LAND AND LAND POLICY IN ETHIOPIA IN THE EYES OF ETHIOPIAN FARMERS: AN EMPIRICAL INVESTIGATION

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Abstract

Land policy that provides sufficient tenure security and adequate incentives for land investment, and that promotes sustainable land use and land management practices is fundamental to sustainable agricultural development. Whether or not the current Ethiopian land policy ensures secured tenure, and promotes investment and sustainable land management practices have been a matter of debate among researchers, academics and development practitioners. However, the debate has been polarized between the merits and demerits of private (free hold) on one hand and public (state ownership) on the other. Besides, the debate largely focused on one or another alternative tenure system as a possible blanket recommendation across the country. This study uses a data set from a survey of over 7000 farmers in 7 regions of Ethiopia to determine factors associated with land tenure insecurity of farmers, propensity of farmers to sell land, and farmer preferences for alternative tenure systems. We found that farmer perceptions of tenure security and preferences for alternative tenure arrangements are determined by a complex set of factors and varies by household demographic characteristics, land endowment, wealth, and region. An average household believes that it will be able to cultivate the plots indefinitely in the future in only 54% of the time. Moreover, an average household expects land redistribution to take place with 30% probability. Regarding alternative tenure systems, an average household prefers public ownership with improve security with 53% probability and private ownership with 32% probability. Our results imply that land tenure insecurity is an important issue among Ethiopian farmers and urgent steps are needed to ensure tenure security. Our results also imply that the notion of one-size-fits-all land policy for the whole country needs to be revisited. Moreover, the debate on land tenure and eventually the choice of land tenure policy needs to be based on results of theoretical and empirical investigations and should be broadened beyond the private/public dichotomy.

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1. INTRODUCTION

Land policy that provides sufficient tenure security and adequate incentives for land investment and that promotes sustainable land use and management practices are fundamental to sustainable agricultural development. Secure land tenure[3] is important to encourage land investments, especially investments that have long-term payoff (Gebremedhin and Swinton, 2003; Alemu, 1998). Secure land tenure facilitates reallocation of production factors to improve allocative efficiency, and the development of the off-farm economy. Land tenure security is also important for the development of efficient land markets (Gebremedhin et al., 2003).

Place and Swallow (2000) identify the three dimensions of tenure security as breadth, duration and assurance. While breadth refers to the number and types of rights held, duration and assurance refer to the length of time over which the individual enjoys her rights to land, and the ability of the land holder to exercise her rights, respectively. Hence, the measurement of land tenure security has been challenging due to its multidimensional nature and location specificity. Moreover tenure security may be related to rights on land that may not necessarily be vested in individuals (ibid), implying that the public has the responsibility to improve land tenure security.

There has been a tendency among researchers and policy makers to equate land tenure security with private ownership of the resource. However, tenure security can be assured even in the absence of private title to land, as several of the studies in Africa have provided inconclusive results of the superiority of private ownership over other forms of tenure (Migot-Adholla et al. 1994).

In Ethiopia, the ownership of rural and urban land is, by constitution, vested upon the state and peoples of Ethiopia. Farmers have usufruct rights to land, and cannot sell or mortgage land. Although land leasing is being practiced in the country, regions impose different types of restrictions of the lease market. Hence, the fact that farmers have only usufruct rights to land has sparked a debate among Ethiopian and foreign scholars regarding the effect of the tenure system on land investment and management, factor mobility and the development of the non-farm sector.

In this paper, we investigate the determinants of farmer perceptions of whether the current tenure systems provides them with adequate land, the desirability of the current land tenure system, the duration of time they would enjoy their rights to land,

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[3] Land tenure security is only one of three dimensions of property rights to land, the other two dimensions being exclusivity and transferability (Place and Swallow, 2000).

some aspects of their rights to land, and the determinants of their preferences for alternative tenure systems.

The paper is organized as follows. The next section presents the data and methods of analysis. Section three discusses the results while section four concludes the paper by presenting policy implications.

2. DATA AND METHOD OF ANALYSIS

2.1 Data

Results are based on a data set collected from a survey of 8, 540 farm households in the regions of Tigray, Amhara, Oromia, Somalia, Afar, Southern Nations, Nationalities and Peoples (SNNP) conducted in 2001. Stratified random sampling based on agro-ecology, population density, access to markets and infrastructure, and farming systems was used to select farm households.

