical or sectoral), and high variability in availability (Meinzen-Dick 2014). By contrast, land is a static resource and the definition of land rights in laws, inheritance and transfers is much more detailed in many countries than that of water (Hodgson 2004; Cotula 2006).

2.2 Bundle of Rights to Measure Property Rights and Claims

Arnot et al. (2011) provide a literature review of definitions and measurements for the analysis of property rights for land and tenure security. Most commonly, property rights are measured using one output variable for a legal situation, such as holding a land title (see e.g. Smith 2004; Alston et al. 1996; Bellemare 2013), or the number of titles issued (Bending 2010). Besides measuring land titles as a proxy for formal rights, Bellemare (2013), for instance, measures informal rights by using different dummy variables for the landowner's perceptions of transfer and use rights. Bubb (2013) measures the household's perception of the bundle alienation rights regarding land. However, he neglects decision-making and use rights. Another common operationalization of customary claims is presented by van Gelder (2007; 2010), Bending (2010), and Broegaard (2005), where farmers' perceptions about the likelihood of future resource conflicts, such as expected land reallocation or the probability of losing land, are assessed. In summary, a single proxy or dummy variables are usually used to study either land or water rights.

To overcome the simplified operationalization of a single proxy such as holding land titles (Broegaard 2005), we quantify in the following all bundles of rights, based on the framework proposed by Schlager and Ostrom (1992). This framework has been applied by many scholars, such as Hayes and Persha (2010) or Jagger (2014). In a more recent article, Galik and Jagger (2015) discussed in how far institutional change can be assessed using this framework. The bundle of rights' approach is rarely used to assess both property rights

and customary claims jointly. One exception is the Rights and Resources Initiative (RRI) (2012) which published an operationalized bundle of rights approach, where tenure rights among countries are compared. However, local customary claims are omitted.

Schlager and Ostrom (1992) and Meinzen-Dick (2014) further elaborate the three main bundles of rights, each of them characterized by case-dependent bundles, as given below:

- 1) Use rights: include e.g. access, withdrawal and exploitation rights of resource units. Holding these rights can increase incentives to invest in a resource.
- 2) Control and decision-making rights: include e.g. management, exclusion and negotiation rights. Holding these rights gives the user power and authority regarding the resource unit.
- 3) Alienation rights: restrict e.g. rent, selling and transfer rights. These rights can also lead to income generation and increase incentives to invest.

The bundles of rights approach is meant to overcome the oversimplified consideration of resource rights (Alchian and Demsetz 1973). We think that this represents the best approach to study property rights and customary claims systematically, allowing for comparisons.

3. Tajikistan's Agricultural Sector

Tajikistan is the smallest of the Central Asian countries in terms of population with around 8 million people in 2012 and an area of only about 140,000 km² (World Bank 2014a). The limited arable area, which makes up only 6 % of the country's area and is equivalent to 0.1 hectare (ha) of arable land per capita,² is mainly located in the lowlands of the Vakhsh and Syr Darya river basins (McKinney and Daene 2004). Precipitation varies greatly among the regions and is highest between September and April. Due to low precipitation in the lowland areas, 85 % of the arable land is irrigated (Akramov and Shreedhar 2012). Especially in the lowlands, where surface water is mainly used, irrigation schemes play a central role in the cotton production of large-scale farms, the commercial crop production of peasants, and in households' food security. In the irrigated lowlands the main crops are cotton, rice and vegetables, whereas in the dry land areas wheat production dominates (FAO 2013). The availability of water in the canals depends very much on the season. Farmers need to cope with hydrological water insecurity, e.g. the risk of high annual

² Compared to (in ha/cap): Uzbekistan: 0.15; Kazakhstan: 1.45; Kyrgyzstan: 0.24; Russia: 0.86 (World Bank 2014b)

variability ranging from too much water due to meltwaters in spring time to water scarcity in late summer (Klümper et al. 2017). According to Bucknall et al. (2003) 60 % of the water used for irrigation is pumped from rivers or reservoirs to the canals. The common irrigation technique on a farm and between farms is gravity irrigation.

3.1 Policy Reform Paths in the Land and Water Sector

After the breakdown of the Soviet Union, the organizational structure of land and water resources changed fundamentally from a centrally planned and state controlled system to decentralized, or even individually managed, systems. Before 1990 all farm land was allocated to kolkhozes (collective farms) and sovkhozes (state farms), which controlled the land and water sectors jointly. They were responsible for the distribution canals between the farms and for on-farm canal maintenance (Hill 2013). The off-farm canals and pumps were controlled and financed by the state authorities. Linked with investments in irrigation infrastructure, large-scale cotton production was introduced during the Soviet time (Rowe 2010). At that time, the major share of farming activities was targeted toward and organized around the cotton sector and cotton farms had the major influence on the management and control of land and water resources. Cotton is still the dominant crop in the lowlands, producing 60 % of the agricultural output and it is still the leading agricultural export crop (FAO 2013). In 2007, cotton farms used 45 % of the irrigated area in Tajikistan (The Government of Tajikistan 2007).

With new policies after 1990, the land and water sectors were reformed (see also Annex 1). Whereas both resources have remained state property, for land, transferrable (leasing but not selling) rights and inheritable use rights for unlimited time have been assigned to private persons (Akramov and Shreedhar 2012; Lerman 2013; World Bank 2012). Land and water sector reforms resulted in two strongly-related challenges for farmers. The first is that the responsibilities of the land and water sectors are separate. The various subsequent reforms have not altered this situation. The second challenge concerns the opaque administrative structures from the farmer's perspective which result from the decentralization of decision-making units (Hill 2013). Although at the national level authorities are defined to manage land and water, farmers at the local level have to refer to multiple responsible authorities which leads to unstandardized management and organization practices (Hill 2013; Sehring 2009).

Comparing the land and water sectors, first reform attempts were pushed especially in the land sector starting in 1991 with the Law on Land Reform, followed by the Land Code in 1996. The major push in the implementation of land reforms, however, started only in 2009 (see Annex 1). Past land reforms led to a

new farm structure, composed of three new farm types: collective farms; dekhani farms (peasant farms);³ and household farming (Lerman and Sedik 2008). Collective farms rarely exist on paper any longer (Lerman 2012); according to the Land Committee, they used less than 6 % of agricultural land in 2013. Dekhani farms have increased tremendously since 2007-2008 and the Land Committee reports that there were already 86 000 in 2013 on an area of more than 500 000 ha. About 40 % of registered dekhani farms cultivate each on less than 2 ha, another 40 % on 2 – 10 ha and only about 20 % more than 10 ha.⁴ In 2009, almost 20 % of arable land was used by household (garden) plots. Household plots were cultivated by 750 000 households with an average size of 0.3 ha (Lerman 2012). A further 75 000 ha were distributed by Presidential Decree number 342/874 to some of the poorest households.

