Impacts of Land Redistribution on Land Management and Productivity in the Ethiopian Highlands

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ABSTRACT: The increasing problem of landlessness in Ethiopia has put pressure on regional governments to redistribute land. In 1997 and 1998, a major land redistribution was undertaken in the Amhara region, reducing landlessness where implemented. While the impacts of such redistributions have been hotly debated, little empirical evidence exists concerning the actual impacts of this redistribution. We find that the recent land redistribution in Amhara has had a positive impact on land productivity, by increasing access to land of farmers who are more interested or able to use purchased inputs such as fertilizer and improved seeds. Our results, however, do not show much effect of the recent land redistribution or expectations of future redistribution on land improvement and management. Thus, to the extent that investment in land improvement are necessary for conservation purposes, it appears that the policy change to stop redistributions is unlikely to have a substantial impact on reducing land degradation in this region of Ethiopia.

Paper to be presented at the Contributed Paper Session
Annual AAEA Meeting
Chicago, IL
August 5-8, 2001

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The authors wish to acknowledge the Norwegian Ministry of Foreign Affairs for funding support.

1. Introduction

When the military government (Derg) took power in Ethiopia in 1974, it ended all forms of tenancy, nationalized all rural lands, and redistributed land to the tillers. However, individual land rights were restricted (i.e., land sales, leasing, inheritance or use as collateral were prohibited) and land redistribution by the government was established as the only means to improve access to land and reduce landlessness. Since the fall of the military government in 1991, the new Ethiopian government has allowed land leasing and inheritance (subject to restrictions) but the prohibition on land sales has continued, codified in the new constitution. The increasing problem of landlessness has put pressure on regional governments to again redistribute land. In 1997 and 1998, the Amhara regional government implemented a major land redistribution. While the impacts of such redistributions have been hotly debated in Ethiopia and elsewhere, little empirical evidence has been available concerning the actual impacts of this redistribution, however.

Although redistribution has been undertaken to accommodate newly-formed and landless households and also to equalize land quality, it is argued that redistribution erodes tenure security and that farmers will not undertake land-improving investments since they may not be able to claim fully the returns on their investment. Thus, to the extent that investments in land are required for conservative purposes and to increase productivity, land redistribution will further promote land degradation and reduce farm output. Currently, the Amhara regional government is considering a land policy that will end land redistributions. A critical question then is whether abolishing land redistribution will improve investments in land that will in turn reduce land degradation and increase productivity.

In this paper, we present evidence and policy implications on the impacts of the recent land redistribution in Amhara region, based on analysis of a community-level survey conducted in 98 villages (*gots*) in the highlands[1] of the region in 2000. The *gots* were selected based on a random stratified sampling of 49 Peasant Associations (PAs), each usually consisting of three

[1] Highlands are defined as those areas above 1500 m.a.s.l..

to four villages. The stratification was based on district (*woreda*) level secondary information of indicators of agricultural potential, market access, population density and presence of irrigation. Two villages were randomly selected from each sample PA. Figure 1 shows the stratification and details of information used in the stratification. A semi-structured questionnaire was administered using group interviews at both PA and village level, and each interview involved 10 respondents chosen to represent different age groups, primary occupations, genders and in the PA-level survey, different villages. The survey collected information about changes in agricultural and land management practices between 1991 and 1999, and their causes and effects.

The next section of this paper examines the institution of land redistribution in Ethiopia and the Amhara region. The conceptual framework for examining the impacts of land redistribution and hypotheses are presented in section 3. In section 4, we present the empirical approach, results and discussion. Conclusions and policy implications are presented in section 5.

2. Land redistribution

Land redistribution has been utilized in many developing countries, often as part of land reform in the wake of social and political revolution. Sometimes, however, land redistribution is utilized as a deliberate policy instrument to capture the efficiency benefits of the family farm, decrease urban food prices and reduce poverty (Prosterman and Riedinger, 1987). The 1974 redistributive land reform in Ethiopia shared many similar attributes (e.g., restricting land sales and other transfers in rural areas to ensure that the farmers remained beneficiaries of the land) to Land-to-the-Tiller programs implemented in other countries (e.g., Philippines in 1972). The main difference between Ethiopia's case and the others is that redistribution of farmland was undertaken regularly (in many cases as often as every 1-2 years during the Derg regime; Fistum *et al*., 1999) to reduce landlessness and to equalize land quality. Local administrations, known as Peasant Associations, were set up and charged with the responsibility of redistribution.

