



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*



**Understanding the role of perceived land rights in the formation of farmers' intentions: evidence from Central Asia**

by Zarema Akhmediyeva and Thomas Herzfeld

*Copyright 2021 by Zarema Akhmediyeva and Thomas Herzfeld.  
All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means,  
provided that this copyright notice appears on all such copies.*

1 UNDERSTANDING THE ROLE OF PERCEIVED LAND RIGHTS IN THE FORMATION  
2 OF FARMERS' INTENTIONS: EVIDENCE FROM CENTRAL ASIA

3 Zarema Akhmediyeva<sup>a</sup>, akhmediyeva@iamo.de

4 Thomas Herzfeld<sup>a</sup>, herzfeld@iamo.de

5 <sup>a</sup>Leibniz Institute of Agricultural Development in Transition Economies (IAMO),  
6 Theodor-Lieser-Straße 2, 06120 Halle (Saale), Germany

7

8 **ABSTRACT**

9 Perception of land rights by farmers often mismatches with what is written in land law. This is  
10 especially the case among countries where land governance systems are still undergoing a reform  
11 process. This study aims to analyse the role of perceived land rights and their discrepancies with  
12 written rules in the formation of farmers' intentions to intensify land use by extending the theory  
13 of planned behaviour. Nearly 1000 farmers producing crops were interviewed in Kazakhstan and  
14 Uzbekistan to collect data. Results show that perceived land rights and their discrepancies with  
15 written land rights have a substantial importance in the formation of farmers' intensification  
16 intention. While they only influence the intentions of Kazakh farmers indirectly through attitude,  
17 subjective norms, and perceive behavioural control, a direct but controversial effect on intention  
18 occurs in the case of Uzbek farmers. The findings from two neighbouring Central Asian  
19 countries provide valuable insights that can contribute to improving land policy design to  
20 enhance land tenure security.

21 **Key words:** perceived land rights; theory of planned behaviour; law enforcement.

22

23 **INTRODUCTION**

24 Emerging in response to the growing world population, intensification of agricultural production  
25 plays a crucial role in food security (Martin et al., 2018; Otsuka & Place, 2014). For marginal  
26 regions where a high level of soil salinity and desertification put an additional burden on  
27 farmers, land intensification is of special importance. Kazakhstan and Uzbekistan, two Central

28Asian countries with poor irrigation conditions and heavily degraded agricultural land,  
29implemented several agricultural reforms to improve producer incentives to revive land  
30productivity after the dissolution of the Soviet Union. Farm restructuring and agricultural land  
31redistribution in the 1990s caused farmers to receive land tenure rights that were supposed to  
32increase land and labour productivity at least by the majority of observers (Lerman & Sedik,  
332018). However, the depth of reforms and their implementation differed across countries, and the  
34subsequent performance of the agricultural sector often did not match expectations.

35As a result of the first land reform in 1994, commercial farmers in Kazakhstan could only lease  
36agricultural land for 49 years, whereas households had land ownership rights. In 2003, the  
37government afforded land privatization to all agricultural producers, and Kazakh farmers  
38obtained the opportunity to own land. Although Kazakh farmers could apply market-oriented  
39farming without serious state interventions, the removal of agricultural subsidies and production  
40targets resulted in a substantial contraction in the sown area and agricultural production in  
41Kazakhstan. Uzbekistan only transferred land use rights to commercial farmers, preserving state  
42subsidies and the public procurement system for cotton and wheat production. Uzbek farmers  
43have lacked the opportunity to adjust their land use to the market environment due to constant  
44changes in land reforms and frequent state interventions into the farming activity (Melniková  
45& Havrland, 2016).

46Kazakh and Uzbek farmers eventually ended up in different land tenure conditions. These  
47differences lie not only in land rights but also in the level of law enforcement that can be  
48explained by the fact that laws in the former Soviet Union countries are not enforced unless they  
49are in the personal interest of state authorities (Hosking, 2005). The Uzbek government controls  
50the allocation of land to peasant farms applying top-down management in the agricultural sector  
51and strictly enforces the implementation of reforms by scrupulous monitoring of farmers'  
52performance (Lombardozi, 2020; Zorya et al., 2019). In Kazakhstan, by contrast, the state's  
53ability to enforce economic policies and legal restrictions is low (Hanson, 2017; Satpayev,

542014). A weak mechanism for criminal prosecution and lack of state support for realizing  
55socially important programs allow Kazakh farmers to bypass the law to gain higher outcomes  
56(Mukhamedova & Pomfret, 2019).

57Several studies report that well-defined and secure land rights increase incentives for land  
58investment and effective land reallocation (Besley, 1995; Feder et al., 1988; Newman et al.,  
592015; Zhillima et al., 2010). Land users, however, tailor their actual land-use practices in line  
60with their subjective perceptions about land rights (Ma et al., 2015; Van Gelder, 2010). Such  
61subjective perceptions are often a product of individual-specific understanding of land  
62legislation, expectations as to the enforcement of rights, years of residence, and other  
63characteristics (Broegaard, 2005). Perceptions do not always match with the rules prescribed by  
64land legislation. These mismatches may appear bidirectionally and lead to land tenure insecurity  
65reducing effective land use (Klümper et al., 2018). Such inconsistencies bear a risk for farmers,  
66increasing uncertainty about the future and, hence, shortening planning horizons (Besley &  
67Ghatak, 2010; Hettig et al., 2016; Leitzel, 1997). Although theory predicts a clear negative  
68relation between insecure tenure and land use intensity, empirical evidence is more mixed and  
69highlights the great influence of farmer's experience of tenure implementation in practice  
70(Besley & Ghatak, 2010; Broegaard, 2005; Rao et al., 2017).

71In Kazakhstan and Uzbekistan where the institutional land tenure system is still in a phase of  
72consolidation, ambiguous formulations in legal documents without providing a necessary base to  
73use land rights in their entirety, 'selective' law enforcement as to land use restrictions, and  
74frequent abuse of power by state authorities threaten the legitimacy of land rights (Hanson, 2017;  
75Melnikovová & Havrland, 2016). To our knowledge, there is only one study comparing legal and  
76perceived land rights in Central Asia. Klümper et al. (2018) identified that customary claims of  
77land users in Tajikistan differ from land rights related to land transfers; however, their study  
78lacks empirical evidence on the impact of these mismatches on land users' decisions about land  
79management. Understanding the role of land rights in the formation of farmers' behaviors in the

80context of Kazakhstan and Uzbekistan is crucial for designing appropriate land policies in  
81transition economies. Cross-country analysis helps better understand the influence of the land  
82rights issues under different institutional arrangements.

83This research aims to investigate whether perceived land rights influence the formation of  
84farmers' intention to intensify land use by utilizing psychological constructs from the theory of  
85planned behaviour (Ajzen, 1991). More specifically, the multidimensional nature of perceived  
86land rights will be covered by operationalizing the bundles of rights approach proposed by  
87Schlager and Ostrom (1992). The theory of planned behaviour allows viewing land rights as  
88background factors influencing farmers' beliefs regarding land intensification as demonstrated in  
89numerous studies on farmers' decisions about participating in agri-environmental schemes,  
90switching to organic farming, or disease control.

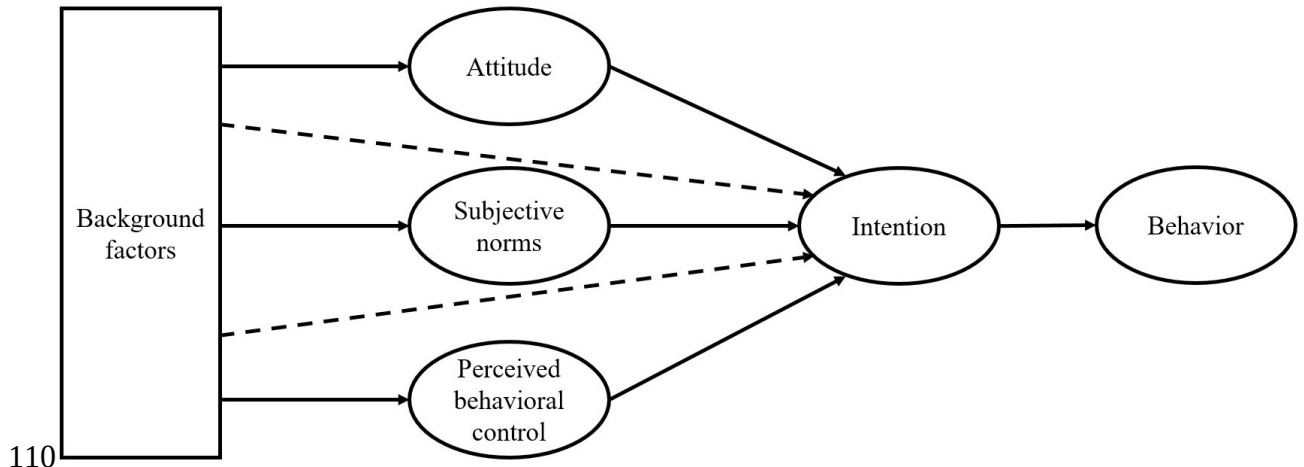
91The paper is structured as follows: The next section elaborates on the theory of planned  
92behaviour. Section three explains the methodological approach, survey design, and estimation  
93strategy of the study. The results are presented in section four. The final section discusses the  
94findings and limitations and provides concluding remarks.