Since 1994, first water reforms took place, followed by the Water Code in 1996 and 2002. Important to mention is also the Law on Water User Associations from 2006, which aimed at new governance structures in the water sector as well as the Water Sector Reform Program 2016 – 2025, focusing more on integrated water resource management. Land and water reforms are still ongoing and are the focus of attention of various agrarian policies. Farm households' knowledge of individual land and water rights was, and still is, described as limited (Mandler 2013; Akramov and Shreedhar 2012; World Bank 2012).

Although reforms have taken place and formal responsibilities are defined, many challenges remain in the water sector leading to overall water insecurity. More than 50 % of gravity systems and pump stations have deteriorated, which makes the irrigation system inefficient and water insecurity increases (Klümper et al. 2017; Akramov and Shreedhar 2012). Most (64.8 %) of the on-farm canal networks are unlined earthen canals which suffer from poor maintenance (Frenken 2012). With respect to the Syr Darya basin, Stucker et al. (2012) report that, due to poor irrigation infrastructure, overall water loss reaches almost 79 %. Up to 65 % of water losses occur between the source and the farmland. Furthermore, a water use efficiency of only 55 – 70 % is reported at the field level (Frenken 2012, p.155).

Larger farms are the main actors in the land and water sectors. They can build on their farm management experience and decision-making power stemming from the time of the Soviet collective farms (Lerman and

³ *Khojagi-i-Dekhoni* : peasant farms defined as individualized, private farms. Official organizational forms are 1) Collective dekhani farms, 2) individual dekhani farms, 3) family dekhani farms (Robinson et al. 2008; World Bank 2012).

⁴ All figures on dekhani farms have to be handled carefully; numbers vary a lot between sources. Here, numbers are taken from an interview with the Land Committee conducted by the author in 2013. Literature revealing the number and farm size of dekhani farms mostly rely on statistics between 2005 – 2010 (see for instance Lerman and Sedik 2008; Lerman 2012) but as the main land reform process only started in 2010, more recent numbers better capture the current situation.

Sedik 2008; Hofman 2013). Based on observations by these authors among others, it is expected that the larger farms which have been the least restructured possess the best networks and influence to enforce the implementation of policies. Therefore, we assume the former collective farms' past is still decisive for post-Soviet resource management (Theesfeld 2018).

4. Methodology and data

We operationalize the equivalent bundles for property rights and customary claims to be able to further quantify the discrepancies. A similar approach has been used by the Rights and Resource Initiative (2012), quantifying bundle of rights for forests. However, they have only operationalized the de jure situation. The advantage of using the bundle classification is that it allows for case-dependent adaptability. To consider various bundles per se also helps to find nuances among resource users. In addition, the same groups of farm types can be systematically assessed with regard to land and water. Hence, we are able to ascertain whether an actor acts more powerful in terms of strong customary claims and whether this perceived power applies to the land or water sector. With this approach we are not able to determine the actual impacts of the discrepancies, which is also not the aim. However, we facilitate the discussion of the consequences of various discrepancy levels.

In order to operationalize both concepts of property rights and customary claims for the case at hand, we used quantitative and qualitative data. In each case, data for property rights and customary claims were gathered from those who establish the rights/claims. Thus, property rights data were gathered at the administrative level. We used a two-step approach for property rights. First, we analyzed secondary data, which were taken from the land and water codes, the two legal frameworks of each sector in Tajikistan. Second, we discussed these findings in expert interviews with members of the official land and water authorities to confirm their validity (eight interviews with authorities of land and water sectors, four focus group discussions with members of regional authorities/WUA). We collected data on customary claims via a survey at the farm household level. For both, property rights and customary claims, the same bundles of rights were used (see Table 1, columns 2-4). In addition, we used similar evaluation and coding criteria. We deliberately did not provide a dichotomous answer set, but a 5-point scale in the farm household survey.⁵ The same scale could not be applied for property rights. Although rights in the land and water codes are

⁵ First, our aim was to determine the nuances between yes and no. Second, we conducted a pre-test of the survey, where farmers often neglected to answer according to dichotomous choice, as they were not able to either say yes or no. Each question was formulated similarly to: "Can you (in terms of are you allowed to) access, withdraw from, etc. water/land?"

precisely defined, we only used a 3-point scale for those. One medium category was integrated which determined rights given only with limitations (or occasionally).

Finally, we derived two ordinal scales (see Table 1, columns 5-6) treated as quasi-metric to further calculate the discrepancies. We could then determine the match and mismatch between the two concepts.

Table 1 Operationalization of the Bundle of Rights (Property Rights and Customary Claims)

	Name of the Bundle of Rights (property rights/customary claims)	Land Variables (property rights/customary claims)	Water Variables (property rights/customary claims)	Property Rights, <i>Possible</i> outcomes for each land and water variable (Source: Land and Water Code)	Customary Claims, <i>Possible</i> outcomes for each land and water variable (Likert scale) (Source: Survey data)
Bundle of rights evaluated	Use Rights/ Claims	Access Withdrawal Land-use Change	Access Withdrawal Unlimited-use	1 = never hold the right	1 = never hold the claim
	Control and Decision-making Rights/ Claims	Management Investment Exclusion Income Generating	Management Investment Exclusion Reallocation Negotiating	3 = have the right occasionally (with limitations)	2 = rarely hold the claim
		Reallocation		5 = have the full rights (always)	3 = occasionally
	Alienation Rights/ Claims	Sell Leasing Inheritance	Sell		4 = very frequently
					5 = always

Source: Own Elaboration

The identification of the farm household sample was based on a stratified random selection. Both selected districts are among the main agricultural lowland areas in Tajikistan, with direct surface water access within the two main river basins Vakhsh and Syr Darya. Both districts are close to the two provincial capitals Khujand and Qurgonteppa. In each district, we selected all jamoats (commune). Within each jamoat we randomly selected one village and finally households within villages were randomly selected according to the selection criteria of Bennett et al. (1994).⁶ Farm households were only selected if they had used irrigation water and farmland for at least two years. We ended up with a total sample of N = 399 farms

⁶ For farm households standard random selection with lists is not possible, which is a typical problem in developing countries (Bennett et al. 1994). Official farm household lists are not available for all villages. Therefore, we used a quasi-random selection introduced by Bennett et al. (1994). Here the enumerator starts in the community center, chooses a random direction and selects the first household in this direction. The following houses are randomly selected along that route (Bennett et al. 1994, p.1282).

consisting of 222 in the northern district Bobojon Gafurov and 177 in the southern district Bokhtar. The sample population consisted of household and presidential decree farms, as well as dekhan farms of different farm sizes.