After the fall of the Derg in 1991, the new government constitutionalized state ownership of all rural lands. The new constitution, drawn in 1994, however, allows temporary leases and guarantees the rights of peasants of free access to land and the right to improvements they make on land including the right to bequeath, transfer, remove or claim compensation for such improvements when the right to use the land expires. In principle, farmers now have the right to use the land indefinitely, lease it out temporarily to other farmers, and transfer it only to their children. However, they still cannot sell or mortgage their lands. Although the constitution has resolved some issues, it seems to create other ambiguities and does not address some important issues (Fistum *et al*., 1999). For example, given land scarcity, it is not clear how farmers' rights of free access to land can be assured in practice, and how much land they are entitled to.[2] The regional governments have been charged to resolve those issues and there have been significant differences across the regions with respect to development of a regional land policy and redistribution of land.

For example, in the Tigray region, land redistribution was stopped in 1991, and the policy of no future redistribution was made official by a new land policy in 1997. In the Oromiya region too, there has not been a redistribution for more than 10 years (Bezuayehu *et al*., 2000), although the regional government has not made any official statement about abandoning it.

In the Amhara region, however, land redistribution has been very common, with a recent and major one undertaken in 1997/98. Although there is no regional land policy per se, administration and use of land in the region have been guided by the provisions made in the national constitution. In 2000, the regional government passed a land policy document that will determine the administration and use of rural land in the region. The document is yet to be made public or proclaimed, however. The provisions in the that document are similar to those provided in the national constitution, including: the right of peasant's to free and indefinite use of land, transfer to dependents, consolidate holdings and rent out; right to use,

[2] In principle, females and males are entitled to farmland when they reach the ages of 18 and 21, respectively, and the maximum allowable holding is set at 10 hectares.

sell, exchange or transfer the wealth cultivated on their land; but not the right to sell or exchange the land. Other important issues such as registration of the timing and limitations of renting out land, maximum land holding and plot size to be used for rain-fed and irrigated agriculture has been relegated to by-laws that will be decided in the future. On the issue of redistribution, the draft document states:

> So long as giving a land free to farmers is maintained, land redistribution shall not be effective unless otherwise the land division does not affect the productive capacity required by the community and unless decided by law (ANRSC, 2000: section 3, article 10).

Although the document is yet to be proclaimed, the above statement suggests that land redistribution in the future is not completely ruled out.

Examining the incidence of land redistribution in the Amhara region, the survey conducted in the region shows that every community has experienced at least one redistribution since 1974, and nearly half have had a land redistribution since 1991, mainly in the recent redistribution in 1997 and 1998. The average number of land redistributions is three, with one village experiencing as many as fourteen since 1974. About four-fifths of the communities expect a redistribution in the future; most within the next few years. Informal discussions with some of the farmers in the region revealed that although they do not fully support land redistribution, it is seen as a necessary tool by which landless farmers gain access to farmland, especially since land sales are prohibited and other transfers are restricted. In the next section, we examine the conceptual framework for analyzing the impact of land redistribution.

3. Conceptual framework and hypotheses

The conceptual framework and hypotheses about how land redistribution may influence land-improving investments, land management, input use, and productivity draw from the literature on property rights and investment incentives (Barrows and Roth, 1990; Migot-Adholla et al., 1991; Feder and Feeny, 1993; Place and Hazell, 1993; Besley, 1995; Gavian and Fafchamps, 1996; Quisumbing *et al*., 1999; Pender and Kerr, 1999; Place and Swallow,

2000). Although land redistributions cause tenure insecurity, they may have mixed impacts on farmers' land management and productivity, through short and long term effects of redistribution. On one hand, expectations of land redistribution may undermine farmers' incentive to invest in land improvements and soil fertility, since farmers' ability to reap the benefits of such investments are undermined (Feder and Feeny, 1993). On the other hand, redistribution may improve access to land of households that have relative surpluses of other important factors of production, such as labor, oxen or cash to purchase inputs, particularly in the context of prohibited land sales and restricted lease markets as exist in Ethiopia. Therefore, land redistribution may increase input intensity, which may in turn increase productivity. Furthermore, the threat of redistribution may encourage farmers to invest if investments reduce the perceived likelihood of losing access to a given piece of land (Snyder, 1996; Quisumbing *et al*., 1999). Thus, land redistribution may either increase or decrease investments in land improvement, the intensity of land management, use of purchased inputs and productivity.