Forty-one *woredas* were first selected to represent the agro-ecological variation in the country, with at least one *Woreda* selected from each agro-ecological zone. Two peasant associations were then randomly selected from each selected *Woreda*, based on distance to market town. Sixty-one households were then randomly selected from each selected peasant association, for a total of 5002 households.

Additional 29 *woredas* were selected based on population density, farming systems and market access. Following the same procedure as in the *woredas* selected based on agro-ecology, 3538 additional households were selected. The survey collected information on household characteristics and endowments, land tenure preferences and expectations, crop and livestock production, agricultural extension services, market access and credit services, and off-farm employment opportunities.

2.2 Methods

Econometric analysis was used to identify factors associated with whether farmers believe that they own enough land, whether they view the current tenure system as good or bad, whether farmers believe that they will retain their land holdings for the indefinite future, whether farmers expect future land redistribution, who they perceive is the owner of land (government or themselves), whether they would consider selling their land should the right to sell land be granted, and farmer preferences for

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alternative tenure systems. Binary and polychotomous dependent variables were used for the analysis (Table 1).

The choice of the econometric model depends on the nature of the dependent variable. Hence, we used Probit models for the binary dependent variables and multinomial logit for the polychotomous dependent variable. We computed marginal effects from the Probit co-efficients and base our discussions on the significance and magnitude of these effects.

2. RESULTS AND DISCUSSION

Availability of enough land

Regression results for the determinants of whether or not farmers feel they have enough land is given in Table 2. An average household would perceive having adequate land holding only in 22% of the time. Female headed households are more likely to feel that they have enough land compared to male headed households. This result is consistent with expectations and is perhaps because of the fact that female headed households have smaller family size or have less resources to cultivate land. Households who have higher dependency ratio also are less likely to feel that they have adequate land holding, as expected. Households with higher family size need larger land area to support themselves.

Households with higher land/labor ratio perceive that they have adequate land as expected. These are perhaps households who have been allocated land disproportionately to their family size compared to the rest of the households. Households who have higher per capita income are also more likely to feel that they have adequate land than households who have lower per capita income. On the other hand, households with higher income per adult labor are less likely to perceive that they have adequate land, suggesting that more productive households are more likely to feel land constrained, and that improvement of the land market can result in improved productivity through relaxing this constraint.

Households who live in high population density areas are less likely to have adequate land compared to those in low population density areas. This result is consistent with expectations, since in high population density areas the availability of land per capita should be lower. Oxen and other livestock ownership are associated with the availability of enough land, suggesting that wealthy households are likely to have

enough land, perhaps through the lease market. Land may not be the real constraint to these households.

There are some differences regarding the availability of enough land across regions. Compared to households living in SNNPR, households living in Tigray, Amhara, Oromia are less likely to have adequate land, while households living in Afar, and Somali are more likely to have adequate land. Afar and Somali regions are predominantly pastoral regions and grazing land and not cultivated land may an important constraint in these areas. The fact that households in Tigray, Amhara and Oromia regions are less likely to perceive having adequate land compared to SNNPR , despite the fact that the average land holding in SNNPR is much lower than the national average land holding, indicates that what is actually important is the effective land available and not the land area per se. The SNNPR is an horticulture based intensive agriculture, while Tigray and Amhara are basically cereal based extensive farming systems. The Oromia region can be characterized as a mixture between horticulture based and cereal based farming systems.

Perceptions about current tenure

Regression results of the determinants of farmer perceptions of whether the current land tenure is good or bad are given in Table 3. On average, a household would consider that the current tenure system is good with 61% probability. Male headed households are more likely to view the current tenure system as bad compared to female headed households. This result is consistent with the perception of male headed households not having enough land. The result may also be indicating that land constraint is more important for male headed households. Households with higher dependency ration also consider current tenure system as bad. On the other hand households with higher land/labor ratio have a positive view about the current tenure. Unexpectedly, however, we find that households living in high population density areas view the current tenure system as good. It is not clear why this is so and further research is needed to come up with a plausible economic explanation.[4]

Comparison across regions shows that households living in all regions except Somali, are more likely to view the current tenure as bad compared to those that live in the SNNPR. This is an interesting result since average land holding is much lower in the

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[4] It is possible that there are other, non-economic factors at play such as historical factors that prevailed before the institution of the current tenure arrangement in 1975 (such as the Gebar system) which make people more comfortable with the current system compared with what prevailed then.

SNNPR than in other regions, and households in this region still favor the system. Further research is needed to explain these differences across regions.