To map the farmers' customary claims we used, in a *first step*, descriptive statistics for each bundle stick.

In the *second step*, we aimed to compare the customary claims with the property rights. We calculated a variable "discrepancy between property rights and customary claims" (Equation 1), its scale and characteristics is depicted in Table 2. These numbers were used to express the relative level of rights. The scale exactly measures the discrepancy level of property rights and customary claims. The scale reaches from -4 (high mismatch, with customary claims outstanding) to + 4 (high mismatch, with property rights outstanding). If the discrepancy is 0, customary claims and property rights are congruent. For example, in a scenario, with a value of 5 for 'Full property rights' and 5 for 'Always' for customary claims ($5-5 = 0$), we conclude that someone's pronounced customary claim is backed up by full-fledged statutory rights. The same result of a congruent situation occurs for the least amount of agreement (1 never hold the right, 1 never hold the claim). Although the situation of full- and little assigned property rights and claims is different in these two examples, we overall refer to a stable system as we have a congruent situation in both examples, where customary claims are not over or under valued. We assume such a tenure system to be more stable, to provoke less transaction costs and require less monitoring.

Of course here we face an oversimplification, classifying the manifold expressions of property rights and claims into only two categories to be able to measure the discrepancy between both.

$$\text{Variable "discrepancy"} = \text{Variable of property rights (e.g. access rights with possible values 5/3/1)} - \text{Variable of customary claims (e.g. customary access claims with possible values 5/4/3/2/1)} \quad (1)$$

Table 2 Scale and characteristic of the variable "discrepancy"

Scale	← -4	-3	-2	-1	0	1	2	3	4 →
Category	High mismatch		Medium mismatch		Match	Medium mismatch		High mismatch	
Description and direction of discrepancy	Do not have the property rights, but hold customary claims		Do not have the property rights or hold them with limitations, but hold customary claims		No discrepancy, property rights = customary claims	Have property rights with limitations, but do not hold customary claims		Have property rights, but do not hold customary claims, do not maximize their respective potential	

Source: Own Elaboration

In the *third* step, we aimed to analyze any possible differences in customary claims among farm types. For data reduction reasons, we grouped each bundle (see Table 1, column 2). Each bundle index was operationalized according to the theoretical construct of the bundle of rights. We decided to separate investment rights for water from the control and decision-making bundle as it was less correlated with the other items. The internal reliability of the scales of each index was tested with Cronbach's Alpha and inter-item correlation.⁷ Descriptive statistics for the four groups of different farm sizes within the described categories were applied. Kruskal-Wallis tests were undertaken on the data for each index to determine whether the values across the four farm types differed significantly.

We defined four farm types as follows: the household plot users and the presidential decree land-users as the smallest farming unit. Both focus on subsistence farming and formed the first group of farm types. The dekhan farms, as commercial farming units, were further categorized according to the size of farmland into three groups of farm types.⁸ Table 3 summarizes the main characteristics of the four farm types identified. For the larger farms, women were often employed as seasonal farm workers during the cotton season. Larger farms mainly produce cotton and wheat, dekhan farms onions, potatoes, tomatoes, fruits and households and presidential land users mainly produced tomatoes, potatoes, cucumbers and fruits for subsistence (see e.g. Klümper et al. 2017).

Table 3 Farm Type's Characteristics for Bobojon Gafurov and Bokhtar district

Household/ Presidential Land (N = 261)	Dekhan Farm < = 5 ha (N= 103)	Dekhan Farms > 5-30 ha (N = 18)	Dekhan Farms >= 30 ha (N = 17)	Total
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⁷ The items were considered to represent the bundle of rights. We suggest that alpha values of 0.5 – 0.7 are still acceptable (Streiner 2003; Schmitt 1996). The low value is acceptable as the index only contains small numbers of items, and only a 5-point scale is used. Using the index in any econometric analysis would require stricter assumptions. For our analysis, it is more important to keep categories as suggested in the theory (Streiner 2003; Schmitt 1996). We derive the following indices according to the bundles in Water use rights (Cronbach's Alpha 0.6294); Water control and decision-making rights (Cronbach's Alpha: 0.5794); Water investment rights; Water alienation rights; Land-use rights (Cronbach's Alpha: 0.5406); Land control and decision-making rights (Cronbach's Alpha: 0.7052); Land alienation rights (Cronbach's Alpha: 0.7481). Only with regard to the index water use rights, we dropped one item "water appropriation" as correlation reports a number close to zero.

⁸ We are aware of different dekhan farms types currently present in the Tajik context. However, as self-classification of farm types is difficult, and a respondent could not indicate any differences between different legal forms of dekhan farms, using official farm types as indicated on the certificate is not useful.

Farm size (in ha), mean (sd)	0.1 (0.08)	1.2 (1.1)	15.2 (8.3)	105.1 (107.4)	5.53 (30.32)
Number of people working on the farm, mean (sd)	3.4 (2.1)	5.2 (3.9)	13.9 (7.1)	93.9 (106.1)	8.21 (28.21)
Share of women working on the farm (%)	61.76	55.77	70.50	61.87	61.02
Years of cultivating this land (up to 2013), mean (sd)	42.3 (31.7)	31.4 (33.0)	20.3 (22.2)	39.2 (26.9)	38.4 (31.9)
No. of household members, mean (sd)	8.7 (4.5)	7.6 (3.9)	9.4 (5.5)	9.5 (4.3)	8.51 (4.39)

Source: own calculation based on Farm Household Survey 2013

5. Empirical Results

5.1 Description of Property Rights and Customary Claims

We will present the property rights and then the customary claims for the land and water sector. We continue by describing the match and mismatch between property rights and customary claims.