4. Econometric approach and results

Econometric analysis was used to investigate the effects of recent (since 1991) land redistributions and expectations of future redistribution on: 1) farmers' land investments (construction of stone terraces, soil bunds, check dams, drainage ditches and canals; and planting of trees, live barriers and grass strips); 2) farmers' land management practices (use of burning to prepare fields, fallow, improved fallow, crop rotation, intercropping, contour plowing, mulching, manuring, composting, plowing in crop residues, green manuring and minimum tillage); 3) farmers' use of purchased inputs (fertilizer, pesticides, herbicides and improved seeds); and 4) crop yields (barley, wheat and teff). The analysis incorporated other factors expected to affect these responses and outcomes, including indicators of agricultural potential, access to markets, population density, and presence of irrigation, technical assistance and credit programs.

We estimate the econometric model given by

1) $$y_i = a + b_1 x_i^1 + b_2 x_i^2 + cz_i + e_i$$

Where y_i is the proportion of farmers in village i that have invested in land conservation and improvement, undertaken land management practice or used purchased inputs in 1999 or y_i is the average crop yield in village i in 1999; x^1_i is a dummy variable equal to one if there was a land redistribution in village i in 1997 or 1998; x^2_i is a dummy variable equal to one if land redistribution is expected in village i in the future; z_i is a vector of observed factors that affect y; and e are unobserved factors that affect y.

The problem with the land investment and management and input use dependent variables is that they are censored, since they are based on proportions data. For example, if the proportion of households using fertilizer was either 0 or 1, then the dependent variable was left or right censored, respectively. The yield variable is also left censored, as a few of the communities reported zero yields due to crop failure or that a particular crop (especially for improved varieties) was not cultivated. We, therefore, used a maximum likelihood censored regression model (or "two-limit tobit model") to estimate the model specified in equation 1, taking into account both left and right censoring and correcting for sampling weights and stratification.

Results

We present only the results in which the overall estimated model was statistically significant at the 10% level of significance. These are presented in Tables 1 and 2.

Investments in land conservation and improvement

With the exception of stone terraces, nurseries and drainage ditches (i.e., three out of twelve investment structures; see Table1), we find that the recent land redistributions in 1997 or 1998 have a statistically insignificant and usually quantitatively small association with land investments in 1999. The positive association with investment in drainage ditches may indicate their relative lower risks of investment compared to the others, such as stone terraces, canals and live fences. The positive association with nurseries (especially trees), on the other hand, may indicate a response to the increased demand for tree seedlings following

the distribution of wastelands on hillsides by the regional government to individuals and groups in 1999 for private tree planting and agroforestry. Furthermore, it may be that younger farmers who gain access through redistribution are more educated and inclined to respond to the need to rehabilitate degraded areas. The negative association with stone terraces may indicate the shortage of cropland as a result of diminishing plot size following redistribution. This supports the finding of (Bekele and Holden, 1998) where farmers were found to dismantle physical conservation structures on their plots in order to increase cultivable area. Some physical conservation structures were found to take about 16% of land out of production (ibid.). We also find that expectations of a future redistribution have a negative association with construction of irrigation canals (see Table 1). Although the presence of irrigation necessitates the construction of irrigation canals, the threat of redistribution undermines the incentive of farmers to undertake the investment to fully utilize the benefits irrigation facilities.

Therefore, the impacts of redistribution on reducing land degradation are mixed, and also depend upon expectations about the future, as we find that respondents' expectations about future redistribution are higher where there has been a recent redistribution.[3] Thus, while there are positive effects of the recent redistribution by allocating land to people who are more educated and willing to invest, the diminishing plot sizes leads to disinvestments (dismantling of stone terraces), by older farmers who lost some land or younger farmers with limited holdings seeking to increase cultivable area. Expectations about future redistribution erode tenure security and reduce the incentives to invest, even where the short-term benefits may be enormous so that the costs of investment can be recovered in relatively short period. Generally, other factors such as the biophysical potential of the land and the presence of irrigation are more important determinants of land investments.

[3] We estimated the a logit model of expecting a land redistribution in future as a function of recent redistribution (with a positive and significant coefficient), number of redistributions in the past (negative), population density (positive), proportion of landless households (positive and significant), and proportion of households that have their land registered (negative).