Duration of land ownership

Farmers were also asked whether or not they feel that their land holdings will remain with them indefinitely in the future. This question was meant to solicit farmer perceptions of tenure security in terms of duration. Results for the determinants of this perception are given in Table 4. We find that an average household is sure that his/her land holding will remain with him/her with a probability of only 54%. This result suggests that tenure insecurity, at least as measured by duration, is low among the Ethiopian farmers.

We find that households with higher family labor supply have less security, perhaps because of expectations of land redistribution either amongst household members or across households. Similarly, we find households who had their land holding changed more feel less secure with their land holdings, suggesting the effect of the experience of losing once holdings on current tenure security perception. Households who have higher land/labor ratio also feel less secure, since these households should be at higher risk of losing land to redistribution. Households in high population density areas are also less secure, apparently because of higher expectation of redistribution.

While households with higher number of oxen feel less secure, households with higher number of other livestock feel more secure. It is not entirely clear why this is so. However, it could be that the households with higher number of oxen are able to cultivate wider land area, which translates into higher risk of losing land. Comparison across regions shows that households in Tigray, Afar, Amhara, and Oromia are on average less secure than households in the SNNPR, while in Somali are more secure than those in SNNPR. There is no difference in Tenure perceptions between households living in Benshangul and those in SNNPR. Further research in needed to find out why these differences across region exist.

Expectation of Future Land Redistribution

Another measure of tenure insecurity used in the survey was whether or not farmers expect land redistribution to take place in the near future. Results of the determinants of this expectations of farmers are given in Table 4. We find that an average farmer expects land redistribution to take place with 30% probability, reinforcing the finding above that tenure insecurity is a real issue among Ethiopia farmers.

Unexpectedly, we find that population density is negatively associated with expectations of future land redistribution. To the extent that the number of landless households is expected to be higher in high population density areas, expectation of future land redistribution should have been higher in high population density areas. It could be that land holding in high population density areas is so small that it dampens the expectation of future land redistribution. However, this is a tentative hypothesis to explain an unexpected result and further research is needed to confirm it.

Number of oxen owned is also positively associated with expectations of land redistribution. This result is consistent with the finding that duration of ownership of plot is negatively associated with oxen ownership. However, an explanation of why the association occurs is not apparent.

Comparison across regions shows that there is no significant difference in expectations of land redistribution between Tigray and the SNNPR, and Benshangul and the SNNPR. However, households in Afar, Amhara, and Oromia are more likely to expect land redistribution than the SNNPR, while households in Somali are less likely. Interpretations of these differences across regions warrants further research.

Who owns land?

Information was also solicited on farmers' views regarding who they think is the owner of land (household or government). Regression results on the determinants of these views are given in Table 5. An average household believes that land is owned by the government with 96% probability.

Households with higher land/labor ratio are more likely to think that land is owned by the government. Nearness to product markets is also associated with higher likelihood of believing that land is owned by the household. On the other hand, proximity to input markets is associated with higher probability of believing that land is owned by the government. It is not apparent why these market access factors have opposite effects. Ownership of livestock other than oxen is also positively associated with the thinking that land is owned by the government. Comparison across regions reveals that residents of Tigray, Amhara and Oromia are more likely to believe that land is owned by the government compared with those in SNNPR.

Propensity to sell land

One of the justifications given against privatisation of land is the fear that farmers may sell their land and migrate to urban centres, resulting in worse social and economic

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consequences. We investgated the determinants of farmer propensity to sell land if the right to do so is granted. We find that an average farmer has a probability of 8.6% to sell land should the opportunity to do so is available, suggesting that the fear of selling as a justification against privatisation should not be overrated.

Higher family labor supply is associated with higher likelihood of selling land. This result is unexpected. We also find that higher land/labor ratio is associated with higher probability of selling land, since these households have more land compared to their labor supply. Higher per capita income is positively associated with higher likelihood of selling land, perhaps because these households derive significant amount of their income from off-farm sources. On the other hand, higher income per labor force is associated with less likelihood to sell land, as these households may be more land constrained than others.

Households who live in high population density areas are also less likely to sell land than those in low population density areas. This may be because household land holding is already small in such areas. Consistent with expectations, higher oxen ownership reduces likelihood of selling land, while higher livestock ownership other than oxen has the opposite effect. Comparison across regions reveals that households in the regions of Tigray, Amhara, Oromia, and Benshangul are more likely to sell land compared with those in the SNNPR. Households in Somali on the other hand are less likely to sell land compared to the SNNPR. Further research is needed to see why these regional differences occur.