## 952 CONCEPTUAL FRAMEWORK

### 962.1 Towards the theory of planned behaviour

97A large body of the empirical literature on land use change considers land intensification in the  
98context of rational choice theory (Bürgi et al., 2017; Hersperger & Bürgi, 2009; Jakovac et al.,  
992017; Josephson et al., 2014; Sluis et al., 2016; van Vliet et al., 2015). Usually in these studies,  
100land intensification includes adoption or investment behaviours that are determined by various  
101geographical, socio-economic, technological, and institutional drivers. The theory of rational  
102choice however has been criticized for several decades. Simon (1956) and Ilbery (1978) argue  
103that the idea of rational decision contains the unrealistic assumption of full information about all  
104decision alternatives. Yet profit maximization does not drive farmers' decisions alone, rather the  
105combination of socio-economic and psychological factors together may explain the full

106complexity of farmers' behaviours (Austin et al., 1998; Borges et al., 2019; Martinovska  
107Stojcheska et al., 2016). Psychological models have proven the ability to explain economic  
108behaviours; however, a psychological mechanism that lies at the heart of farmers' actions is still  
109underinvestigated (Hansson et al., 2012; Senger et al., 2017).



111 **Figure 1:** The theory of planned behavior (adapted from Fishbein and Ajzen, 2010)

112One of the most relevant models analysing the formation of human behaviour is the socio-  
113psychological theory of reasoned action (TRA) and its extension, the theory of planned  
114behaviour (TPB) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 2010). Although the rational  
115choice and the TRA and TPB models are based on the expectancy-value framework, the  
116TRA/TPB has important advantages as to the understanding of farmers' behaviour. The  
117TRA/TPB assumes that individuals' intention to perform a particular behaviour is the main  
118determinant of that behaviour. An intention has three direct antecedents: attitude towards the  
119behaviour, subjective norms (SN), and perceived behavioural control (PBC) (Fig. 1). Attitude  
120consists of the individuals' beliefs about outcomes of the behaviour and the importance of  
121outcomes. Subjective norms are representing the perceived social pressure to perform given  
122behaviour and demonstrate individuals' beliefs about approval or disapproval of the behaviour  
123by other individuals or groups. PBC corresponds to the beliefs about control factors, namely  
124opportunities and resources required to perform the behaviour, and perceived power over these  
125control factors.

## **1262.2 Land tenure settings in the TPB model**

127In their book, Fishbein and Ajzen (2010) underline the particular importance of background  
128factors that can influence a behaviour indirectly and contribute to the understanding of  
129behavioural determinants. There are three ways through which background factors may change  
130the formation of behavioural, normative, and control beliefs: by direct observation, by accepting  
131outside information, or through inference processes. Structural background factors such as  
132geographical characteristics, societal culture, and political conditions can explain behavioural  
133patterns. In this study, we introduce land tenure settings as a background factor influencing the  
134intention to intensify land use through farmers' beliefs about intensification (Fig. 1). The reason  
135is that farmers driven by their perception of the external environment, such as land rights, might  
136attach varying importance to certain beliefs.

137Ajzen and Fischbein (2010) left the TPB model open for incorporating background factors,  
138pointing out at the fact that their relationships with behavioural, normative, or control beliefs are  
139“an empirical question.” In order to study land intensification intentions, institutional aspects of  
140land use are expected to be key background factors. As outlined by the literature cited above, the  
141institutional framework has been reduced to tenure security. Empirical evidence so far did not  
142manage to establish a consensus whether higher and more transparent tenure security results in  
143higher intensification. Therefore, a broader operationalization of the institutional aspects as  
144background factors will be outlined in the following subsection.

## **1452.3 Land rights, perceived land rights and tenure insecurity**

146There is no common view on how to measure land rights. Empirical studies employ various  
147indicators associated with formal possession or expected loss of rights (Ayamga et al., 2016;  
148Feder, 1987; Ma et al., 2015, 2017). However, these studies fail to capture the wide range of  
149legally allowed or prohibited land use practices, such as farm management or land allocation,  
150that constitute an integral part of land tenure. One of the first works recognizing different  
151property rights by specific activities was pioneered by Schlager and Ostrom (1992). They



152suggested grouping property rights into two bundles: operational-level rights (rights for access  
 153and withdrawal) and collective-choice level rights (rights for management, exclusion and  
 154alienation). Their approach has been later improved by other scholars that enriched the number  
 155of property rights and bundles (Galik & Jagger, 2015; Klümper et al., 2018; Meinzen-Dick,  
 1562014). In this study, we adopt three bundles of land rights utilized by Klümper et al. (2018) and  
 157add one more bundle – government protection from land expropriation (Table 1). We assume  
 158that government protection is an essential part of land tenure because it involves land-users’  
 159ability to protect themselves in disputes over rights. We also claim that government protection is  
 160independent of other land rights; farmers may experience varying levels of government  
 161protection and security, especially in countries with weak law enforcement (Brasselle et al.,  
 1622002).

163**Table 1:** Bundles of land rights

<b>Bundles</b>	<b>Rights</b>	<b>Descriptions</b>
<b>Land Use</b>	Access	Right to enter a defined physical plot
	Withdrawal	Right to obtain the benefits from land
	Land use change	Right to change the type of agricultural activity
<b>Control and decision-making</b>	Management	Right to control internal use patterns and transform the land by making improvements
	Investment	Right to invest in land melioration and irrigation systems
	Exclusion	Right to define who has access right
	Income generating	Right to earn income from the land
<b>Alienation</b>	Reallocation	Right to sell or lease the right of management and/or the right of exclusion
	Sell	Right to sell the land
	Leasing	Right to rent out the land
	Inheritance	Right to inherit the land
<b>Government protection</b>	Land protection by government	Right to government protection
	Power of land certificates	Right to have legally valid land certificates

164*Note:* definitions were compiled from Schlager and Ostrom (1992), Meinzen-Dick (2014), Klümper et al.  
 165(2018).

166Besley (1995) points out that better land rights stimulate investment in certain conditions;  
 167therefore, we may assume that farmers with a higher perception of rights have a stronger  
 168intention to intensify agricultural production. However, individual perception of rights can  
 169deviate from legal land rights; the deviation might be two-fold (Besley, 1995; Schlager &  
 170Ostrom, 1992). Driven by customs and informal rules, farmers might neglect legal restrictions on

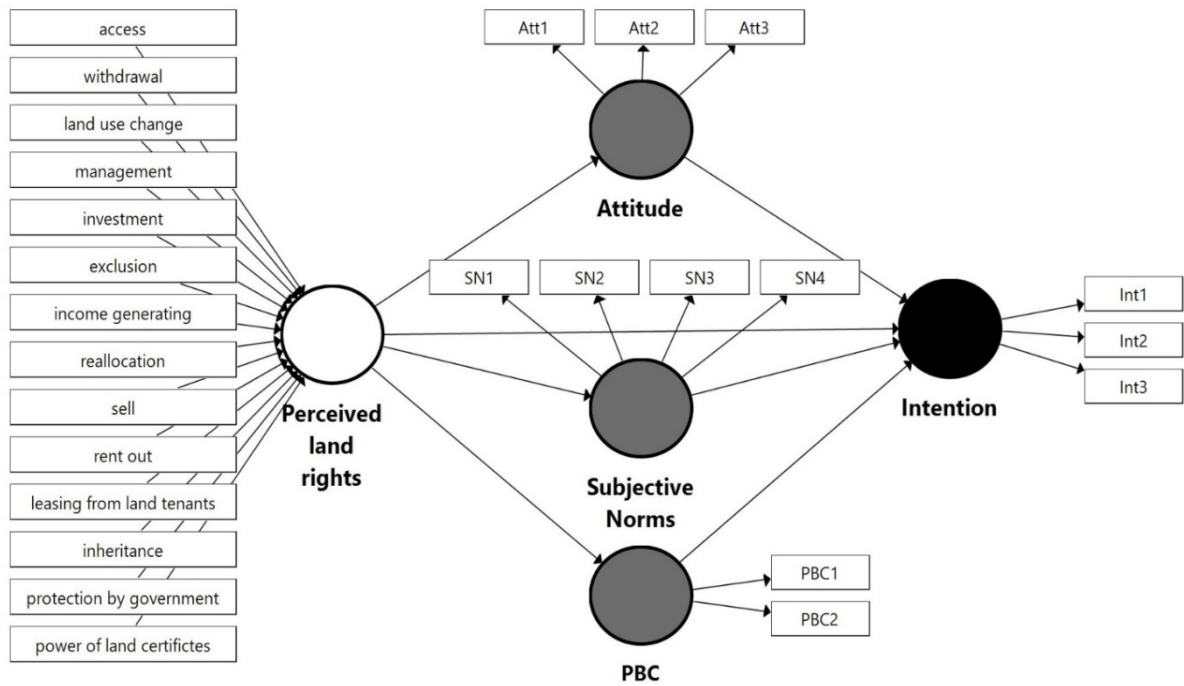
171certain farming activities and violate the law. On the other hand, farmers might have low  
172awareness about their legal privileges or be restricted in their ability to use the full potential of  
173tenure rights for various reasons and, thus, underuse their rights. These discrepancies from legal  
174rights might be associated with tenure insecurity and, consequently, reduced land investment and  
175intensification (Klümper et al., 2018). Yet in communities with strong informal institutions, land  
176users may perceive sufficient tenure security even when they neglect legal restrictions (Rao et  
177al., 2017). The situation when land users violate legal restrictions indicates that the governance  
178mechanism is unable to enforce the law. The underuse of land rights may occur when a  
179government issues contradictory legislative documents or local administration misuses its power.