Land and Water Rights

Figure 2 displays the results of the property rights coding. In contrast to water rights, land property rights are more clearly specified in the Land Code from 1996 (see Annex 1), and more rights are legally transferred to the farmers. Investment, reallocation and land-use change rights are limited. The latter can also be connected to the law on dekhan farms, for instance, which states that all land has to be always used efficiently. If large-scale land-use change is intended by the farmer, he/she needs to apply for via the local land committee.

In the water sector, only access, withdrawal and investment rights are transferred to farmers without limitations, in line with the latest Water Code from 2000 (see Annex 1). All other rights are either given with limitations or not provided at all. Limitations in this regard mean that local water sector authorities are assigned control tasks and limit the farmers' decision-making power. As regards reallocation and negotiation rights for instance, farmers cannot individually control the volumes available in the canals. Local water authorities need to fulfill the task of up- and downstream water distribution. In particular, control and decision-making rights, which are currently being transferred to WUAs, are still very limited. Compared to land rights, the water sector has relatively more limitations by law.

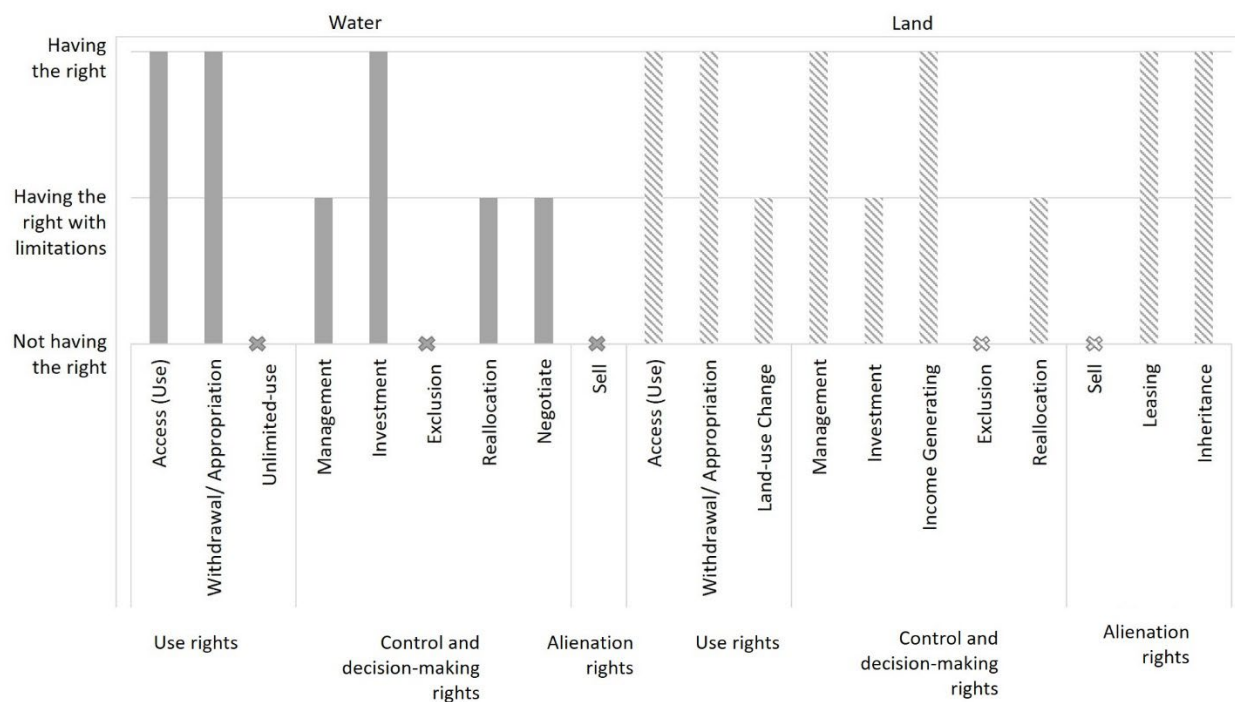


Figure 2 Land and Water Property Rights

Source: Own Figure, Land and Water Property Rights: Coded from the Land and Water Code

Land and Water Claims

The results in Figure 3 show that farmers perceived customary claims to be overall stronger for land than for water (mean values > 3.1) (see also annex 2). Further, the variables, exclusion and reallocation claims, are important factors pointing to perceived power regarding the resource use. For instance, exclusion rights were perceived by 46 %, however, 42 % never felt they had an exclusion claim. This may exemplify different endowments with power, where one group perceives this right but another group does not.

Although it is often stated (e.g. in Rowe 2010; World Bank 2012) that getting access to land is difficult for Tajik farmers, strong customary access claims existed in most surveyed cases. Nevertheless, about 59 % of the surveyed farmers stated that they cannot get access to *more* land in the future. The main limiting factors to getting more land are the high costs of land (30.8 %), lack of capacities/manpower (24 %), and lack of knowledge about which authority to contact (11.2 %).

Land-use change claims are possessed occasionally, but the results further show a high standard deviation, where about 35 % perceived this claim less than occasionally. An initial explanation is that some larger farms are still forced to fulfill cotton quotas which limited the right to decide individually on the land use.

Thirty-one percent of the dekhan farms felt obliged to produce cotton and, even more surprisingly, 10 % of the dekhan farms reported an obligation to produce orchard fruits. Production of orchard fruits was also seen as limiting perceived land-use change claims during an interview in Bobojon Gafurov, where regional authorities prohibited the cutting of non-yielding fruit trees on a dekhan farm's 2 ha area. The second assumption for the high standard deviation in customary land-use change claims can be explained by the characteristics of those surveyed household plots which mainly produced staple food crops. This form of production only allows for limited land-use change options for the household since subsistence needs to be assured.

Overall, the customary water property claims are less pronounced compared to land. Apart from the customary claims to access water, no other property claims were perceived more than occasionally. In general, the data presented in Figure 3 show especially low values for customary control and decision-making claims. Less pronounced claims were related to the diversity and uncertainty of responsibilities in the irrigation sector. Half of the respondents stated that they do not know who is responsible for canal maintenance. Such a high degree of unawareness would very likely be linked to the bad condition of many canals. Beside irrigation canal management, old and destroyed drainage canals constitute a major concern for farmers. In the case study areas, interviews confirmed that the lack of proper drainage canal management, which leads to a rising groundwater table and an increase in soil salinity, limits production potentials and even forces farmers to abandon land.