Preferences for alternative tenure arrangements

In order to identify farmer preferences of alternative tenure systems, the survey asked farmers for their first priority alternative tenure system to the current one. Three major responses were obtained: no alternative, public ownership with increased tenure security, and private ownership. We used Multinomial Logit model to identify factors associated with different tenure preferences. We find that an average household prefers private ownership with a probability of 32% and public ownership with improved security with a probability of 53%. An average household is unwilling to reveal preference for alternative tenure with a probability of 15%. It is not clear whether the farmers who abstained from revealing an alternative really prefer the current system to any other alternative, or are unsure of their preferences for any tenure system.

Households with higher family labor supply prefer public ownership with improved security to no alternative, while they are indifferent between private ownership and

public ownership with improved security. Farmers who have experienced a large change in their land holding have preference for private ownership of land over public ownership with improved security, as expected. These are households who have experienced highest loss in their holdings and would have higher preference for secure holding. However, we also find that these same households prefer no alternative to public ownership with improved security.

Farmers who have higher land/labor ratio prefer private ownership to public ownership with improved security. These same households also prefer public ownership with improved security to no alternative. These results show that higher land/labor ratio is clearly associated with the need for more secure tenure. Higher income per labor force is associated with preference for no alternative over public ownership with improved security, but did not matter for preference between private ownership and public ownership with improved security. This result is unexpected especially because high income per labor (higher labor productivity) households appeared more land constrained than lower labor productivity households.

Households in high population density areas prefer private ownership to public ownership with improved security, perhaps because the threat of redistribution may be higher in these areas. However, unexpectedly we also find that households in these areas have preference for no alternative over public ownership with improved security. Higher ownership of livestock other than oxen is also associated with preference for public ownership over no alternative. Ownership of oxen did not affect tenure preference significantly.

Comparison across regions shows that households in Tigray, Afar and Oromia prefer public ownership with improved security over private ownership compared to household in the SNNPR. Households in Somali region prefer private ownership to public ownership with improved security compared to those in SNNPR. There was no difference in preference for private over public with improved security between households in Amhara and the SNNPR. Households in Tigray, Amhara, Oromia, and Benshangul have preference for public ownership with improved security over no alternative compared to those in the SNNPR, whereas households in Somali have preference for no alternative over public ownership with improved security compared to those in the SNNPR. These differences across regions are interesting and further research is needed to corroborate why they occur.

3. CONCLUSION AND IMPLICATIONS

Sufficient tenure security is an important prerequisite for land investment, sustainable land management, and agricultural growth. Whether a given tenure system translates into adequate tenure security of farmers is an empirical question since different tenure systems can have different impact on tenure security perception of farmers. In this paper we have conducted an empirical analysis of the level and determinants of various farmer perceptions of the current Ethiopian land tenure systems and the determinants of farmer preferences for alternative tenure systems.

We find that land tenure insecurity, at least as measured by duration, is an important problem among Ethiopian farmers. An average household believes that it will be able to operate its land holding in the future with only 54% probability (or a 46% probability of losing once holding). The problem of land tenure insecurity is more serious with households who have higher family labor supply, have experienced higher change of land holding in the past, reside in higher population density areas, and possess larger land size relative to their family labor supply. Expectation of future land redistribution is another manifestation of tenure insecurity. An average household expects that land redistribution will take place with 30% probability, a probability level sufficiently high to be an important concern of the current land tenure system. A related issue is farmer perceptions of who they think owns the land. We find that farmers believe that land is under the sole ownership of the government.

Farmers do not also believe that the current system has enabled them to operate adequate land to feed their families; an average household believes that it has adequate land with only 22% probability. Shortage of land is more serious with male-headed households, who have higher labour productivity, and who reside in high population density areas. These results indicate that liberalization and development of the land market may facilitate land transaction, relax the land constraint to those land constrained households but more productive households, and increase production.

In the debate over land tenure and land policy in Ethiopia, one justification often given against privatisation of land is the fear that farmers may sell their land and migrate to urban centres where there would be inadequate employment opportunities, thus resulting in grave social and economic consequences. However, our result shows that farmers' propensity to sell land is very low. An average household is likely to sell its land with only 8.6% probability.