### 1803 **METHODOLOGY**

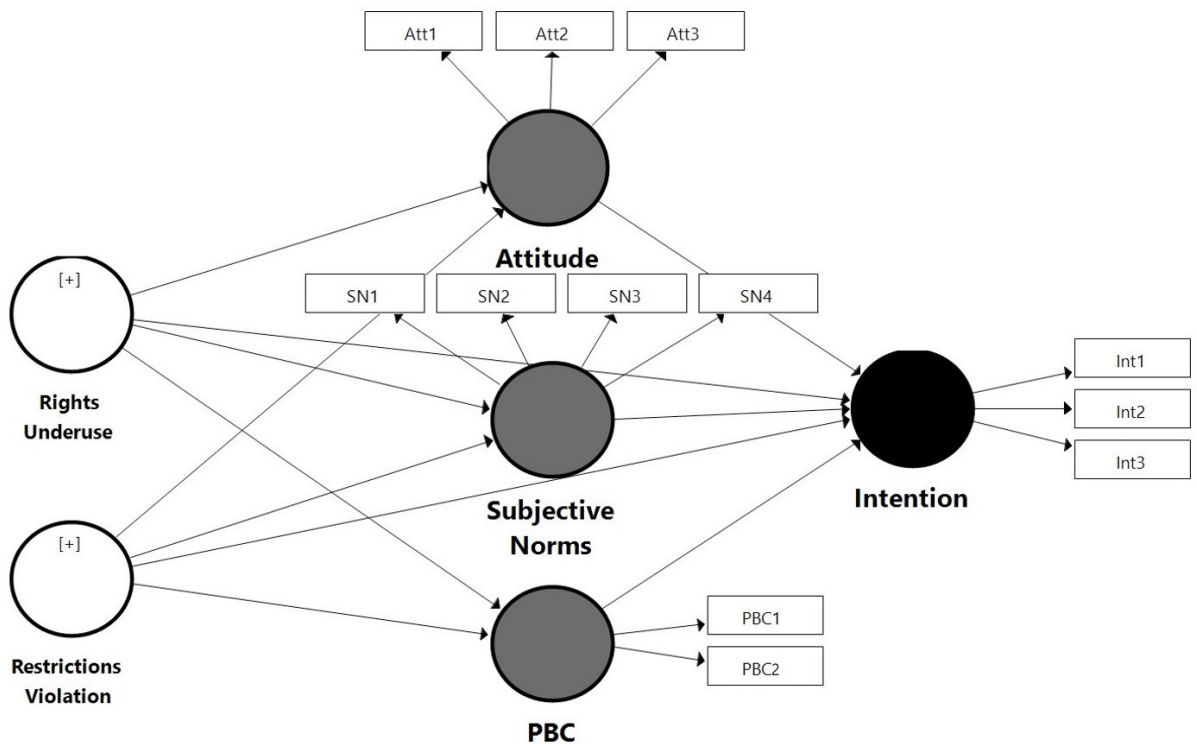
#### 1813.1 **Modelling farmers' intention to land intensification and estimation strategy**

182Whether a farmer bases her/his decision on the perceived rights or whether there is an awareness  
183of the discrepancies has not been analysed so far. Therefore, two different operationalization of  
184land rights as background factors will be estimated and compared against each other. Given the  
185flexible nature of the TPB, we develop first a structural model presented in Fig. 2 to examine the  
186relationship between perceived land rights and TPB constructs. The latent constructs of  
187intention, attitude, subjective norms, and perceived behavioural control have a reflective  
188structure because the items used to measure the constructs are interchangeable and highly  
189correlated. The construct for perceived land rights (Perceived LR) is formative because the  
190indicators are assumed to cause the latent construct. We hypothesize, in line with the literature  
191above, that Perceived LR is positively associated with attitude, subjective norms, and PBC. In  
192addition, we examine the direct effect of Perceived LR on farmers' intention. To investigate  
193whether discrepancies between legal and perceived land rights have an impact on farmers'  
194intention through the behavioural, normative, and control beliefs, we built another structural  
195model (Fig.3) that includes two additional latent formative constructs, Rights Underuse and

196 Restrictions Violation. Details on how we build the formative constructs relating to land rights  
 197 are given below.



198 **Figure 2:** Structural equation model of farmers' intention towards land intensification extended  
 199 with perceived land rights



200  
 201 **Figure 3:** Structural equation model of farmers' intention towards land intensification extended  
 202 with discrepancies between legal and perceived land rights

203 Considering the complicated combination of latent constructs in the TPB model, we apply Partial  
204 Least Squares Structural Equation Modelling (PLS-SEM) to analyse farmers' intention to  
205 intensify land use. PLS-SEM estimates partial model structures with principal component  
206 analysis and ordinary least squares regressions (Hair et al., 2017). This approach has attracted  
207 increasing attention in social sciences over the last decade as it has no distributional restrictions  
208 on variables and allows to handle formative and reflective constructs simultaneously. In addition,  
209 PLS-SEM is well suited for identifying the driving constructs and have high statistical power for  
210 predictive models. The estimation of PLS-SEM and related calculations were conducted with  
211 SmartPLS 3 software (Ringle et al., 2015). As PLS-SEM is a nonparametric approach, we  
212 applied the bootstrapping procedure to test whether coefficients are different from zero based on  
213 a t-test. We applied 5000 bootstrap samples estimating path coefficients of the structural model,  
214 following the recommendations of Hair et al. (2017).

### 215 **3.2 Data collection**

216 The study is based on the data collected from farmers producing crops in Turkistan province of  
217 southern Kazakhstan and Samarkand province of eastern Uzbekistan<sup>1</sup>. The two neighbouring  
218 regions have irrigated agriculture dominated by cotton and wheat cultivation. Three districts in  
219 Uzbekistan (Pastdargom, Payarik, and Jomboy) and three districts in Kazakhstan (Maktaaral,  
220 Shardara, and Sariagash) were selected for the survey.

221 The field survey was conducted in March and April 2019; therefore, farmers were asked to  
222 provide information related to the farming activities of 2018. Due to administrative constraints  
223 two different sample selection procedures had to be applied. Using a direct random selection  
224 approach, 460 farmers were chosen from the list of the targeted population in three districts in  
225 Uzbekistan; they constituted 30% of the farmers cultivating crops. In Kazakhstan, a random  
226 sampling has been applied at two levels. After a random selection of three sub-districts within  
227 each district around 50 farms in each sub-district were randomly selected and interviewed. The  
228 final sample in Kazakhstan constituted of 495 farmers, which corresponds to only 2% of the

<sup>19</sup> The Agrichange II survey has been financed by Volkswagen Foundation, BMBF, and IAMO.

229officially registered farms. The questionnaire originally prepared in English was translated to  
230Kazakh and Uzbek languages. The pre-survey training and guideline for interviewers were  
231provided in both countries.

### 2323.3 Measurement of the TPB components

233To define the TPB-related questions and statements, we followed the procedures for constructing  
234the TPB questionnaire recommended by Fishbein and Ajzen (2010). Table 2 presents a list of  
235questions and statements used in the survey. Three questions are used as direct measures of the  
236reflective construct intention which plays a role of the dependent latent variable in this study.  
237Farmers' behavioural determinants are three latent variables (attitude, subjective norms, and  
238PBC) that we operationalize using several relevant items. All reflective constructs are scored on  
239a five-point Likert scale.

### 2403.4 Measurement of Perceived LR, Rights Underuse and Restrictions Violation

241The first formative construct that we integrated into the TPB model is Perceived LR that  
242incorporates farmers' perceptions about four bundles of land rights. Additional TPB model  
243includes two formative constructs that imply two types of discrepancies between legal and  
244perceived land rights (Rights Underuse and Restrictions Violation). The Klümper et al. (2018)  
245method used to operationalize the bundle of rights approach allows us to make a comparison  
246between legal and perceived land rights, measuring them on the same ordinal scale. The  
247advantage of using this method is that it can be applied to land users with different sets of land  
248rights.

249Table 3 displays the approach that we apply to convert legal and perceived land rights into  
250measurable factors. Data collected from the farmer survey was used for the assessment of  
251perception magnitude. Farmers were asked to evaluate the level of freedom to which they can  
252utilize their land rights. The questions were formulated in a way such as "To what extent are you  
253free to access, withdraw from land, etc.?" and responses reflected the magnitude varying from  
254one to five. The Perceived LR construct is a composite of farmers' perceptions. Each of the

255perceptions in Perceived LR represents an independent farming activity that cannot be replaced  
 256by others; adding and dropping one of the perceptions may change the conceptual domain of  
 257formative construct. These characteristics confirm a formative specification of the Perceived LR  
 258construct, nevertheless, we provide additional construct selection procedures below to validate  
 259constructs' formative nature (Coltman et al., 2008; Diamantopoulos & Siguaw, 2006; Jarvis et  
 260al., 2003).

261**Table 2:** *Statements and scales of the reflective measures for intention and PBC*

	<b>Variable</b>	<b>Questions and statements</b>	<b>Scale of 1 to 5</b>
Intention	Int1	How strong is your intention to increase crop yield in at least part of your farm in the next year?	Weak–strong
	Int2	Do you plan to increase crop yield in at least part of your farm in the next year?	Unlikely–likely
	Int3	How likely is it that you will increase crop yield in at least part of your farm in the next year?	Strongly disagree–strongly agree
Attitude	Att1	How important is the increase in crop yield in at least part of your farm in the next year?	Not important at all–Extremely important
	Att2	How profitable is the increase in crop yield in at least part of your farm in the next year?	Exceptionally detrimental–Exceptionally profitable
	Att3	How necessary is the increase in crop yield in at least part of your farm in the next year?	Absolutely unnecessary–Absolutely necessary
Subjective norms	SN1	Most people who are important to you think that you should increase crop yield in at least part of the farm in the next year.	Strongly disagree–strongly agree
	SN2	Most people who are important to you approve that you increase crop yield in at least part of your farm in the next year.	Unlikely–likely
	SN3	Your extended cultural community thinks that you should increase crop yield in at least part of your farm in the next year.	Unlikely–likely
	SN4	Most farmers that are similar to you will increase crop yield in at least part of their farms in the next year.	Strongly disagree–strongly agree
Perceived behavioural control	PBC1	You have enough knowledge to increase crop yield in at least part of your farm in the next year.	Strongly disagree–strongly agree
	PBC2	For you, the increase of crop yield in at least part of your farm in the next year is a feasible task.	Strongly disagree–strongly agree

262

263We distinguished three types of farmers who participated in the survey on the basis of  
 264differences in legal privileges and limitations in land use: Kazakh landowners, Kazakh land  
 265tenants, and Uzbek land tenants. We assessed their land rights by analysing national land codes.  
 266Land rights are supposed to be applied uniformly on a nationwide level; therefore, they are

267endowed with similar evaluation criteria within each farm type. We also assigned them scores  
 268from one to five, but the scores “2” and “4” were intentionally skipped because to assess how  
 269strong are restrictions in land use is a challenging issue. The assessment of land rights for three  
 270types of farmers is presented in Fig. A.1 in Appendix.

