



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

*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.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.



Factors affecting entry and intensity in informal rental land markets in Southern Ethiopian highlands

Tesfaye Teklu^a, Adugna Lemi^{b,*}

^a Department of Economics, Western Michigan University, Kalamazoo, MI 49008, USA

^b Department of Economics and Finance, College of Business, Winona State University, Winona, MN 55987, USA

Received 26 October 2001; received in revised form 28 September 2002; accepted 2 October 2002

Abstract

Informal land transactions, particularly rental land markets, are emerging in rural Ethiopia in response to the inadequacies of the administratively based land distribution system to meet the growing demand for land and correct imbalances in factor proportions at the farm level. These informal land markets provide a vehicle to equalise factor proportions at the farm level and to improve productivity and hence households' welfare. Among the farmers who lease out land, those who live in the highland-areas, where land is scarce and unequal, are more likely to engage in these markets. Increases in the size of land holdings relative to labour and livestock ownership, the number of non-working household members and pressure for subsistence increase the likelihood of leasing out land. On the other hand, increases in the number of working adults, improved nutritional status and greater wealth affect negatively the supply of land into these markets. The potential exists for these markets to improve factor equalisation, reduce inequality in land holdings, and shift the income position of participating households. However, success depends on whether other factor markets are functioning to thwart forced disposal of land to meet subsistence. Public policy has pivotal role in fostering the growth of these markets and their land transfer and factor equalisation functions by ensuring their legally enforceable status, and removing legal restrictions that constrain choices of contracts and trading over greater distances. In addition, both long and short-term policy measures are needed to reduce the extent to which poor farmers engage in distress transactions.

© 2003 Elsevier B.V. All rights reserved.

JEL classification: Q15

Keywords: Ethiopia; Land lease; Market

1. Introduction

Highlands account for nearly 40% of the Ethiopian land mass. These highlands, which account for 43% of African highlands, are home to 80% of the country's human and livestock population. Population density is high, farms are small and fragmented. Arable land in

particular is increasingly scarce due to continuous soil degradation and rapidly population growth.

The land reform of 1975 (Proclamation 31/1975) and the subsequent constitutions of the country (1987, 1995) bestow the right of land ownership to the state. As of 1997, the rights to set and enforce rules governing land access, use, and transfer are divided between the federal and regional governments (Proclamation 89/1997). Qualified farmers have open-ended usufruct rights to land through state-mandated peasant associa-

* Corresponding author.

E-mail address: alemi@winona.edu (A. Lemi).

tions (PAs). These use rights are inheritable. They are also tradable in the form of rent in some of the regions. Farmers forfeit these use and transfer rights if they are unable to cultivate their land continuously and/or fail to comply with physical residency requirement.

Farmers access land mainly through state-mandated peasant associations, which are formed in fixed geographically demarcated areas that do not exceed 800 ha (PA-land). Farmers are only eligible for PA-land where they are physically resident. The fixed supply of PA-land is 'equally' shared among qualified resident members according to a mutually agreed allocation formula. The common practice is to allocate land in relation to the number of household members (Teklu, 1979; Rahmato, 1984; various case studies in Rahmato, 1994; Gavian and Teklu, 1996; Adal, 1997; Haile-Gabriel, 2000; Admassie, 2000). Other factors such as land quality, the size of family workforce and ownership of farm assets, which have substantial influence on ability to use land, are not given as much emphasis as family size. Hence, there are households with equal allocations of PA-land, but with significant variations in factor intensity such as land per adult, land per oxen and land per working capital.

While PA-based land allocation has been the principal means of land acquisition, access to land through informal land rental markets (crop-sharing and cash rental) is gaining importance.¹ Four factors contribute to this trend. First, the ability of the PAs to accommodate the continuous demand for land is diminishing, as is evident from the growing number of farmers with no PA-land, especially newly formed young farm households. Second, the technical ability of the PAs to anticipate and correct changes in factor proportion at the farm level is limited. Third, the policy changes that have been instituted since 1989, which include the rights to use hired labour, to bequeath use rights to land, and to rent land, have created an enabling environment and incentives for the growth of non-PA based venues for land acquisition. Fourth, farmers who participate in land rental markets are able to combine land rent with other factor markets (e.g., labour, oxen,

credit) and overcome problems associated with missing or incomplete factor markets.

Informal land rental markets are thus emerging in rural Ethiopia in response to the inadequacies of the administratively based land distribution system to meet the growing demand for land and correct imbalances in factor proportions at the farm level. Evidence indicates that as many as 15–30% of farm households transact in these informal land rental markets throughout the country (Gebre-Medhin, 1998; Kidanu and Tadesse, 1994; Kaba, 1994; Habtu, 1994; Gavian and Teklu, 1996; Sandford and Sandford, 1994; Chekun, 1994). They are thriving in some regions, particularly in areas with developed market infrastructure and commercialisation of agriculture (Haile-Gabriel, 2000).

The aim of this paper is to analyse these informal land rental markets, particularly the key factors that influence the decision to lease out land and the intensity of land transactions. The study focuses particularly on farmers on the supply side of the market and complements past studies that have focused only on the demand side (Gebeyehu, 1999; Croppenstedt and Mammo, 1996; Gavian and Teklu, 1996). It begins with a brief review of recent developments on emerging informal land rental markets in rural Ethiopia. It then tests a set of factors that are hypothesised to influence participation in the land rental market and land transaction intensity using survey data from three districts of southern Ethiopia. Finally, the implications of the results for future research are drawn in the concluding remarks.