Farmers preferences for alternative tenure systems reveals that households prefer public ownership with improved security with 53% probability, and private ownership with 32% probability. These results imply that it may not be time to go for private ownership of rural land at the moment, although ensuring tenure security is desperately needed. Obviously, private ownership of land is not the only means of ensuring tenure security.

Table 1: Definition and measurement of dependent and independent variables used in the econometric analysis

Variable name	Definition	Measurement
Dependent variables		
Have enough land	Whether farmer believes he/she has enough land	Yes=1/No=0
Current tenure good	Whether farmer thinks current land tenure is good or bad	Yes=1/No=0
Land remains with you in future	Whether land holding remains with farmer in future	Yes=1/No=0
Expect land distribution in future	Whether farmer believes that there will be future land distribution	Yes=1/No=0
Owner of land	Who owns land	Government=1/household =0
Propensity to sell land I	Would you sell your land if allowed	Yes=1/No=0
Have alternative tenure preference	Farmer choice of alternative tenure to current tenure	
Independent variables		
Sex of household head	Sex of household head	Male=1/Female=o
Dependency ratio	Dependency ratio	Numeric
Family labor supply	Family labor supply (working age family members)	Numeric
Change in land holding (ha)	Change in land holding of households since establishment of the household	Numeric
Land/labor ratio	Ratio of current land holding to current family labor	Numeric
Per capita income	Household per capita income	Numeric
Income per labor force	Household income per family labor (Birr)	Numeric
Nearest distance to product market	Distance to product market (km)	Numeric
Nearest distance to input market	Distance to input market (km)	Numeric
Population density	Population density in Woreda (people/km^2)	Numeric
Number of oxen owned by household	Household ownership of oxen at survey time	Numeric
N Number of livestock without oxen	Household ownership of other livestock than oxen at survey time	Numeric
Dummy for Tigray	Region is Tigray (cf. SNNPR)	Tigray=1/Otherwise=0
Dummy for Afar	Region is Afar (cf SNNPR)	Afar=1/Otherwise=0
Dummy for Amhara	Region is Amhara (cf SNNPR)	Amhara=1/Otherwise=0
Dummy for Oromia	Region is Oromia (cf. SNNPR)	Oromia=1/Otherwise=0
Dummy for Somali	Region is Somali (cf. SNNPR)	Somalia=1/Otherwise=0
Dummy for Benshangul	Region is Benshangul (cf. SNNPR)	Benishangl=1/Otherwise =0

Our results imply that the debate on land tenure and land policy in Ethiopia needs to be broadened beyond the public ownership/private ownership dichotomy. Alternative land tenure systems need to be evaluated based on their impact on tenure security of farmers. Moreover, land tenure and land policy should be evaluated periodically in order to identify appropriate modifications to accommodate the changing economic and social conditions in the country.

Table 2: Regression (Probit) results for the determinants of farmer perceptions of their having adequate land

Independent Variables	Coefficient	Marginal effect	Z-stastics (P-value)
Sex of household head (1=M, 0=F)	-0.28686	-0.09019	-4.49 (0.000)***
Dependency ratio	-0.00051	-0.00015	-2.15 (0.032)**
Family labor supply	0.01281	0.00368	1.01 (0.312)
Change in land holding (ha.)	-0.00508	-0.00146	-0.64 (0.525)
Land-labor ratio	0.44658	0.12839	11.11 (0.000)***
Per capita income (br.)	0.00030	0.00009	4.85 (0.000)***
Income per labor force (br.)	-0.00013	-0.00004	-4.19 (0.000)***
Nearest distance for product market (in standard unit)	0.00111	0.00032	0.89 (0.374)
Nearest distance for input market (in standard unit)	-0.00037	-0.00011	-0.34 (0.732)
Population density	-0.0009	-0.0002	-5.68 (-5.68)***
Number of oxen owned by the household	0.03642	0.01047	2.25 (0.024)**
Household livestock unit without oxen	0.03242	0.00993	7.82 (0.000)***
Dummy for Tigray	-0.37408	-0.09321	-4.62 (0.000)***
Dummy for Afar	0.6668	0.0.0196	0.53 (0.596)
Dummy for Amhara	-0.16908	-0.04663	-3.09 (0.002)***
Dummy for Oromia	-0.22188	-0.06325	-4.71 (0.000)***
Dummy for Somali	0.31424	0.10076	0.88 (0.378)
Dummy for Benishangul	-0.0258	-0.0073	0.55 (0.581)
Constant	-0.85357		-9.10 (0.000)***
No. Of observation		7161	
Wald Chi2 (prob>chi2)		588.52 (0.0000)	
Log likelihood		-3437.1848	
Pseudo R2		0.0988	