271**Table 3:** Operationalization of legal and perceived land rights

Bundles	Right	Legal rights	Magnitude of perception
Land use	Access	Scale 1-3-5:	Scale 1-2-3-4-5:
	Withdrawal		
	Land use change		
Control and decisions	Management	1-no right;	1-Never hold the practice;
	Investment		
	Exclusion		
	Income generating		
Alienation	Reallocation	3-limited right;	2-rarely hold;
	Sell		
	Rent out	5-full right.	3-occasionally;
	Leasing from land tenants <sup>2</sup>		
	Inheritance		
Government protection	Land protection by government		4-very frequently;
	Power of land certificates		
			5-always.

272Note: adopted from Klümper et al. (2018).

273Finally, we generated discrepancies by subtracting the magnitude of perceptions from the score  
 274of land rights. Derived discrepancies ranged from -4 to 4. Values close to endpoints indicate high  
 275mismatches between two concepts and those close to zero demonstrate medium mismatches. A  
 276negative sign denotes a mismatch in favour of perceived land right that means that a farmer  
 277violates law or concedes a potential breach of land use restrictions. A positive sign indicates that  
 278discrepancy occurs in favour of the land right. The absence of discrepancies shows the full  
 279overlapping of land rights with farmers’ perceptions. Cross-country descriptive statistics of  
 280perceived land rights and discrepancies are presented in Table A.1 in Appendix.

281To build formative latent constructs representing discrepancies between legal and perceived land  
 282rights, we separate discrepancies for every land right, if present, into negative and positive items.  
 283We combine positive items into one formative construct Rights Underuse and negative items into

26<sup>2</sup> The right to lease land in the alienation bundle was split into two: the right to rent out and the right to lease land  
 27from farmers who lease state land, or so-called land tenants. Thus, we can reveal whether farmers rent the additional  
 28land from land tenants that are forbidden to rent out in Kazakhstan and Uzbekistan.

284another formative construct Restrictions Violation. The rationale behind this is that every  
285positive discrepancy is evidence of the farmer's underuse of corresponding land right, and  
286together they compose one index. Similarly, every negative discrepancy indicates the farmer's  
287potential violations of legal restrictions in the corresponding land right and contributes to the  
288common index of Restrictions Violation.

## 2894 Results

### 2904.1 Validation of measurement models

291To assess the reliability and validity of the reflective construct measures, we use rules proposed  
292by Hair et al. (2017) that identify the criteria for internal consistency, convergent validity, and  
293discriminant validity. Table A.2 in Appendix presents corresponding indicators required for the  
294evaluation of reflective models (TPB constructs). All standardized factor loadings have an  
295allowable level that should be greater than 0.70. In the model of Uzbek farmers, we removed two  
296factors (SN3 and SN4) that correspond to extended cultural community and most farmers,  
297respectively, because their loadings were below 0.40. Such low loadings may appear due to poor  
298wording, inappropriate item, or incorrect transfer of the meaning across contexts (Hulland,  
2992016). Composite reliability values are above the threshold of 0.70 in both country-specific  
300models. The average variance extracted (AVE), a criterion of convergent validity, estimates the  
301amount of variance that a latent variable captures from the corresponding variables. Fornell and  
302Larcker (1981) postulate a threshold value of 0.5 for AVE which is fulfilled by our reflective  
303models. Heterotrait-monotrait ratio (HTMT) is a measure of discriminant validity that shows  
304how distinct is one construct from others. The HTMT statistics are below 0.90 and the  
305confidence intervals of HTMT are below 1.00 for all reflective constructs; that confirms their  
306discriminant validity.

307To assess the stability of formative constructs (Perceived LR, Rights Underuse and Restrictions  
308Violation), we performed Confirmatory Tetrad Analysis in PLS-SEM (CTA-SEM; Gudergan et  
309al., 2008) that initially assumes a reflective measurement specification. The results of CTA-SEM



310 confirmed that these measurement models have a formative model specification because at least  
311 one of the tetrad's residual values in each of the country-specific models is significantly different  
312 from zero. The assessment of collinearity issues in formative constructs for the Kazakhstan  
313 model revealed that one of the indicators has a high variance inflation factor (VIF) that is above  
314 the threshold of 5. The violation of renting out with a VIF of 5.954 was excluded from the  
315 Restrictions Violation model. This item is highly correlated with the violation of selling state  
316 land. Although the right to rent out is different from the right to sell state land, they both measure  
317 the concept of land transferability; which leads to a multi-collinearity in our case. In the  
318 Uzbekistan model, all the formative indicators in the Rights Underuse model and the Restrictions  
319 Violation model yielded VIF values below 5 ensuring that multicollinearity is not an issue.

320 Convergent validity of formative constructs is a requirement that shows whether the formative  
321 indicators jointly represent the construct properly (Cheah et al., 2018). Since we miss a 'global'  
322 item summarizing the essence of the formative constructs or the reflective-multi-item measure of  
323 our composite variables, we cannot carry out the redundancy analysis using the multiple  
324 indicators multiple causes model (Jöreskog & Goldberger, 1975). Instead, we follow MacCallum  
325 and Browne's (1993) suggestions to achieve identification in formative constructs through adding  
326 at least two unrelated reflective measurement models. Thus, a model with formative indicators  
327 should predict at least two latent variables with reflective construct to gather convergent and  
328 discriminant validity. Perceived LR, Rights Underuse, and Restrictions Violation in the TPB  
329 framework emit at least two paths to reflective constructs and, therefore, are identified.

330 The final step in assessing the validity of formative constructs is testing the statistical  
331 significance of the estimated indicator weights in the context of a structural model (Table A.3 in  
332 Appendix). Although only several perceived land rights and discrepancies have significant  
333 impacts on their formative constructs, we retain all non-significant indicators to avoid the  
334 changes in the conceptual domain of formative measurement models (Henseler & Sarstedt, 2013;  
335 Jarvis et al., 2003). The co-occurrence of negative and positive coefficients demonstrates that

336bivariate correlations – albeit at allowable levels – between indicators distort the estimates of the  
337weak indicators<sup>3</sup>. This situation can be explained by the fact, that land rights from the same  
338bundle reflect a common concept. We keep all items in formative constructs because the present  
339collinearity evidence poses a threat only to the interpretation of individual formative indicators,  
340but structural effects between constructs remain unaffected (Cenfetelli & Bassellier, 2009; Chin,  
3411998).

#### 3424.2 Structural models

343To assess the structural model of TPB, we followed procedures proposed by Hair et al. (2017).  
344We estimated basic and extended TPB models to investigate the influence of additional  
345constructs on the overall model performance. Examination of the extended country-specific  
346models for collinearity showed that the tolerance value (VIF) for each predictor construct in  
347basic and extended models for Kazakh and Uzbek farmers lies between 0.20 and 5,  
348demonstrating no collinearity issue in the structural models. Table 4 presents the results of PLS-  
349SEM for basic and extended TPB models. Using the 5000 bootstrap re-samples, we tested the  
350significance of individual path coefficients of the PLS structural models, that are actually  
351standardized coefficients of ordinal least squares regressions (Henseler & Sarstedt, 2013).

352Path coefficients in the basic model of Kazakh farmers have expected signs (column 1).  
353However, PBC in the extended model with Perceived LR and the model with Rights Underuse  
354and Restrictions Violation have negative but not statistically significant signs (columns 2 and 3).  
355Attitudes play a predominant role in predicting Kazakh farmers' intentions in basic and extended  
356models, followed by subjective norms. Perceived LR in the extended model (column 2) has a  
357significant positive impact on attitude, subjective norms, and PBC but has no direct effect on  
358Kazakh farmers' intention. Rights Underuse, as well as Restrictions Violation, also has no direct  
359effect on farmers' intention (column 3). However, Rights Underuse has a negative significant  
360impact on the three predictors of intention with the largest impact on subjective norms and the

---

<sup>3</sup> Indicators in a formative construct may have all negative or all positive weights depending on the coding direction.

361smallest impact on PBC. Restrictions Violation only has a significant positive effect on attitude  
362and subjective norms of Kazakh farmers.

363Structural models of Uzbek farmers produced statistically significant and expected path  
364coefficients from the three TPB constructs to the farmers' intentions. Subjective norms are  
365relatively more important in the basic model and the model with Perceived LR (columns 4 and  
3665). Perceived LR is an important predictor for Uzbek farmers' intention as well as for attitude,  
367subjective norms, and PBC (column 5). However, unlike in Kazakhstan, Perceived LR has a  
368negative impact on these constructs. Results of the extended model with discrepancies (column  
3696) reveal that Restrictions Violation has a negative and statistically significant impact on all TPB  
370constructs. All paths from Rights Underuse to the TPB construct including intention are not  
371significant in a statistical sense. One might assume that the negative impact of Restrictions  
372Violation on the TPB variables in the case of Uzbek farmers explains the contradictory impact of  
373Perceived LR since violations are farmers' perceptions exceeding legal limits. To check this  
374assumption, we run an additional extended model with Perceived LR and Restrictions Violation.  
375The results in column (7) show that after adding Restrictions Violation, Perceived LR has no  
376longer a statistically significant impact on intention and PBC; however, it preserves the negative  
377effect on attitude and subjective norms. This is attributable to the fact that Restrictions Violation  
378partly absorbs the negative effect of Perceived LR. Thus, we can state that part of Uzbek farmers  
379with higher Perceived LR violates legal restrictions facing more risks due to strong law  
380enforcement.