The results of customary water investment and management claims show a high standard deviation around the mean (see Annex 2). Therefore, we can assume that a certain number of farmers were willing to contribute money and labor to improve the system while others are unwilling. A particular analysis of providing money and labor in the irrigation system depending on perceived non-formalized or formalized land rights is done by Klümper and Theesfeld (2017)

Customary unlimited-use claims are occasionally perceived. Again, the mean value of that variable has a high standard deviation. For dekhan farmers, irrigation schedules to limit water volumes must be established formally, however, our results indicate the potential presence of free riders neglecting the general schedule system. Concerning water volumes, 31.5 % of the respondents claimed that it was their independent decision to decide about water volumes used per irrigation turn. Other responsible regulatory bodies were mentioned with 19.25% (State Water Resources Department (Vodkhoz), 17.25% (WUAs), 14.75% (Jamoats), 10.5% (Local Large Farms) and 6 % of the respondents were unable to name the actor in charge.

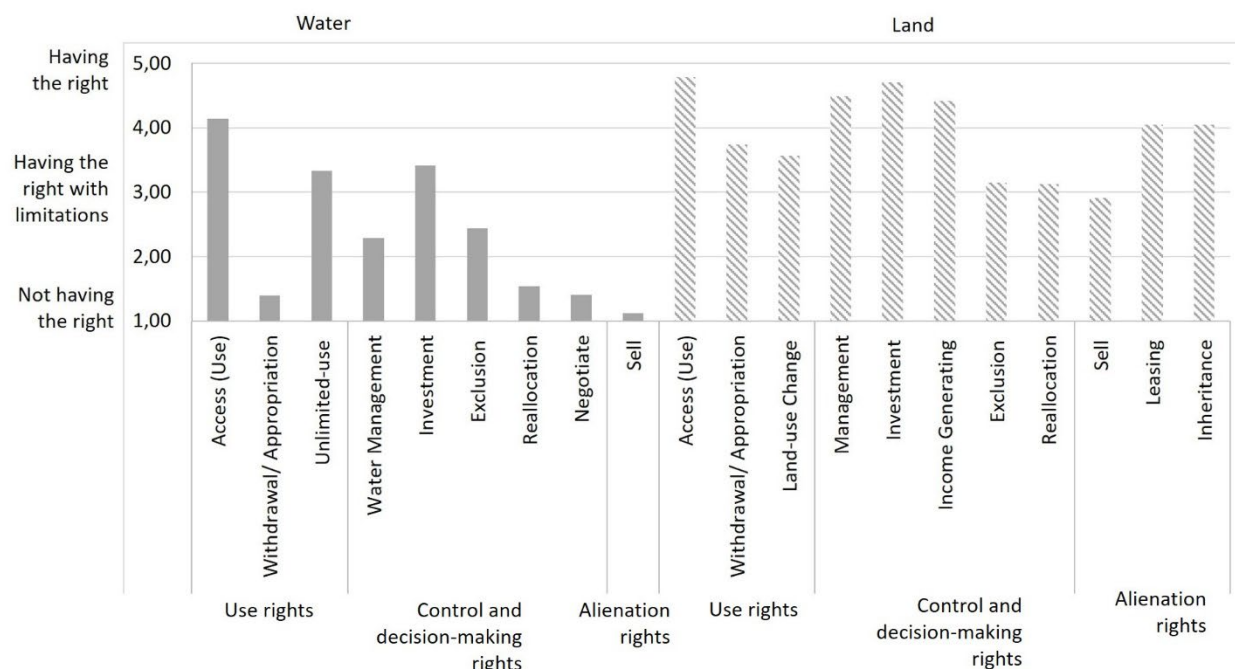


Figure 3 Land and Water Customary Claims

Source: Own Figure; Source: Land and Water Customary Claims: Coded from Farm Household Survey 2013

5.2 Discrepancies between property rights and customary claims

The selected results of the discrepancy values are displayed in Figure 4. Overall, the discrepancy values in the land sector indicate more conformity between customary claims and property rights. But we also find non-conformity in the sense that property rights are not followed but rather abused, illustrated by negative values. This shows that property rights are by law either not defined or defined only with restrictions. However, the surveyed farmers indicated well-pronounced customary claims, which would result in non-compliant behavior. A high discrepancy is given for land exclusion and selling, indicating that farmers perceived customary decision-making claims and, therefore, perceived more power than provided by the law. However, there is an unequal distribution of farmers complying and not complying with the law (see values of standard deviation in Table included in the Annex 2). The interviews further showed that informal land distribution, that is selling land informally to others, took place. Informal land transfers are one option for not going through the more expensive and complex procedure of getting land-use titles. To circumvent access barriers, 14 % of the surveyed farmers rented land unofficially, which also indicates an informal land reallocation process among farmers.

The opposite discrepancy situation can be determined between water rights and customary claims. Most of the discrepancy values, except unlimited use, exclusion and selling, have a positive sign. This means there is a mismatch for most bundles where property rights were given but seem to be not obvious as customary claims were not pronounced. This shows a lack of laws' implementation and lower awareness of farmers regarding their water rights, especially with respect to exploiting the full potential of using the resource. Without perceived customary claims in this case, less investment and maintenance will be undertaken, so limiting productivity increases and long-term sustainability efforts.

The results of the discrepancy value unlimited-use rights show an intermediate (-2) discrepancy. This indicates that on average farmers, whether deliberately or not, contravene the law with regard to unlimited-use rights. The result shows that formal institutions were less strongly enforced in this case. Almost all watersheds, villages or groups of farmers (should) set up yearly or monthly schedules for water use so that overuse of water by certain users cannot occur. These schedules are especially important for cotton farmers, due to the water requirements of cotton throughout the year (see also Klümper and Theesfeld 2017). The interviews with jamoats and WUAs illustrated that the power to decide to use water in an unlimited way, neglecting the regulations, was unequally distributed between farmers. Those farmers in the focus group discussions, who stated that they had continued for several years as a kolkhoz growing cotton, enjoyed more unlimited water use. These farmers were either the decision makers within a WUA or had strong ties to the Water Master, giving themselves a certain unassailability.