Note: *** is significant at least at 1%
           ** is significant at least at 5%
           * is significant at least at 10%
Dummy for Region: 'SNNPR' is base variable

Table 3: Regression (Probit) results for the determinants of farmer perceptions of whether current tenure system is good or not

Independent Variables	Coefficient	Marginal effect	Z-stastics (P-value)
Sex of household head (1=M, 0=F)	-0.15866	-0.05907	-2.64 (0.008)***
Dependency ratio	-0.00062	-0.00024	-2.96 (0.003)***
Family labor supply	-0.00387	-0.00147	-0.33 (0.738)
Change in land holding (ha.)	-0.01109	-0.00423	-1.57 (0.116)
Land-labor ratio	0.07463	0.02845	2.33 (0.020)**
Per capita income (br.)	0.00002	6.99e-06	0.45 (0.651)
Income per labor force (br.)	0.00002	9.31e-06	1.01 (0.314)
Nearest distance for product market (in standard unit)	-0.00062	-0.00023	-0.54 (0.588)
Nearest distance for input market (in standard unit)	0.00108	0.00041	1.11 (0.269)
Population density	0.0004	0.00016	-3.16 (0.0025)***
Number of oxen owned by the household	0.00602	0.00229	0.42 (0.671)
Household livestock unit without oxen	0.00917	0.00349	2.34 (0.019)**
Dummy for Tigray	-0.43478	-0.17097	-6.30 (0.000)***
Dummy for Afar	-0.68016	-0.26616	-5.61 (0.000)***
Dummy for Amhara	-0.79201	-0.30717	-15.48 (0.000)***
Dummy for Oromia	-0.69842	-0.26355	-15.6 (0.000)***
Dummy for Somali	0.02037	0.00774	0.13 (0.893)
Dummy for Benishangul	-1.23403	-0.44536	-9.64 (0.000)***
Constant	0.96431		10.94 (0.000)***
No. Of observation	7133		
Wald Chi2 (prob>chi2)	399 (0.0000)		
Log likelihood	-4557.6751		
Pseudo R2	0.0436		

Note: *** is significant at least at 1%

        ** is significant at least at 5%

        * is significant at least at 10%

        Figures in () are p> $|z|$

Dummy for Region: 'SNNPR' is base variable

Table 4: Regression (Probit) results for farmer perceptions of whether current plots will remain with him/her in the future

Independent Variables	Coefficient	Marginal effect	Z-stastics (P-value)
Sex of household head (1=M, 0=F)	-0.06398	-0.02532	-1.10 (0.271)
Dependency ratio	-0.00009	-0.00003	-0.42 (0.673)
Family labor supply	-0.02433	-0.00966	-2.16 (0.031)**
Change in land holding (ha.)	-0.03079	-0.01222	-3.76 (0.000)***
Land-labor ratio	-0.10844	-0.04305	-3.49 (0.000)***
Per capita income (br.)	6.86e-06	2.72e-06	0.18 (0.858)
Income per labor force (br.)	-3.57e-06	-1.42e-06	-0.15 (0.879)
Nearest distance for product market (in standard unit)	-0.00159	-0.00063	-1.50 (0.133)
Nearest distance for input market (in standard unit)	-0.00016	-0.00006	-0.17 (0.863)
Population density	-0.0003	-0.0001	-2.34 (0.019)**
Number of oxen owned by the household	-0.03449	-0.01369	-2.43 (0.015)**
Household livestock unit without oxen	0.01059	0.0042	2.76 (0.006)***
Dummy for Tigray	-0.41991	-0.16576	-6.34 (0.000)***
Dummy for Afar	-0.27319	-0.10860	-2.35 (0.019)**
Dummy for Amhara	-0.84611	-0.32446	-17.09 (0.000)***
Dummy for Oromia	-0.25315	-0.10033	-6.01 (0.000)***
Dummy for Somali	0.34269	0.13136	2.42 (0.015)**
Dummy for Benishangul	0.0286	-0.0114	-0.22 (0.825)
Cool semi-arid mid highland (DRE1)	0.65647		7.69 (0.000)***
Constant	0.6565		7.69 (0.000)***
No. Of observation	7164		
Wald Chi2 (prob>chi2)	425.64 (0.0000)		
Log likelihood	-4720.7911		
Pseudo R2	0.0451		