381Country-specific basic and extended models have a satisfactory level of predictive accuracy for  
382the farmers' intention to intensify land use. The increase in the predictive power from basic to  
383extended models in Kazakhstan is negligible compared to Uzbekistan. The explained variance of  
384Kazakh farmers' intention to intensify land use remains almost the same when the TPB model is  
385extended with Perceived LR and increases only from 45.7% to 46.1% when the model is  
386extended with Rights Underuse and Restrictions Violation. The R-square value for the Uzbek

387farmers' intention increases from 0.617 to 0.648 with adding Perceived LR to the basic model, to  
3880.666 with adding Rights Underuse and Restrictions Violation, and to 0.663 with adding  
389Perceived LR and Restrictions Violation, confirming a substantial advancement in the predictive  
390power of TPB model.

391The results of the  $f^2$  effect sizes presented in Table A.4 in Appendix indicate a medium effect of  
392attitude on intention in all models for both countries. Subjective norms have a medium effect on  
393intention in the case of Kazakh and Uzbek farmers; however, the effect is large in the basic TPB  
394model. Perceived LR has a medium effect on attitude, subjective norms, and PBC in the case of  
395Kazakh farmers but, for Uzbek farmers, they have a large effect on subjective norms and a  
396medium effect on PBC. Rights Underuse and Restrictions Violations have mainly a small or no  
397effect on the endogenous constructs. Stone-Geisser's  $Q^2$  values of all dependent constructs in  
398both models are above zero indicating the predictive relevance of these constructs.

399**Table 4:** Path coefficients of the basic and extended PLS models

Relations	Kazakh farmers			Uzbek farmers			
	Basic model	Model with	Model with	Basic model	Model with	Model with	Model with Perceived
	(1)	Perceived LR (2)	discrepancies (3)	(4)	Perceived LR (5)	discrepancies (6)	LR and Violation (7)
Attitude -> Intention	0.472 (0.000)	0.468 (0.000)	0.466 (0.000)	0.358 (0.000)	0.361 (0.000)	0.392 (0.000)	0.377 (0.000)
SN-> Intention	0.272 (0.000)	0.265 (0.000)	0.257 (0.000)	0.472 (0.000)	0.367 (0.000)	0.337 (0.000)	0.359 (0.000)
PBC-> Intention	0.024 (0.496)	-0.000 (0.999)	-0.007 (0.872)	0.147 (0.000)	0.101 (0.005)	0.073 (0.037)	0.081 (0.025)
Perceived LR ->Intention		0.030 (0.654)			-0.220 (0.000)		0.000 (0.998)
Perceived LR -> Attitude		0.388 (0.000)			-0.268 (0.000)		-0.431 (0.002)
Perceived LR ->SN		0.471 (0.000)			-0.538 (0.000)		-0.511 (0.000)
Perceived LR ->PBC		0.320 (0.000)			-0.372 (0.000)		-0.137 (0.200)
Rights Underuse ->Intention			-0.078 (0.214)			0.071 (0.430)	
Rights Underuse -> Attitude			-0.295 (0.000)			-0.006 (0.948)	
Rights Underuse ->SN			-0.371 (0.000)			0.283 (0.346)	
Rights Underuse ->PBC			-0.274 (0.003)			0.161 (0.368)	
Restrictions Violation -> Intention			-0.028 (0.553)			-0.231 (0.000)	-0.262 (0.000)
Restrictions Violation -> Attitude			0.121 (0.011)			-0.173 (0.021)	0.188 (0.112)
Restrictions Violation ->SN			0.145 (0.004)			-0.302 (0.000)	-0.031 (0.692)
Restrictions Violation ->PBC			0.112 (0.173)			-0.304 (0.000)	-0.270 (0.004)
R <sup>2</sup> for Intention	0.457	0.456	0.461	0.617	0.648	0.666	0.663

400Note: P-values are presented in parentheses.

### 4014.3 Robustness check: endogeneity

402 Several studies on the relationship between land rights and land investment reveal the potential  
403 endogeneity of rights that might arise from the reverse causality (Besley, 1995; Brasselle et al.,  
404 2002; Twerefou et al., 2011). Since land intensification involves investments in land  
405 improvements, the possible endogeneity of Perceived LR, Rights Underuse, and Restrictions  
406 Violation poses a threat to the correctness of the PLS-SEM results. To assess the potential  
407 endogeneity and to check the robustness of our results, we follow the recommendations of Hult  
408 et al. (2018) that employ the Gaussian copula approach of Park and Gupta (2012) to model the  
409 correlation between the endogenous variables and the error term. Firstly, we undertook the  
410 Kolmogorov–Smirnov test with Lilliefors correction on the standard composite scores of  
411 Perceived LR, Rights Underuse, and Restrictions Violation. The test revealed that the  
412 distributions of latent variables are not normal and can be considered as endogenous.

413 Table 5 exhibits that three Gaussian copulas (for Perceived LR, Rights Underuse, and  
414 Restrictions Violation) in the models of Kazakh farmers are not statistically significant,  
415 indicating the absence of endogeneity issue and the robustness of the structural model results  
416 (columns 1 and 2). For Uzbek farmers, the Gaussian copula of Perceived LR is statistically  
417 significant in the model with Perceived LR, confirming the possibility of endogeneity (column  
418 3). The copula of Restrictions Violation in two models of Uzbek farmers (columns 4 and 5) has a  
419 statistically significant impact, indicating the endogeneity issue.

420 Due to the lack of valid instruments in this study, we prefer to use the results of the models with  
421 copulas for Uzbek farmers; controlling for endogeneity helps to adjust the magnitude of the  
422 potentially endogenous variables. The coefficients of attitude appear to be slightly overvalued in  
423 the original PLS-SEM models for Uzbek farmers, and the coefficients of subjective norms are  
424 slightly reduced. Since endogeneity is not an issue for Kazakhstan models, the Gaussian copula  
425 approach produced results that are consistent with the original models.

426**Table 5:** *Assessment of endogeneity using the Gaussian copula approach*

Endogenous variable Variable	Kazakh farmers		Uzbek farmers		
	Perceived LR (1)	Underuse, Violation (2)	Perceived LR (3)	Underuse, Violation (4)	Perceived LR, Violation (5)
Attitude	0.468 (0.000)	0.465 (0.000)	0.351 (0.000)	0.373 (0.000)	0.357 (0.000)
SN	0.266 (0.000)	0.258 (0.000)	0.377 (0.000)	0.346 (0.000)	0.372 (0.000)
PBC	0.000 (0.996)	-0.006 (0.876)	0.102 (0.004)	0.086 (0.014)	0.096 (0.006)
Perceived LR	0.027 (0.861)		-0.504 (0.000)		-0.069 (0.622)
Underuse		-0.015 (0.941)		0.043 (0.703)	
Violation		0.008 (0.923)		-0.439 (0.000)	-0.425 (0.000)
C Perceived LR	0.002 (0.984)		0.297 (0.006)		0.068 (0.559)
C Underuse		-0.067 (0.693)		0.022 (0.842)	
C Violation		-0.027 (0.591)		0.241 (0.001)	0.207 (0.012)

427Note: C indicates the copula term.

428

## 4295 DISCUSSION AND CONCLUSIONS

430This study widens the scope of TPB application in analysing farmers' behaviour by  
431incorporating perceived land rights and discrepancies between legal and perceived land rights as  
432background factors influencing directly and indirectly farmers' intentions to intensify land use.  
433This is the first study to consider perceptions of land rights beyond tenure security as an  
434important factor in the formation of farmers' behaviour. Our findings suggest that land  
435intensification and increasing land use productivity depend on the farmers' attitudes and  
436motivation from the social environment. The perception of capability to perform land  
437intensification carries importance for Uzbek farmers but not for Kazakh farmers.

438Extending the TPB model produced intriguing results indicating substantial importance of land  
439rights perception in the formation of behavioural, normative, and control beliefs regarding land  
440intensification. Perceived land rights have proven to have an impact on psychological constructs  
441determining farmers' willingness to intensify, with the largest influence on subjective norms. In  
442addition, the path coefficient from subjective norms to intention in extended models appear to be  
443lower, especially for Uzbek farmers; this fact indicates an overestimation of intentions when  
444institutions are neglected. However, while higher perceptions of land rights have a positive

445association with land intensification in Kazakhstan, Uzbek farmers with higher perception  
446manifested lower willingness to intensify.

447Considering differences in law-enforcement environment and agricultural market system in these  
448two countries, we used discrepancies between legal and perceived land rights to explain the  
449controversial effects of perceived land rights on farmers' intention. Positive discrepancies have a  
450negative impact on behavioural attitude to land intensification, subjective norms, and the  
451perceived own capability of Kazakh farmers, weakening thus the direct effects of these  
452psychological constructs on the behavioural intention. For Uzbek farmers, positive discrepancies  
453have no statistically significant effect on any of the three conceptual components. This situation  
454can be explained by the fact that most of the Uzbek farmers in our sample are cotton producers  
455who had to follow the quota system. Although the National Land Code of Uzbekistan grants  
456certain land rights to farmers, additional legislative documents impose contradictory rules on the  
457cotton producers. As a result, Uzbek farmers comply with these contradictory documents  
458producing positive discrepancies that do not carry importance for farmers' intention. Besides,  
459Uzbek farmers, who are more compliant with the law, expressed a higher willingness to intensify  
460land use. The findings from Table 4 (column 7) confirm that such behaviour could be affected  
461not only by social desirability of higher land intensification but also by the threat of sanctions  
462stemming from the breaching land use regulations.