Land management practices

Similar to land investments, we find that the recent land redistributions or expectations of a future redistribution have a statistically insignificant and usually quantitatively small association with land management practices in 1999. The only exception to this is a negative association between future expectation of redistribution and practicing contour plowing in 1999 (see Table 1). To conserve soil and moisture on steep slopes, it is recommended to plow along the contour, which is a very laborious and time-consuming activity. Therefore, the threat of redistribution undermines the incentive of farmers to engage in the practice, and they may switch to the more easy and time-saving (but erosive) practice of plowing up and down the slope. Here too, other factors such as the biophysical potential of the land and the presence of irrigation are much more important determinants of land management practices

Use of purchased inputs

In contrast to the limited impacts on land investment and management practices, increased use of purchased inputs (fertilizer, pesticides, herbicides and improved seeds) in 1999 is strongly associated with recent land redistribution in 1997 or 1998 (see Tables 2). It might be hypothesized that this is because the government extension program focused more attention on areas where the land redistribution occurred. However, we find a negative and relatively small correlation between the presence of extension and credit programs and where land redistribution has occurred. Thus, it appears that land redistribution has contributed to greater input intensity by increasing access to land among households with greater proclivity or ability to use inputs. This may be because the younger farmers who gain access through redistribution are more educated or have access to off-farm sources of income with which to finance input purchases.

Cereal yields

Consistent with the positive impacts of land redistribution on input use, we also find that yields of barley, wheat and teff in 1999 are higher in communities where there has been a recent redistribution (see Table 3). Yields of local varieties of these crops are about 400 kg.

per hectare higher and yields of improved wheat are about 600 kg. per hectare higher where there has been a recent redistribution.

5. Conclusions and implications

Overall, these results suggest that the recent land redistribution in Amhara has had a positive impact on land productivity, at least in the near term, by increasing access to land of farmers who are more interested or able to use purchased inputs such as fertilizer and improved seeds. This does not mean that land redistribution must be continued and used as a tool to improve access to land, as the longer-term impacts of such redistributions depend upon how these may affect farmers' perceptions of tenure security and incentives to invest in land improvement. Except for reduction in investments in stone terraces, we do not find much evidence that land redistribution has undermined land-improving investments. Redistribution also has increased farmers' sense of tenure security in some places by reducing the problem of landlessness. It has also increased investment in tree nurseries, by increasing access to land of farmers who are more educated and willing to respond to the need to rehabilitate degraded areas earmarked for tree planting and agroforestry. Nevertheless, it is difficult to continue to use redistribution as a tool to address landlessness because of the very small size of farm holdings in the Ethiopian highlands. In addition, we find that expectations of a future redistribution have a negative association with the construction of irrigation canals, as the threat of redistribution undermines the incentive of farmers to undertake the investment to fully utilize the benefits irrigation facilities, even thought the short-term benefits may be enormous to outweigh the costs of investment within a relatively short period.

Improving access to farmland through development of land rental markets may present a more sustainable strategy to improving agricultural productivity. However, this development may be undermined by continued reliance on land redistribution as a means of allocation. To the extent that renting out a piece of land signals the inability of the owner to farm that piece of land and making it prone to be redistributed by the government, stopping redistribution may increase the scope of the existing informal land-rental markets in the region.

For the most part, however, our results do not show much effect of the recent land redistribution or expectations of future redistribution on land improvement. In addition, almost all farmers expect future redistributions. Although the regional government is considering a policy that may end land redistributions, we find that respondents' expectations of future redistributions are also significantly affected by landlessness. Thus, to the extent that investments in land improvement are necessary for conservation purposes, it appears that as long as landlessness is prevalent, the intended policy change to end redistributions is unlikely to have a substantial impact on reducing land degradation in this region of Ethiopia. Given that other factors such as the presence of irrigation and extension and credit programs were more important determinants of land investment and management, those other factors may present better strategies for reducing land degradation in the Ethiopian highlands.

References

Amhara National Regional State Council (ANRSC). 2000. The administration and use of rural land in Amhara region. *Draft policy document.* Bahir Dar, Ethiopia.

Barrows, R. and Roth, M. 1990. Land tenure and investment in African Agriculture: Theory and practice. *Journal of Modern African Studies* 28(2):265-297.