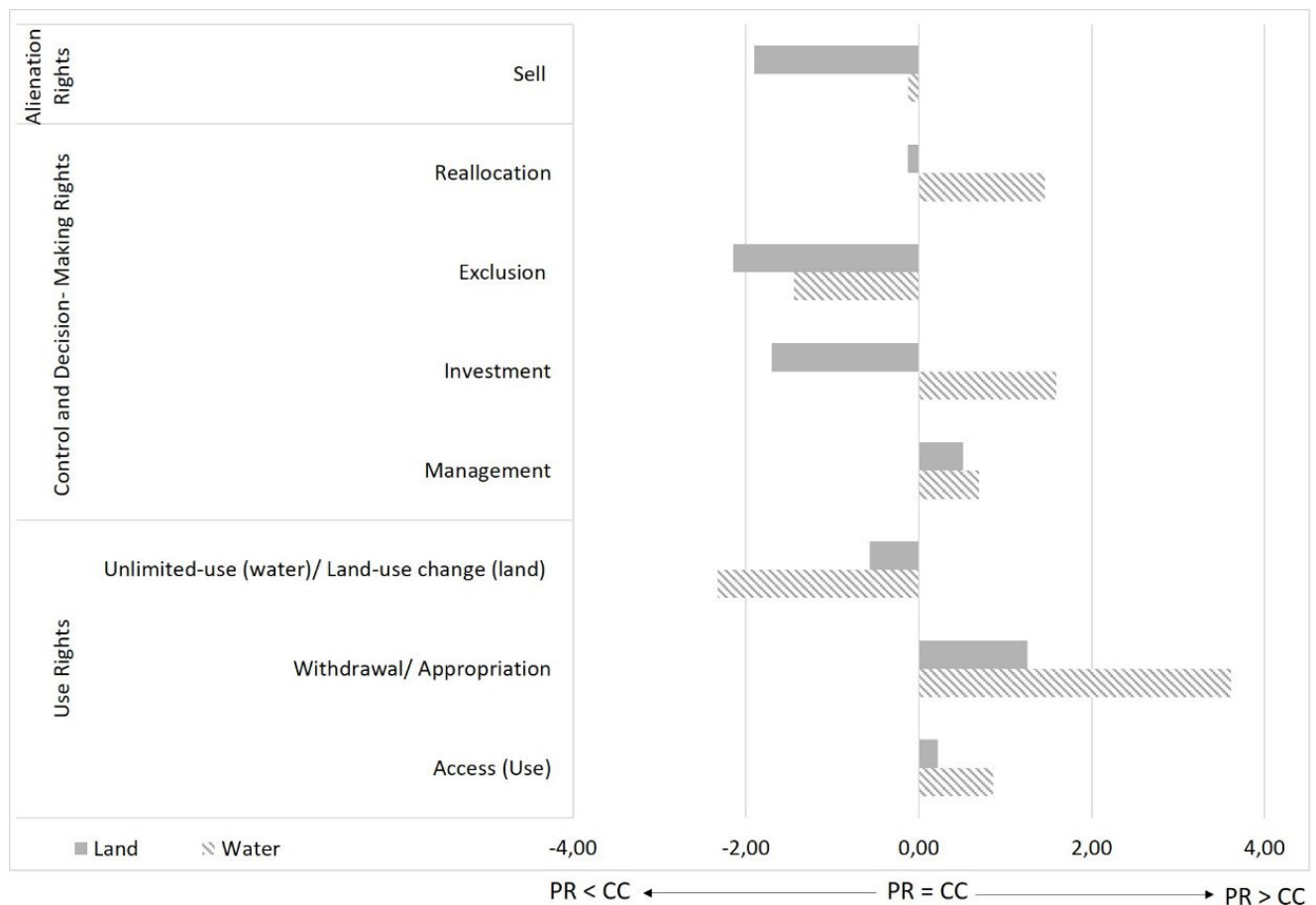


Figure 1 Evolution and Impact of Discrepancies between Property Rights and Customary Claims

Source: Own Figure: Property Rights: Coded from the Land and Water Code; Customary Claims: Farm Household Survey 2013, N=399

5.3 Comparing customary claims among farm types

As the previous results have shown, the bundles of customary claims differed substantially across respondents. We therefore analyze differences across farm types⁹. Table 4 presents results of a statistical test of the indices' means across subgroups of farms categorized by size and organizational form.

The customary land claims were more pronounced in the groups of smaller farms. However, interestingly the opposite holds for water claims, which is discussed later. In particular, the customary land decision-making claims were seemingly more pronounced by households and presidential decree land users. Furthermore, the interviews indicated that the larger farms faced more external influence (e.g. by

⁹ Alternatively, variation across respondents might be caused by geographical differences. A North-South comparison of the results shows that differences between farm types are more important than geographical differences.

governmental authorities). At the farm level, the regulations by the local authorities on managing and generating income inhibited the farmers' decision-making power. In some cases, larger farmers still faced the obligatory need to produce cotton. Although cotton quotas no longer exist officially, according to our interviews some regional authorities still followed the rule that 70 % of arable land had to be cultivated with cotton. These obligations function rather as informal arrangements and affect customary land-use change claims. According to the interviews, crop choice restrictions were mainly imposed and enforced by the jamoats via a dekhan farm advisor.

However, we must be aware that, although most customary land claims were less pronounced by larger farms, this does not mean they were less powerful in the community, e.g. also providing land-related services or labor to villagers. The procedure for obtaining land and the incentive to establish a farm is difficult per se and already requires power and decision-making.

For water, the results of the different customary bundle claims show that these were more pronounced in the group of larger farm types (see Table 4). Differences in the customary water use claim index can be partly explained by differences in access to primary canals. A share of 42 % of the dekhan farms larger than 30 ha had access to primary canals, whereas only 11 % of household plots used primary canals. However, these primary canals were not only upstream. Therefore, proximity to the primary canal was not the only reason for stronger customary claims.

The customary decision-making claims and the investment claims demonstrate the main differences among the farm types which are also statistically significant. Interviews with household farms clearly stated that the major determinant of a household's access to water was proximity to the large cotton farms and their investment in the canal systems. The interviews also showed, in line with findings of the World Bank (2008), that water access by household farms was often connected to providing a labor force to the larger farms controlling the water canals.