463The composite variable of negative discrepancies has been proven to be a significant predictor of  
464attitudes and subjective norms in the case of Kazakh farmers, and all three conceptual  
465components of intention, including intention itself, for Uzbek farmers. The reason for the  
466controversial effects of negative discrepancies might lie again in different levels of law  
467enforcement. In pursuit of higher economic profit, the Uzbek government strictly monitors  
468farmers' compliance with the law, imposing penalties for non-compliance or seizing the land  
469from farmers. Therefore, Uzbek farmers who consciously violate legal restrictions would  
470perceive higher tenure insecurity that negatively impacts farming behaviours. The positive effect



471of negative discrepancies on the TPB constructs in the case of Kazakh farmers confirms the  
472claim of Satpayev (2014), which states that overall the law enforcement in practice is ignored in  
473Kazakhstan. Thus, the violation of restrictions does not generate risks of sanctions for Kazakh  
474farmers.

475Cross-country differences in coefficients of attitudes and subjective norms show that the  
476intention of Kazakh farmers is driven more by behavioural attitudes, and the intention of Uzbek  
477farmers is driven more by subjective norms. This variation can be explained by cross-cultural  
478and institutional differences. Members of individualistic cultures tend to make decisions on the  
479basis of behavioural beliefs about personal gains, whereas members of collectivistic cultures  
480prioritize social goals over personal benefits (H. S. Park, 2000; Triandis, 1989). The fact that  
481normative components for Uzbek farmers are more important than personal outcomes may  
482indicate a more collectivistic culture in Uzbekistan. However, taking into account the frequent  
483interventions of the Uzbek government into agricultural production, we are inclined to believe  
484that this difference could be determined by institutional settings rather than by cultural  
485characteristics.

486Despite the informative findings, this study has several limitations. One of them is a possible  
487biasedness in data due to several unidentified reasons. There might be farmers with an already  
488high intensification level and with no plans to increase agricultural productivity in the next year.  
489This situation may lead to the understatement of the willingness to intensify. On the other hand,  
490land intensification could have been seen as a socially desirable behaviour, and hence, farmers  
491could overdraw their intentions. Another considerable limitation is the presence of negative and  
492positive path weights of indicators in Perceived LR, Rights Underuse, and Restrictions Violation,  
493which make it difficult to interpret these indicators. Future research, therefore, should consider  
494incorporating additional questions measuring global single items into the survey questionnaire to  
495enable the redundancy analysis of formative constructs.

496To improve the interpretation of results, it would also be interesting to detect the reasons for the  
497underuse of land rights by farmers. Additional open questions about the potential barriers to the  
498use of land rights during the elicitation study or post-survey interviews could help to fill the gap.  
499Due to the lack of clear evidence in this study, further investigation is necessary to provide more  
500insights on what influences intention more: perceived rights or discrepancies.

501This study holds special interest for policy makers and state executive bodies in Kazakhstan and  
502Uzbekistan. As the underuse of land rights in Kazakhstan exposes reducing effect on the  
503underlying determinants of farmers' willingness to intensify, local executive bodies should  
504ensure farmers' awareness of land rights and enable them to use land rights to the fullest extent.  
505The positive effect of the violation of land use restrictions by Kazakh farmers on the attitude and  
506subjective norms should be a signal for policy makers, that some restrictions in land rights  
507impede the effective land use and need to be reconsidered. Moreover, this should be also a signal  
508of insufficient law enforcement and the weak rule of law in the study region of Kazakhstan.  
509Policy makers in Uzbekistan should reconsider the strict restrictions in land use legislation,  
510particularly those in land management and investment activities, that play a crucial role in  
511agricultural productivity.

## 513 REFERENCES

- 514 Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2),  
515 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- 516 Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Prentice-Hall.
- 517 Austin, E. ., Willock, J., Deary, I. ., Gibson, G. ., Dent, J. ., Edwards-Jones, G., Morgan, O., Grieve, R., &  
518 Sutherland, A. (1998). Empirical models of farmer behaviour using psychological, social and economic  
519 variables. Part I: linear modelling. *Agricultural Systems*, 58(2), 203–224. <https://doi.org/10.1016/S0308->  
520 521X(98)00066-3
- 521 Ayamga, M., Yeboah, R. W. N., & Ayambila, S. N. (2016). An analysis of household farm investment decisions  
522 under varying land tenure arrangements in Ghana. *Journal of Agriculture and Rural Development in the*  
523 *Tropics and Subtropics*, 117(1), 21–34.
- 524 Besley, T. (1995). Property Rights and Investment Incentives: Theory and Evidence from Ghana. *Journal of*  
525 *Political Economy*, 103(5), 903–937.
- 526 Besley, T., & Ghatak, M. (2010). Property Rights and Economic Development. *Handbook of Development*  
527 *Economics*, 5, 4525–4595. <https://doi.org/10.1016/B978-0-444-52944-2.00006-9>
- 528 Borges, A. R. J., Lansink, A. G. J. M. O., & Emvalomatis, G. (2019). Adoption of innovation in agriculture  
529 Adoption of Innovation in Agriculture: A Critical Review of Economic and Psychological Models.  
530 *International Journal of Innovation and Sustainable Development*, 13(1), 56.  
531 <https://doi.org/10.1504/IJISD.2019.096705>
- 532 Brasselle, A.-S., Gaspart, F., & Platteau, J.-P. (2002). Land tenure security and investment incentives: puzzling  
533 evidence from Burkina Faso. *Journal of Development Economics*, 67(2), 373–418.  
534 [https://doi.org/10.1016/S0304-3878\(01\)00190-0](https://doi.org/10.1016/S0304-3878(01)00190-0)
- 535 Broegaard, R. J. (2005). Land Tenure Insecurity and Inequality in Nicaragua. *Development and Change*, 36(5), 845–  
536 864.
- 537 Bürgi, M., Bieling, C., von Hackwitz, K., Kizos, T., Lieskovský, J., Martín, M. G., McCarthy, S., Müller, M.,  
538 Palang, H., Plieninger, T., & Printsmann, A. (2017). Processes and driving forces in changing cultural  
539 landscapes across Europe. *Landscape Ecology*, 32(11), 2097–2112. <https://doi.org/10.1007/s10980-017-0513->  
540 z
- 541 Cenfetelli, R. T., & Bassellier, G. (2009). Interpretation of Formative Measurement in Information Systems  
542 Research. *MIS Quarterly*, 33(4), 689–707.
- 543 Cheah, J. H., Sarstedt, M., Ringle, C. M., Ramayah, T., & Ting, H. (2018). Convergent validity assessment of  
544 formatively measured constructs in PLS-SEM: On using single-item versus multi-item measures in  
545 redundancy analyses. *International Journal of Contemporary Hospitality Management*, 30(11), 3192–3210.  
546 <https://doi.org/10.1108/IJCHM-10-2017-0649>
- 547 Chin, W. (1998). Issues and Opinion on Structural Equation Modeling. *MIS Quarterly*, 22(1).
- 548 Coltman, T., Devinney, T. M., Midgley, D. F., & Venaik, S. (2008). Formative versus reflective measurement  
549 models: Two applications of formative measurement. *Journal of Business Research*, 61(12), 1250–1262.  
550 <https://doi.org/10.1016/j.jbusres.2008.01.013>
- 551 Diamantopoulos, A., & Siguaw, J. A. (2006). Formative versus reflective indicators in organizational measure

552 development: A comparison and empirical illustration. *British Journal of Management*, 17(4), 263–282.  
553 <https://doi.org/10.1111/j.1467-8551.2006.00500.x>

554Feder, G. (1987). Land Ownership Security and Farm Productivity: Evidence from Thailand. *The Journal of*  
555 *Development Studies*, 24(1), 16–30. <https://doi.org/10.1080/00220388708422052>

556Feder, G., Onchan, T., Chalamwong, Y., & Hongladarom, C. (1988). *Land Policies and Farm Productivity in*  
557 *Thailand*. The Johns Hopkins University Press.

558Fishbein, M., & Ajzen, I. (2010). *Predicting and Changing Behavior: The Reasoned Action Approach*. Psychology  
559 Press.

560Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and  
561 measurement error. *Journal of Marketing Research*, 18(1), 39–50.

562Galik, C. S., & Jagger, P. (2015). Bundles, Duties, and Rights: A Revised Framework for Analysis of Natural  
563 Resource Property Rights Regimes. *Land Economics*, 91(1), 76–90. <https://doi.org/10.3368/le.91.1.76>

564Gudergan, S. P., Ringle, C. M., Wende, S., & Will, A. (2008). Confirmatory tetrad analysis in PLS path modeling.  
565 *Journal of Business Research*, 61(12), 1238–1249. <https://doi.org/10.1016/j.jbusres.2008.01.012>

566Hair, J. F., Hult, G. T., Ringle, C., & Sarstedt, M. (2017). A Primer on Partial Least Squares Structural Equation  
567 Modeling (PLS-SEM). In *Sage*.

568Hanson, M. (2017). Legalized Rent-Seeking: Eminent Domain in Kazakhstan. *Cornell International Law Journal*,  
569 50(1).