Bekele Shiferaw and Holden, S. 1998. Resource degradation and adoption of land conservation technologies in the Ethiopian highlands: A case study in Andit Tid, North Shewa. *Agricultural Economics* 18:233-247.

Besley, T. 1995. Property rights and investment incentives: Theory and evidence from Ghana. *Journal of Political Economy* 103(5):913-937.

Feder, G. and Feeny, D. 1993. The theory of land tenure and property rights. In Hoff, K., Braverman, A., and Stiglitz, J.E. (Eds.) *The economics of rural organization: Theory, practice and policy*. Washington, D.C.: The World Bank.

Fistum Hagos, Pender, J., and Nega Gebreselassie. 1999. Land degradation in the highlands of Tigray and strategies for sustainable land management. Socioeconomic and Policy Research Working Paper No. 25. Addis Ababa, Ethiopia: The International Livestock Research Institute.

Gavian, S. and Fafchamps, M. 1996. Land tenure and allocative efficiency in Niger. *American Journal of Agricultural Economics* 78(2):460-471.

Migot-Adholla, S.E., Hazell, P., Blarel, B., and Place, F. 1991. Indigenous land rights systems in sub-Saharan Africa: A constraint on productivity? *World Bank Economic Review* 5(1):155-175.

Pender, J. and Kerr, J. 1999. The effect of land sales restrictions: Evidence from south India. *Agricultural Economics* 21:279-294.

Place, F. and Hazell, P. 1993. Productivity effects of indigenous land tenure systems in sub-Saharan Africa. *American Journal of Agricultural Economics* 74(3):360-373.

Place, F. and Swallow, B. 2000. Assessing the relationships between property rights and technology adoption in smallholder agriculture: A review of issues and empirical methods. CAPRi Working Paper No. 2.

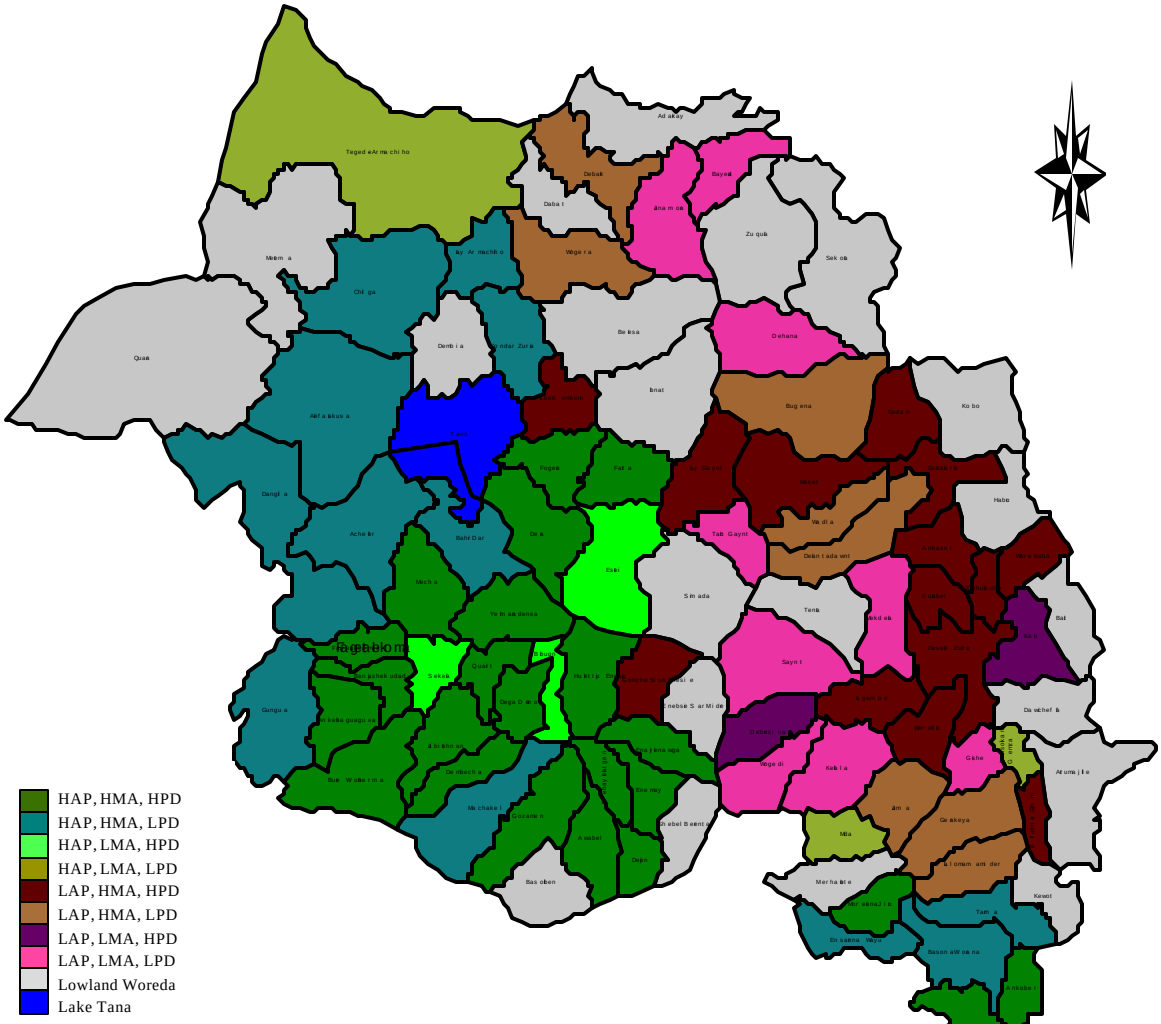
Prosterman, R.L. and Riedinger, J.M. 1987. Land reform and democratic development. Baltimore, MD.: John Hopkins University Press.