Note: *** is significant at least at 1%
        ** is significant at least at 5%
        * is significant at least at 10%
      Figures in () are p>|z|
Dummy for Region: 'SNNPR' is base variable

Table 5: Regression (Probit) results for farmer expectations of whether land redistribution would take place

Independent Variables	Coefficient	Marginal effect	Z-stastics (P-value)
Sex of household head (1=M, 0=F)	0.08712	0.02923	1.40 (0.162)
Dependency ratio	0.00011	0.00004	0.51 (0.607)
Family labor supply	0.01554	0.00532	1.31 (0.190)
Change in land holding (ha.)	-0.00096	-0.00033	-0.13 (0.805)
Land-labor ratio	0.03757	0.01287	1.16 (0.245)
Per capita income (br.)	-0.00004	-0.00001	-0.86 (0.389)
Income per labor force (br.)	-0.00003	-0.00001	-1.39 (0.165)
Nearest distance for product market (in standard unit)	0.00080	0.00028	0.75 (0.453)
Nearest distance for input market (in standard unit)	0.00108	0.00037	1.18 (0.239)
Population density	-0.0007	-0.0002	-5.23 (0.000)***
Number of oxen owned by the household	0.05708	0.01956	3.83 (0.000)***
Household livestock unit without oxen	0.00698	0.0014	1.07 (0.283)
Dummy for Tigray	-0.00253	-0.00087	-0.03 (0.973)
Dummy for Afar	0.39321	0.14589	3.25 (0.001)***
Dummy for Amhara	0.20471	0.07227	3.93 (0.000)***
Dummy for Oromia	0.32416	0.11160	7.24 (0.000)***
Dummy for Somali	-0.49103	-0.14289	-2.96 (0.003)***
Dummy for Benishangul	0.7367	0.28221	5.82 (0.000)***
Constant	-1.02396	-	-11.19 (0.000)***
No. Of observation	7159		
Wald Chi2 (prob>chi2)	226.70 (0.0000)		
Log likelihood	-4227.7034		
Pseudo R2	0.0272		

Note: *** is significant at least at 1%

   ** is significant at least at 5%

   * is significant at least at 10%

Figures in () are p> $|z|$

Dummy for Region: 'SNNPR' is base variable

Table 6: Regression (Probit) results for farmer perceptions of who owns land (government or household)

Independent Variables	Coefficient	Marginal effect	Z-stastics (P-value)
Sex of household head (1=M, 0=F)	0.08430	0.00719	0.82 (0.412)
Dependency ratio	-0.00008	-6.23e-06	-0.20 (0.845)
Family labor supply	-0.00795	-0.00064	-0.39 (0.700)
Change in land holding (ha.)	0.02288	0.00183	1.35 (0.176)
Land-labor ratio	0.17930	0.01434	2.29 (0.022)**
Per capita income (br.)	-0.00003	-2.48e-06	-0.48 (0.631)
Income per labor force (br.)	8.02e-06	6.42e-06	0.18 (0.860)
Nearest distance for product market (in standard unit)	-0.00354	-0.00028	-3.11 (0.002)***
Nearest distance for input market (in standard unit)	0.00327	0.00026	2.81 (0.005)***
Population density	0.0003	0.00002	1.46 (0.145)
Number of oxen owned by the household	-0.0365713	-0.00293	-1.43 (0.153)
Household livestock unit without oxen	0.02112	0.00168	2.69 (0.007)***
Dummy for Tigray	0.43914	0.02514	3.57 (0.000)***
Dummy for Afar	0.32701	0.01987	1.46 (0.145)
Dummy for Amhara	0.7281	0.04174	7.58 (0.000)***
Dummy for Oromia	0.36217	0.02867	5.41 (0.000)***
Dummy for Somali	0.32262	0.01949	1.23 (0.218)
Dummy for Benishangul	-	-	-
Constant	1.25219		8.09 (0.000)***
No. Of observation	6972		
Wald Chi2 (prob>chi2)	98.85 (0.0000)		
Log likelihood	-1168.2135		
Pseudo R2	0.0422		

Dummy for Benishangul region dropped since it predicts perfectly.