570Hansson, H., Ferguson, R., & Olofsson, C. (2012). Psychological Constructs Underlying Farmers' Decisions to  
571 Diversify or Specialise their Businesses - An Application of Theory of Planned Behaviour. *Journal of*  
572 *Agricultural Economics*, 63(2), 465–482. <https://doi.org/10.1111/j.1477-9552.2012.00344.x>

573Henseler, J., & Sarstedt, M. (2013). Goodness-of-fit indices for partial least squares path modeling. *Computational*  
574 *Statistics*, 28(2), 565–580. <https://doi.org/10.1007/s00180-012-0317-1>

575Hersperger, A. M., & Bürgi, M. (2009). Going beyond landscape change description: Quantifying the importance of  
576 driving forces of landscape change in a Central Europe case study. *Land Use Policy*, 26(3), 640–648.  
577 <https://doi.org/10.1016/J.LANDUSEPOL.2008.08.015>

578Hettig, E., Lay, J., & Sipangule, K. (2016). Drivers of Households' Land-Use Decisions: A Critical Review of  
579 Micro-Level Studies in Tropical Regions. In *Land* (Vol. 5, Issue 4). <https://doi.org/10.3390/land5040032>

580Hosking, G. (2005). Dictatorship of the Law. *Index on Censorship*, 4. <https://doi.org/10.1080/03064220500416889>

581Hulland, J. (2016). Use of Partial Least Squares (PLS) in Strategic Management Research: A Review of Four Recent  
582 Studies. *Strategic Management Journal*, 20(2), 195–204.

583Hult, G. T. M., Hair, J. F., Proksch, D., Sarstedt, M., Pinkwart, A., & Ringle, C. M. (2018). Addressing endogeneity  
584 in international marketing applications of partial least squares structural equation modeling. *Journal of*  
585 *International Marketing*, 26(3), 1–21. <https://doi.org/10.1509/jim.17.0151>

586Ilbery, B. W. (1978). Agricultural decision-making: a behavioural perspective. *Progress in Human Geography* ,  
587 2(3), 448–466. <https://doi.org/https://doi.org/10.1177/030913257800200303>

588Jakovac, C. C., Dutrieux, L. P., Siti, L., Peña-Claros, M., & Bongers, F. (2017). Spatial and temporal dynamics of  
589 shifting cultivation in the middle-Amazonas river: Expansion and intensification. *PLoS ONE*, 12(7).  
590 <https://doi.org/10.1371/journal.pone.0181092>

591Jarvis, C. B., Mackenzie, S. B., Podsakoff, P. M., Giliatt, N., & Mee, J. F. (2003). A Critical Review of Construct  
592 Indicators and Measurement Model Misspecification in Marketing and Consumer Research. *Journal of*  
593 *Consumer Research*, 30(2), 199–218. <https://doi.org/10.1086/376806>

594Jöreskog, K. G., & Goldberger, A. S. (1975). Estimation of a Model with Multiple Indicators and Multiple Causes of  
595 a Single Latent Variable. *Journal of the American Statistical Association*, 70(351a), 631–639.  
596 <https://doi.org/10.1080/01621459.1975.10482485>

597Josephson, A. L., Ricker-Gilbert, J., & Florax, R. J. G. M. (2014). How does population density influence  
598 agricultural intensification and productivity? Evidence from Ethiopia. *Food Policy*, 48, 142–152.  
599 <https://doi.org/10.1016/J.FOODPOL.2014.03.004>

600Klümper, F., Theesfeld, I., & Herzfeld, T. (2018). Discrepancies between paper and practice in policy  
601 implementation: Tajikistan’s property rights and customary claims to land and water. *Land Use Policy*, 75,  
602 327–339. <https://doi.org/10.1016/J.LANDUSEPOL.2018.03.030>

603Leitzel, J. (1997). Rule evasion in transitional Russia. In J. M. . Nelson, C. Tilly, & L. Walker (Eds.), *Transforming*  
604 *Post-Communist Political Economies* (pp. 118–130). National Academy Press.

605Lerman, Z., & Sedik, D. (2018). Transition to smallholder agriculture in Central Asia. *Journal of Agrarian Change*,  
606 18(4), 904–912. <https://doi.org/10.1111/joac.12282>

607Lombardozi, L. (2020). Patterns of accumulation and social differentiation through a slow-paced agrarian market  
608 transition in post-Soviet Uzbekistan. *Journal of Agrarian Change*, 20(4), 637–658.  
609 <https://doi.org/10.1111/joac.12366>

610Ma, X., Heerink, N., Feng, S., & Shi, X. (2015). Farmland tenure in China: Comparing legal, actual and perceived  
611 security. *Land Use Policy*, 42, 293–306. <https://doi.org/10.1016/j.landusepol.2014.07.020>

612Ma, X., Heerink, N., Feng, S., & Shi, X. (2017). Land tenure security and technical efficiency: new insights from a  
613 case study in Northwest China. *Environment and Development Economics*, 22, 305–327.  
614 <https://doi.org/10.1017/S1355770X1600036X>

615MacCallum, R. C., & Browne, M. W. (1993). The use of causal indicators in covariance structure models: Some  
616 practical issues. *Psychological Bulletin*, 114(3), 533–541. <https://doi.org/10.1037/0033-2909.114.3.533>

617Martin, A., Coolsaet, B., Corbera, E., Dawson, N., Fisher, J., Franks, P., Mertz, O., Pascual, U., Rasmussen, L. V.,  
618 & Ryan, C. (2018). Land use intensification: The promise of sustainability and the reality of trade-offs. In K.  
619 Schreckenberg, G. Mace, & M. Poudyal (Eds.), *Ecosystem Services and Poverty Alleviation: Trade-offs and*  
620 *Governance* (1st ed., Issue 1). Taylor & Francis Group.

621Martinovska Stojcheska, A., Kotevska, A., Bogdanov, N., & Nikolić, A. (2016). How do farmers respond to rural  
622 development policy challenges? Evidence from Macedonia, Serbia and Bosnia and Herzegovina. *Land Use*  
623 *Policy*, 59, 71–83. <https://doi.org/10.1016/j.landusepol.2016.08.019>

624Meinzen-Dick, R. (2014). Property rights and sustainable irrigation: A developing country perspective. *Agricultural*  
625 *Water Management*. <https://doi.org/10.1016/j.agwat.2014.03.017>

626Melnikovová, L., & Havrland, B. (2016). State Ownership of Land in Uzbekistan – an Impediment to Further  
627 Agricultural Growth? *Agricultura Tropica et Subtropica*, 49(1–4), 5–11. [https://doi.org/10.1515/ats-2016-](https://doi.org/10.1515/ats-2016-0001)  
628 0001

629Mukhamedova, N., & Pomfret, · Richard. (2019). Why Does Sharecropping Survive? Agrarian Institutions and  
630 Contract Choice in Kazakhstan and Uzbekistan. *Comparative Economic Studies*.  
631 <https://doi.org/10.1057/s41294-019-00105-z>

632Newman, C., Tarp, F., & Van Den Broeck, K. (2015). Property rights and productivity: The case of joint land titling  
633 in Vietnam. *Land Economics*, 91(1), 91–105. <https://doi.org/10.3368/le.91.1.91>

634Otsuka, K., & Place, F. (2014). *Changes in land tenure and agricultural intensification in sub-Saharan Africa* (No.  
635 2014; 051).

636Park, H. S. (2000). Relationships among attitudes and subjective norms: Testing the theory of reasoned action across  
637 cultures. *Communication Studies*, 51(2), 162–175. <https://doi.org/10.1080/10510970009388516>

638Park, S., & Gupta, S. (2012). Handling Endogenous Regressors by Joint Estimation Using Copulas. *Marketing*  
639 *Science*, 31(4), 567–586.

640Rao, F., Spoor, M., Ma, X., & Shi, X. (2017). Perceived land tenure security in rural Xinjiang, China: The role of  
641 official land documents and trust. *China Economic Review*. <https://doi.org/10.1016/j.chieco.2017.03.009>

642Ringle, C. M., Wende, S., & Becker, J.-M. (2015). *SmartPLS 3*. SmartPLS. <http://www.smartpls.com>

643Satpayev, D. (2014). *Corruption in Kazakhstan and the Quality of Governance* (No. 475; IDE Discussion Papers).

644Schlager, E., & Ostrom, E. (1992). Property-Rights Regimes and Natural Resources: A Conceptual Analysis.  
645 *Source: Land Economics*, 68(3), 249–262. <http://www.jstor.org/stable/3146375>

646Senger, I., Borges, J. A. R., & Machado, J. A. D. (2017). Using the theory of planned behavior to understand the  
647 intention of small farmers in diversifying their agricultural production. *Journal of Rural Studies*, 49(October),  
648 32–40. <https://doi.org/10.1016/j.jrurstud.2016.10.006>

649Simon, H. A. (1956). Rational choice and the structure of the environment. *Psychological Review*, 63(2).  
650 <https://doi.org/10.1037/h0042769>

651Sluis, T. van der, Pedroli, B., Kristensen, S. B. P., Cosor, G. L., & Pavlis, E. (2016). Changing land use intensity in  
652 Europe - recent processes in selected case studies. *Land Use Policy*, 57, 777–785.  
653 <https://doi.org/10.1016/j.landusepol.2014.12.005>

654Triandis, H. C. (1989). The Self and Social Behavior in Differing Cultural Contexts. *Psychological Review*, 96(3),  
655 506–520. <https://doi.org/10.1037/0033-295X.96.3.506>