Table 4 Difference between indices of bundle of customary claims across farm types in both research areas (Bokhtar and Bobojon Gafurov), Household and Presidential Land-users (N=260), Dekhan Farms < = 5 ha (N=103), Dekhan Farms > 5 ha (N= 18), Dekhan Farms >= 30 (N=17)

Index (p-value ^a)	Farm Type	Mean	Std. Dev.
Water Use Index (0.3092)	Household and Presidential Land	3.804	1.323
	Dekhan Farms < = 5 ha	3.573	1.351
	Dekhan Farms > 5-30 ha	3.611	1.420
	Dekhan Farms >= 30 ha	3.853	1.296

Water Decision-Making Index (* 0.0528)	Household and Presidential Land	1.928	0.934
	Dekhan Farms < = 5 ha	1.767	0.959
	Dekhan Farms > 5-30 ha	2.167	1.088
	Dekhan Farms >= 30 ha	2.441	1.267
Water Investment Index (***0.0007)	Household and Presidential Land	3.245	1.730
	Dekhan Farms < = 5 ha	3.466	1.792
	Dekhan Farms > 5-30 ha	4.278	1.127
	Dekhan Farms >= 30 ha	4.647	0.996
Water Alienation Index (0.3109)	Household and Presidential Land	1.092	0.518
	Dekhan Farms < = 5 ha	1.204	0.772
	Dekhan Farms > 5-30 ha	1.000	0.000
	Dekhan Farms >= 30 ha	1.235	0.970
Land-Use Index (***0.0001)	Household and Presidential Land	4.275	0.885
	Dekhan Farms < = 5 ha	3.628	1.155
	Dekhan Farms > 5-30 ha	3.667	1.079
	Dekhan Farms >= 30 ha	3.137	0.850
Land Decision-Making Index (***0.0001)	Household and Presidential Land	4.114	0.786
	Dekhan Farms < = 5 ha	3.494	1.082
	Dekhan Farms > 5-30 ha	3.516	0.807
	Dekhan Farms >= 30 ha	3.134	1.022
Land Alienation Index (***0.0001)	Household and Presidential Land	4.102	1.204
	Dekhan Farms < = 5 ha	2.835	1.470
	Dekhan Farms > 5-30 ha	3.370	0.976
	Dekhan Farms >= 30 ha	2.451	1.007

Source: own calculation based on Farm Household Survey 2013

^{a)} Level of significance (Kruskal-Wallis Test): $p < 0.01 = ***$, $p < 0.05 = **$, $p < 0.10 = *$

6. Discussion

Our analysis shows on the one hand, how closely linked land and water resources are but, on the other hand, how differently they are regulated, perceived and managed by farmers. The presented initial proposition to quantify the bundles of rights allowed scrutinizing into the above-mentioned aspects. Overall, the results show how complex customary claims can be a) between land and water resources and b) between different farm types. This goes in line with findings from Lambrecht and Asare (2016) who

further point to the difficulty to design effective land policies in cases where customary claims are complex and dynamic. However, the implementation of rules has different implications for the two natural resources.

Our results show that, overall, the perceived claims for land are more pronounced than those for water. Access to farmland is no longer perceived to be a major barrier although it was often mentioned previously (e.g. Rowe 2010; World Bank 2012). This shows one success of land reform, with its primary aim of individualizing former collective farmland. Nevertheless, customary land-use change claims, an important issue for farmers wanting to implement soil conservation or meeting market demands, is not well established. Interviews showed that the limitations of land-use change options exist especially for cotton farmers, a hangover from Soviet agricultural practices. In this respect, growing cotton as a cash crop would not result in perceived tenure sovereignty.

The results for the land sector show that several bundles of customary land claims coincide more closely with property rights but, other customary land claims disregard property rights. For instance, illegally renting out land is becoming more popular in several rural areas of Tajikistan (Hierman and Nekbakhtshoev 2014). After 20 years of reforms in land policies and measures in Tajikistan, 8 % of the farmers still know nothing about their legal rights situation. In our case study regions, we identified that local (informal) institutions are often most important for farmers and their village unity, which goes in line with Mandler (2013) and Boboyorov (2013), who have investigated this in other regions of Tajikistan.

The discrepancy level in the water sector points to the fact that the development potential provided by law is often not fully exploited or perceived. Therefore, the implementation of the Water Code with the aim of transferring rights to farmers still lags behind that of the Land Code. Meinzen-Dick (2014) emphasizes that, where annual water variability is high, which is the case in Tajikistan, transferring water property rights and strengthening water claims is difficult. Customary water control and decision-making claims are indistinct, which leads to challenges for the operation and maintenance of irrigation infrastructure. The results are water losses and inefficient water allocation. The current policy – based on the Water Code from 2000– for strengthening individual water management is to establish WUAs. However, our interviews showed that WUAs are not yet an efficient solution for our case study regions, like in many post-socialist countries (Theesfeld 2018). Some of the WUAs in our research areas exist only on paper and active membership is well below the number of registered members.

Based on our analysis, we conclude that both farm types, small-scale household and large commercial farms, are limited in productivity growth. Concerning tenure systems on paper and practice, we get a more diversified picture than assumed. In contrast to the water challenges for household plots, the larger farms face difficulties in the land sector. Individual land decision-making is not perceived to be a customary claim by the larger farmers. If land tenure is perceived as insecure, farmers' investment fails to materialize. Soil improvement in particular, which could be achieved by changes in land-use practices or the increased use of external inputs, would add to long-term productivity and sustainability returns. According to Bubb (2013), farm size is one indicator of perceived transfer claims. Based on our results, this is not the case for large dekhan farms, since they have fewer transfer claims in the land sector.

Household farms are especially challenged by limited decision-making and accountability in the water sector. The household farms in Tajikistan are mainly managed by women. As Zwarteveen (1997) analyzes for several developing countries, women as water users are often disadvantaged and are not favored by allocation policies. By contrast, larger farms where the farm managers tended to be men held stronger customary water claims. The farm managers felt they had more negotiation power and could therefore influence or even change the schedule system, which should function on an equal demand basis. The largest farms, as shown in our interviews, were also the main investors in irrigation infrastructure. Due to their knowhow and past experiences, especially in the water sector, large farms could even establish interest groups, which might result in even more influence over the implementation of property rights at the local level for all farm types.