Note: *** is significant at least at 1%

        ** is significant at least at 5%

         * is significant at least at 10%

          Figures in () are p> |z |

Dummy for Region: 'SNNPR' is base variable

Table 7: Regression (Probit) results for farmer propensity to sell land

Independent Variables	Coefficient	Marginal effect	Z-stastics (P-value)
Sex of household head (1=M, 0=F)	0.03544	0.00522	0.42 (0.674)
Dependency ratio	-0.00015	-0.00002	-0.49 (0.626)
Family labor supply	0.02612	0.00394	1.73 (0.083)*
Change in land holding (ha.)	0.00860	0.00129	1.07 (0.286)
Land-labor ratio	0.19119	0.02880	4.43 (0.000)***
Per capita income (br.)	0.00016	0.00002	2.98 (0.003)***
Income per labor force (br.)	-0.00012	-0.00002	-2.56 (0.011)**
Nearest distance for product market (in standard unit)	-0.00099	-0.00015	-0.72 (0.475)
Nearest distance for input market (in standard unit)	0.00056	0.00009	0.49 (0.626)
Population density	0.0006	0.00009	3.30 (0.001)***
Number of oxen owned by the household	-0.04271	-0.0064	-1.57 (0.116)
Household livestock unit without oxen	0.01054	0.00159	2.02 (0.043)**
Dummy for Tigray	0.39184	0.07382	4.24 (0.000)***
Dummy for Afar	-0.26641	-0.03356	-1.34 (0.180)
Dummy for Amhara	0.17452	0.02821	2.32 (0.021)**
Dummy for Oromia	0.25212	0.03867	3.93 (0.000)***
Dummy for Somali	-0.8837	-0.07167	-2.33 (0.020)**
Dummy for Benishangul	0.62088	0.13640	4.22 (0.000)***
Constant	-1.73224	-	-13.86 (0.000)***
No. Of observation	7138		
Wald Chi2 (prob>chi2)	86.25 (0.0000)		
Log likelihood	-2049.8524		
Pseudo R2	0.0257		

Note: *** is significant at least at 1%

       ** is significant at least at 5%

       * is significant at least at 10%

       Figures in () are p> |z |

Dummy for Region: 'SNNPR' is base variable

Table 8: Regression (Multinomial Logit) results for farmer preferences of alternative tenure systems

Independent Variables	Outcome 1(no alternative)	Outcome 2 (Private ownership)
	Coefficient (z-statistics)	Coefficient (z-statistics)
Sex of household head (1=M, 0=F)	0.04519 (0.33)	-0.04444 (-0.43)
Dependency ratio	-0.00041 (-0.82)	-0.00002 (-0.05)
Family labor supply	-0.06488 (-2.33)**	0.02079 (1.05)
Change in land holding (ha.)	0.06137 (3.37)***	0.04437 (3.19)***
Land-labor ratio	-0.48663 (-4.37)***	0.17194 (3.24)***
Per capita income (br.)	-0.00008 (-0.74)	0.00006 (0.86)
Income per labor force (br.)	0.00014 (2.18)**	0.00003 (0.83)
Nearest distance for product market (in standard unit)	-0.00067 (-0.25)	-0.00141 (-0.77)
Nearest distance for input market (in standard unit)	-0.00038 (-0.18)	-0.00189 (-1.20)
Population density	0.0014 (4.68)***	0.0019 (8.81)***
Number of oxen owned by the household	0.02012 (0.63)	-0.02210 (-0.86)
Household livestock unit without oxen	-0.02818 (-2.81)***	-0.00046 (-0.07)
Dummy for Tigray	-1.01771 (-6.07)***	-0.77258 (-6.12)***
Dummy for Afar	-0.3262 (-1.31)	-1.43927 (-5.31)***
Dummy for Amhara	-0.47001 (-4.22)***	0.11861 (1.40)
Dummy for Oromia	-0.55547 (-5.89)***	-0.23774 (-3.23)***
Dummy for Somali	3.30108 (7.73)***	2.03676 (4.91)***
Dummy for Benishangul	-34.31481 (-226.66)***	-0.32377 (-1.55)
Constant	-0.38769 (-1.92)*	-0.40956 (-2.74)***
No. Of observation	7190	
Wald Chi2 (prob>chi2)	92372 (0.0000)	
Log likelihood	-6827.3633	
Pseudo R2	0.0358	

Outcome 3 (Public ownership with improved security) is comparison base.
Note: *** is significant at least at 1%
 ** is significant at least at 5%
 * is significant at least at 10%
Dummy for Region: 'SNNPR' is base variable