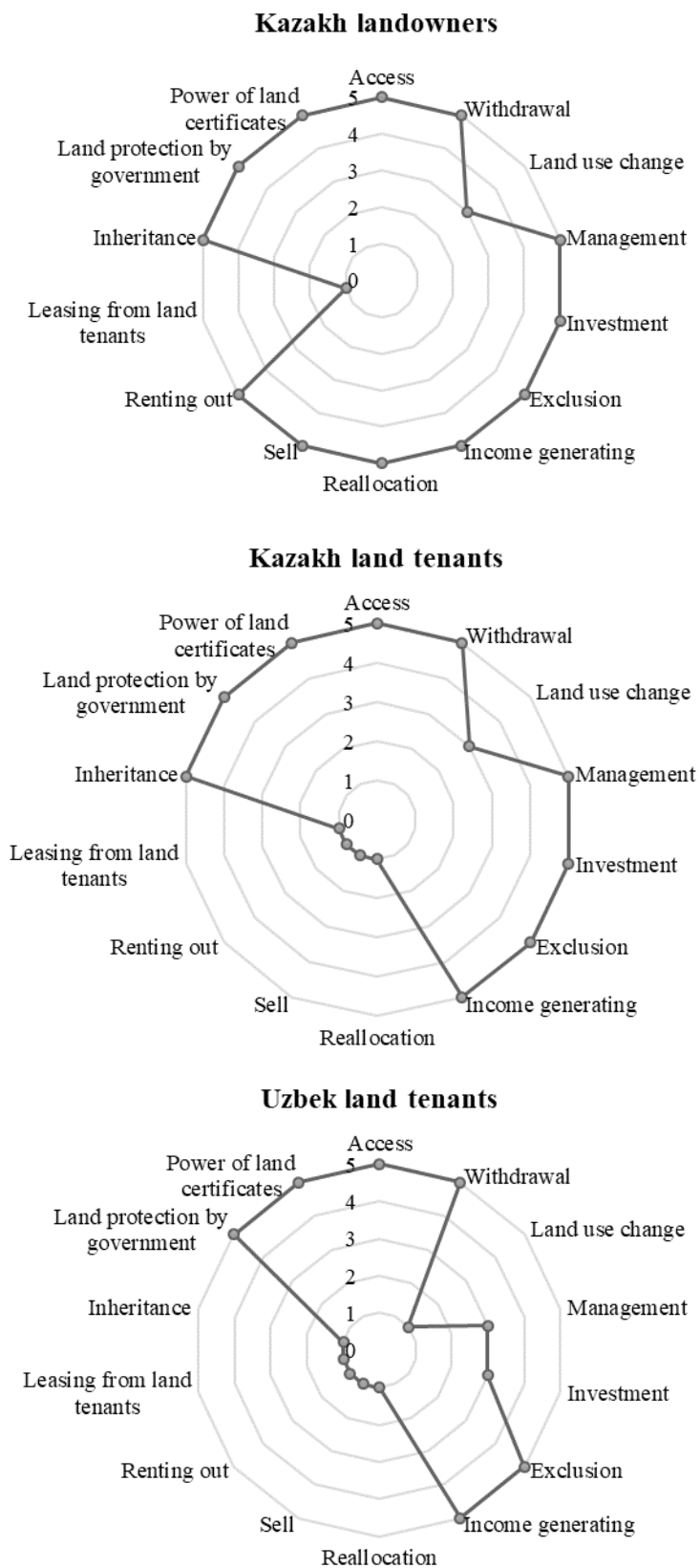
656Twerefou, D. K., Osei-Assibey, E., & Agyire-Tettey, F. (2011). Land tenure security, investments and the  
657 environment in Ghana. *Journal of Development and Agricultural Economics*, 3(6), 261–273.

658Van Gelder, J.-L. (2010). What tenure security? The case for a tripartite view. *Land Use Policy*, 27, 449–456.  
659 <https://doi.org/10.1016/j.landusepol.2009.06.008>

660van Vliet, J., de Groot, H. L. F., Rietveld, P., & Verburg, P. H. (2015). Manifestations and underlying drivers of  
661 agricultural land use change in Europe. *Landscape and Urban Planning*, 133, 24–36.  
662 <https://doi.org/10.1016/J.LANDURBPLAN.2014.09.001>

663Zhillima, E., Viaggi, D., & Muller, D. (2010). Property rights to land and its perception in rural part of central  
664 Albania. *New Medit*, 3, 56–64.

665Zorya, S., Djanibekov, N., & Petrick, M. (2019). *Farm Restructuring in Uzbekistan: How Did It Go and What is*  
666 *Next?* (World Bank Working Papers).  
667



**Figure A.1:** The assessment of land rights using national land codes

671 Source: authors' assessment of the Land Code of Kazakhstan (2003) and the Land Code of Uzbekistan (1998)

**Table A.1:** Cross-country descriptive statistics of perceived land rights and discrepancies between legal and perceived land rights for Kazakh and Uzbek farmers (means with standard deviations)

Land rights	Perceived land rights		Discrepancies		
	Kazakhstan	Uzbekistan		Kazakhstan	Uzbekistan
access	4.89 (0.37)	4.92 (0.43)	positive	0.11 (0.37)	0.09 (0.43)
withdrawal	4.71 (0.56)	2.50 (1.54)	positive	0.29 (0.56)	2.50 (1.54)
use change	4.58 (0.88)	1.47 (0.93)	positive	0.08 (0.36)	—
			violation	1.66 (0.63)	0.47 (0.93)
management	4.74 (0.54)	2.92 (0.75)	positive	0.26 (0.54)	0.28 (0.49)
			violation	—	0.20 (0.45)
investment	4.67 (0.68)	4.29 (1.08)	positive	0.33 (0.68)	0.14 (.49)
			violation	—	1.43 (0.73)
exclusion	4.53 (1.03)	4.53 (1.15)	positive	0.47 (1.03)	0.47 (1.15)
income generating	4.73 (0.58)	1.57 (0.96)	positive	0.27 (0.58)	3.43 (0.96)
reallocation	3.50 (1.69)	1.34 (0.69)	positive	0.067 (1.33)	—
			violation	0.50 (1.14)	0.34 (0.69)
sell	3.68 (1.75)	1.00 (0.07)	positive	0.54 (1.26)	—
			violation	0.55 (1.31)	0.004 (0.07)
rent out	3.86 (1.57)	1.27 (0.54)	positive	0.47 (1.10)	—
			violation	0.66 (1.36)	0.27 (0.54)
lease from land tenants	3.84 (1.48)	1.18 (0.50)	violation	2.84 (1.48)	0.18 (0.50)
inheritance	4.22 (1.35)	1.61 (0.89)	positive	0.78 (1.35)	—
			violation	—	0.61 (0.89)
protection by government	3.57 (0.93)	3.07 (0.65)	positive	1.43 (0.93)	1.93 (0.65)
power of certificates	4.61 (0.85)	4.18 (0.87)	positive	0.39 (0.85)	0.82 (0.87)

*Note:* authors' calculations. Negative discrepancies are named as violations of restrictions and shown as positive numbers for the ease of interpretation.



**680Table A.2:** *Reliability and validity results of reflective constructs*

Constructs	Variables	Kazakh farmers			Uzbek farmers		
		Outer loadings	AVE	Composite reliability	Outer loadings	AVE	Composite reliability
Intention	Int1	0.800	0.677	0.863	0.878	0.724	0.887
	Int2	0.813			0.832		
	Int3	0.855			0.841		
Attitude	Att1	0.818	0.622	0.831	0.923	0.800	0.923
	Att2	0.736			0.831		
	Att3	0.808			0.926		
Subjective norms	SN1	0.752	0.572	0.843	0.934	0.869	0.930
	SN2	0.748			0.931		
	SN3	0.769			-		
	SN4	0.756					
Perceived behavioural control	PBC1	0.855	0.649	0.787	0.809	0.711	0.831
	PBC2	0.753			0.877		

681

682

**683Table A.3:** *Formative constructs outer weights significance testing results*

Indicators	Kazakh farmers			Uzbek farmers		
	Perceived LR	Rights Underuse	Restrictions Violation	Perceived LR	Rights Underuse	Restrictions Violation
Access	0.133*	0.131		-0.128*	-0.191	
Withdrawal	0.415***	0.427***		-0.154**	0.066	
Use change	-0.022	-0.094	0.410***	0.374***		0.337***
Management	0.295***	0.374***		0.094	-0.146	0.205**
Investment	0.128	0.164		-0.321***	-0.198	-0.507***
Exclusion	-0.083	-0.049		-0.286***	-0.489	
Income generating	0.025	0.016		0.051	0.535	
Reallocation	-0.019	0.085	0.020	0.195		0.224*
Sell	-0.092	-0.192	0.362			
Rent out	0.424***	0.206		0.133		0.112
Lease from tenants	0.225*		0.763***	0.114		0.047
Inheritance	-0.228**	0.026		-0.208***		-0.289***
Protection	0.307***	0.412***		-0.118*	-0.102	
Power of certificate	-0.092	-0.046		0.396***	0.467	

684Note: \*, \*\*, \*\*\* indicate significance at the 10%, 5%, 1% levels, respectively.

685

686**Table A.4:**  $f^2$  effect sizes

Relations	Kazakh farmers			Uzbek farmers			
	Basic model (1)	Model with Perceived LR (2)	Model with discrepancies (3)	Basic model (4)	Model with Perceived LR (5)	Model with discrepancies (6)	Model with Perceived LR and Violation (7)
Attitude -> Intention	0.265	0.254	0.256	0.241	0.265	0.318	0.298
SN-> Intention	0.085	0.074	0.071	0.376	0.203	0.172	0.202
PBC-> Intention	0.001	0.000	0.000	0.050	0.024	0.013	0.016
Perceived LR ->Intention		0.001			0.092		0.000
Perceived LR -> Attitude		0.170			0.077		0.048
Perceived LR ->SN		0.278			0.407		0.088
Perceived LR ->PBC		0.117			0.161		0.005
Rights Underuse ->Intention			0.008			0.009	
Rights Underuse -> Attitude			0.083			0.000	
Rights Underuse ->SN			0.143			0.071	
Rights Underuse ->PBC			0.070			0.020	
Restrictions Violation -> Intention			0.001			0.091	0.047
Restrictions Violation -> Attitude			0.014			0.020	0.009
Restrictions Violation ->SN			0.022			0.081	0.000
Restrictions Violation ->PBC			0.012			0.072	0.021

687

688