Quisumbing, A.R., Payongayong, E., Aidoo, J.B., and Otsuka, K. 1999. Women's land rights in the transition to individualized ownership: Implications for the management of tree resources in Western Ghana. Food Consumption and Nutrition Department Discussion Paper No. 58. Washington, D.C.: International Food Policy Research Institute.

Snyder, K.A. 1996. Agrarian change and land use strategies among Iraqw farmers in Northern Tanzania. *Human Ecology* 24(3):315-340.

Bezuayehu Tefera, Gezahen Ayele, Yigezu Atnafe, Paulos Dubale, and Jabbar, M.A. 2000. Nature and causes of land degradation in the Oromiya region: A review of literature. Paper presented at the workshop on Policies for Sustainable Land Management in the Highlands of Ethiopia, May 22-23, 2000, International Livestock Research Institute, Addis Ababa, Ethiopia.

Figure 1. Classification of the Highlands of Amhara Region



Lowland Woredas are those with more than 50% of their total land area classified as *Kolla*, which is traditionally estimated at 500-1500 meters above sea level. Source of area data: Bureau of Agriculture, Basic Agricultural Data, Bahir Dar, 1999.

Agriculture Potential is based on Disaster Prevention and Preparedness Committee's (DPPC) classification of the region into drought-prone vs. non drought-prone Woredas. *High Agriculture Potential* (HAP) refers to non-drought prone and *Low Agriculture Potential* (LAP) refers to drought prone.

Market Access is defined by the condition of the road (all weather vs. dry weather) that passes through and links Woreda towns. *High Market Access* (HMA) implies all weather road and *Low Market Access* (LMA) implies dry or seasonal weather road. Source of road condition data: Ethiopian Map Authority, 1994. Ethiopia tourist map. Addis Ababa, Ethiopia.

Population Density is defined by the 1994 rural population/km^2 of total land area. *High Population Density* (HPD) is greater than 100 persons/km^2 and *Low Population Density* (LPD) is less than or equal to 100 persons/km^2. Source of data: Bureau of Planning and Economic Development. 1998. Statistical bulletin for the year 1993/94-1996/97, Bahr Dar, Ethiopia.

Map produced by Land Use and Regulatory Team, Bureau of Agriculture, Bahir Dar, Ethiopia.

Table 1. Regression results of the impact of land redistribution on proportion of households investing in land conservation and improvement since 1991 and practicing land management in 1999 in the highlands of Amhara region