7. Conclusion

In this paper, we argued that the highest challenges for sustainable land use and productivity increase in the land and water sector emerge if customary claims, where farmers base their actions on, are either not backed up by legislation or if farmers' customary claims are less pronounced. To analyze the discrepancy, we developed and applied the method of quantifying the customary claims to contrast these to property rights. We did this in a quantitative way by conceptualizing the bundle of rights' approach for both concepts. Our results were manifold showing different discrepancy levels for different bundles. This detailed knowledge helps to formulate better tailored policies, if those counteract customary claims and moreover might even be designed to exactly change production habits that rest on such perceived claims. In these cases, additional measures to close the discrepancy gap would be needed ranging from administrative monitoring and controlling, to economic subsidies, to education aiming at voluntary

compliance. Whereas the land sector is increasingly being individualized and individual property rights are being transferred to farmers, our results find that water rights are still not transparent enough. Although we do not discuss the reasons for the discrepancies, it must be mentioned that discrepancies between property rights and customary claims are not only of an institutional nature. Economic barriers can also increase discrepancies. This was shown by the limited choice of production systems (land-use change claims) for household plots that need to ensure subsistence farming for food security reasons.

Each reform that is ongoing in Tajikistan should verify and control for sustainability use of the other interlinked resource and consider the dynamic and complexity of customary claims that exist. This would call for more coherence between land, water and other related agricultural policies. For instance, our results show that customary land access claims are already rather conform to property rights. However, without secure long-term water use, as well as water control and decision-making claims, agricultural land in Tajikistan is of less value.

Concerning reform effectiveness as regards the various farm types, property rights should be enforced equally. More tailored advice and training for the particular farm types is required to increase acceptance of formal rules and establish trust in the authorities. In the water sector in particular, the role of networks and local elites is still dominated by large-scale farmers, who also invest the most and have the decision-making power over water. Smaller farms also need to be recognized and involved more formally in the new evolving responsibilities, such as the WUAs. The smaller farm types share in gross agricultural output is already greater than their share of land, despite their contribution to local and regional food security. Further integrating smaller farms into the water sector would mobilize more financial resources and create more broadly based responsibilities for the water sector, too. However, solely holding strong customary claims and transferring property rights alone is not sufficient. Technical expertise is also needed for Tajik small-scale farmers so that solutions are found for the burden of the largely destroyed irrigation infrastructure and in order to realize the aims of the various past land reforms.

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Annex 1

Land Policies	
1st phase: 1991	<i>Law on Land Reform</i> (1991): restructuring process from state and collective farms to commercial peasant farms (<i>dekhan farms</i>), allocation of land to individual households and former state/collective farm workers.
2nd phase: 1996	<i>Land Code</i> (1996): enforcement of the restructuring process to individual farming in 1996 (Akramov and Shreedhar 2012; Lerman and Sedik 2008; Robinson et al. 2008). Land reform process remained very slow (Lerman and Sedik 2008). Especially in the cotton growing areas, where investors and rayon administration remained the most powerful in land distribution (Bliss 2010). <i>Presidential Decree</i> (1995, further continued in 1997): allocation of presidential land to the very poor.
3rd phase: 2002	<i>Law on Dekhan Farms and the Law on Freedom of Farming</i> (2002) Right to get long-term use rights with formal land certificates. Foreigners can lease land for up to 50 years . Duties have to be fulfilled: paying taxes and cultivating efficiently (Robinson et al. 2008) If duties are not fulfilled, the Land Committee can withdraw land. The determinants of inefficiency are not further defined in the Land Code. In 2007, 45 % of arable land was restructured, increasing decline of state and collective farms.
4th phase: 2009	Major push in land reform In 2009, about 75 % of arable land was cultivated by private dekhan farms or household plots (Akramov and Shreedhar 2012), this is also considered as the main push in land reform. Freedom to Farm Decree: free crop choice was introduced, moving away from cotton quotas (Governmental Decree of the Republic of Tajikistan number 111). Cotton debts were officially abolished (van Atta 2009).
Water Policies	
1994	<i>Constitution of the Republic of Tajikistan</i> (1994): water was owned exclusively by the state; the state was responsible for the protection and effective use of water resources.
1996, 2000	The <i>Water Code</i> (1996, 2000), developed by the Ministry of Melioration and Water Economy (MMWE), defined the property rights (UNECE 2012.)

- 2006 *Law of the Republic of Tajikistan on Water User Associations* (WUA) (2006) aimed at irrigation management transfer to non-commercial forms of organizations such as WUAs (Yakubov and Hassan 2007).
- 2007 The *latest Water Code* in 2007 announced an Irrigation Service Fee for gravity-irrigated areas only of US\$2.25 for 1,000 m³ and US\$3.65 for 1,000 m³ for lift-irrigated areas (World Bank 2012).

Annex 2

Bundle Name	Variable	Property Rights	Customary Claims			Discrepancy Values between Property Rights and Customary Claims		
		value	mean	median	sd	mean	median	sd
Use Rights/ Claims	Water Access (Use)	5	4.14	5	1.38	.86	0	1.38
	Water Withdrawal/ Appropriation	5	1.39	1	1.07	3.61	4	1.07
	Water Unlimited-use	1	3.33	4	1.72	-2.33	-3	1.72
Control and Decision- Making Rights/ Claims	Water Management	3	2.29	1	1.68	0.70	2	1.68
	Water Investment (e.g. in Infrastructure or in Quality)	5	3.41	4	1.73	1.59	1	1.73
	Water Exclusion	1	2.44	1	1.72	-1.44	0	1.72
	Water Reallocation	3	1.54	1	1.23	1.46	2	1.23
	Water Negotiate	3	1.40	1	1.11	1.60	2	1.11
Alienation Rights/ Claims	Water Sell	1	1.12	1	0.61	-0.12	0	0.61
Use Rights/ Claims	Land Access (Use)	5	4.78	5	0.78	0.22	0	0.78
	Land Withdrawal/ Appropriation	5	3.74	5	1.76	1.26	0	1.76
	Land-use Change	3	3.57	5	1.73	-.57	-2	1.73
Control and Decision- Making Rights/ Claims	Land Management	5	4.49	5	1.18	0.51	0	1.18
	Land Investment	3	4.70	5	0.85	-1.70	-2	0.85
	Land Income Generating	5	4.42	5	1.26	0.58	0	1.26
	Land Exclusion	1	3.15	4	1.90	-2.15	-3	1.90
	Land Reallocation	3	3.13	4	1.91	-0.13	-1	1.91
	Land Sell	1	2.91	2	1.94	-1.91	-1	1.94

Alienation Rights/ Claims	Land Leasing	5	4.05	5	1.62	0.95	0	1.56
	Land Inheritance	5	4.05	5	1.56	0.95	0	1.62