Explanatory variable	Stone terrace	Drainage ditch	Canal	Nursery	Crop rotation	Contour plowing
Land redistribution in 1997 or 1998	-0.3918*	0.9291*	-0.4111	0.6135***	-0.0141	-1.3722
Expectation of future land redistribution	-0.3111	0.8941	-0.3407***	0.0869	-0.0566	-6.6091***
High agricultural potential[a]	-0.2162*	0.9059***	0.2272	-0.0139	0.6753*	1.7492
Altitude (m.a.s.l)	0.0001	0.0005	-0.0002	0.0008***	-0.0011**	0.0018*
Presence of irrigation in 1999	-0.1319	-0.5257	2.4096***	-0.0621	-0.6964	1.2947
Proportion of land with good soil in 1999	-0.4581***	-1.3799*	0.2164	-0.2102	0.8372	-4.3858**
Distance (km) to woreda town	-0.0013	-0.0042	-0.0075***	-0.0031	0.0291*	0.0046
Persons per hectare in 1999	0.1332	0.1753	-0.0536	0.2593**	2.1925*	0.4174
Population of households receiving extension from bureau of agriculture	0.3922*	-0.9882*	0.1525	1.777***	-2.1388**	-0.0662
Proportion of households with access to credit by bureau of agriculture in 1999	0.3405*	0.2604	0.1488	0.1179	1.8898***	0.2048
Proportion of adult literates in 1999	-0.5274*	0.3954	0.8202	0.7034***	2.4137***	-2.4851*
Proportion of landless households in 1999	-0.1021	-3.0903**	0.9343	-2.4236***	-0.3205	-2.6103*
Intercept	0.8834*	0.4422	-1.8796***	-0.4729***	1.99261	7.6539***
F	3.77***	10.39***	42.12***	11.07***	7.08***	3.97***
Uncensored observations	54	20	23	17	5	4
Left-censored observations	25	16	60	77	2	1
Right-censored observations	17	60	12	2	89	91
Total observations	96	96	95	96	96	96

Notes: All censored regression results are corrected for stratification and sampling.

[a] High agricultural potential includes non-drought prone (as classified by the Ethiopian Disaster Prevention and Preparedness Committee).

* Statistically significant at the 10% level; ** Statistically significant at the 5% level; *** Statistically significant at the 1% level.

Table 2. Regression results of the impact of land redistribution on the proportion of households using purchased inputs in 1999 and on average cereal yields (kg/ha) in 1999 in the highlands of Amhara region

Explanatory variable	Fertilizers	Pesticides	Herbicides	Improved seeds	Barley	Wheat	Teff
Land redistribution in 1997 or 1998	0.8523***	0.5835*	1.2455**	0.3676*	4.0190**	3.8998*	3.9232***
Expectation of future land redistribution	-0.1330	-0.0138	-0.7397	0.1194	1.283	1.0171	1.7348*
High agricultural potential[a]	-0.0638	-0.2764	0.8549*	-0.1877	1.9071	4.0136***	0.6506
Altitude (m.a.s.l)	0.0001	-0.0004	0.0003	0.0002	0.0001	-0.0009	0.0026*
Presence of irrigation in 1999	0.1318	0.2132	0.1561	0.0640	4.0857**	0.3079	-0.7885
Proportion of land with good soil in 1999	0.4658	0.3166	0.2850	0.9668***	9.2659**	8.5882***	7.2061***
Distance (km) to woreda town	-0.0002	0.0039	0.0047	-0.0007	0.0098	0.0151	-0.0248
Persons per hectare in 1999	-0.0892	0.0828	0.3722	-0.0137	-3.0455	-1.8080*	4.0132***
Population of households receiving extension from bureau of agriculture	-0.1363	-0.1021	-0.3874	-0.0421	-0.4368	-0.1615	-0.7412
Proportion of households with access to credit by bureau of agriculture in 1999	0.0475	0.0230	0.4943*	-0.0035	2.7144	1.8220	1.0164
Proportion of adult literates in 1999	0.9448***	0.8363	0.2433	0.5612	7.2846*	1.0537	-0.8145
Proportion of landless households in 1999	-0.2881	1.7588**	0.1331	0.2367	9.3956	-1.9802	0.5690
Intercept	-0.2956	-0.4325	-2.8160**	-0.9652	-6.0822	0.9308	-9.6781*
F	7.39***	2.21**	2.44**	2.65**	1.24*	2.11*	8.99***
Uncensored observations	62	30	19	55	70	53	74
Left-censored observations	14	53	74	25	2	2	1
Right-censored observations	19	13	3	15	0	0	0
Total observations	95	96	96	95	72	42	75

Notes: All censored regression results are corrected for stratification and sampling.

[a] High agricultural potential includes non-drought prone (as classified by the Ethiopian Disaster Prevention and Preparedness Committee).

* Statistically significant at the 10% level; ** Statistically significant at the 5% level; *** Statistically significant at the 1% level.