2. Emerging informal land rental markets: a review²

All farmers participating in these informal rental markets share the common objectives of increasing production and income, and thereby improving their welfare status. But the specific reasons for participation are varied. For farmers with no access to either PA-land or parental land, the motivation to participate is simply to acquire land for cultivation. For the majority of the transacting farmers, however, the need

¹ The focus of this paper is on informal land rental transactions. Informal land transactions cover market-mediated (rental contracts such as crop-sharing and cash rental) and non-market mediated transfers (for example, borrowing or gifts). The terms share cropping, crop sharing and share rental are used interchangeably in this paper.

² See Teklu (2003) for a comprehensive review of the literature on land issues and evidences in Ethiopia.

to balance factors of production (for example, land, labour, oxen and cash), and increase factor intensity and production are the primary motivating factors. Because non-land factor markets are missing or incomplete, farmers often use the land market as a substitute for missing or incomplete factor markets, such as the market for credit.

Different types of informally arranged land rental contracts are used. By far the major type of contract is the crop-sharing arrangement (Kidanu and Tadesse, 1994; Habtu, 1994; Abate, 1994; Kebede and Croppenstedt, 1995). Share tenancy is prevalent in most parts of the country, particularly among resident farmers with close social ties. Next in importance is cash rental. While it co-exists with share rental in many localities, its incidence tends to be high in areas where markets are better developed and agricultural production is commercialised, especially among cash crop producers (Gavian and Teklu, 1996; Haile-Gabriel, 2000; Bruce et al., 1994). Unlike share contracts that are mostly orally arranged, cash rentals are mostly based on written agreements.

Contracts are short-term and rarely exceed more than two crop seasons. The rare cases of long-term cash rental may be disguised land sale (Bruce et al., 1994). The rental rates are negotiable and vary depending on soil fertility, scarcity of land and farmers' resource endowments including their financial status (Abate, 1994; Bruce et al., 1994; Haile-Gabriel, 2000). The rental rate is directly correlated with land quality. Where arable land is scarce, farmers, who lease out land, tend to demand for lower input share and/or ask for greater output share, and/or demand for cash deposit to obtain a right to lease land. Because these markets are thin and fragmented, rental rates are geographically localised and contingent on the economic status of the transacting households.

Why these types of informal contract co-exist within the same locality cannot be fully explained from existing empirical evidence. Two forces appear to influence the choice of contract: transaction costs and risk attitude. The greater preference for sharecropping among farmers with long-established social interactions suggests that the costs of monitoring and enforcement of share contract are small in such settings, as evidenced from case studies in South and Southeast Asia (Otsuka, 1993; Otsuka et al., 1992; Otsuka and Hayami, 1988; Hayami and Kikuchi, 1982). And to the extent that

farmers are risk averse, share contracts provide a vehicle to pool and share risks. But, as transaction costs rise, farmers tend to shift towards fixed cash rental, especially among farmers with distant relations.

The emerging land market, while still in its infancy, appears to provide a venue for equalising factor proportions at farm level through trade (Gavian and Teklu, 1996; Gavian and Ehui, 1999; Kebede and Croppenstedt, 1995). Gavian and Teklu (1996) and Gavian and Ehui (1999), in particular, show little variation in factor intensity by tenure type, especially in the ratio of land to labour. These studies suggest that factor equalisation tends to occur regardless of tenure type, and that share tenancy is not an inferior contract in relation to fixed rental or own-operated farms. The plausibility of these conclusions rests on transaction costs on land rent makes and the degree to which household factor endowments explain differences in factor intensity. To the extent that these transaction costs are low, differences in factor intensity are likely to narrow. But these costs are unlikely to be zero. In an environment such as Ethiopia, where factor markets are not complete, household factor endowments are likely to have a significant influence on factor intensity at the farm level. No studies to date have isolated the influence of the endowment effect from the tenure effect.

Transactions on informal land markets tend to contribute towards reasonable equality in the size distribution of operated land-areas. First, farmers who otherwise would not have access to land are able to get access to and operate land. There are thus more farmers who get access to land at the lower end of the distribution. Second, the process of equalisation of landholdings means that farmers with large initial landholdings (pre-transaction) transfer land to those with smaller holdings. Third, the short-term nature of land transactions precludes farmers from accumulating land and thus widening the disparity in landholdings in Ethiopia. These results are in conformity with the findings of Andre and Platteau (1998) in Rwanda, which, like Ethiopia, is characterised by high population density, scarcity of land, a low level of agricultural technology, and declining land productivity. Temporary land transfers such as land rentals and loans contributed to moderate the impact of inequality of landholdings in Rwanda. However, the offsetting impact of these transactions on the land

disequalising effect of land sales is declining over time.

Land held under short-term rental contracts is rarely used to grow permanent crops (Chekun, 1994; Kebede and Croppenstedt, 1995; Sandford and Sandford, 1994). Farmers invest little in on-site land conservation and improvement structures since the probability of capturing future benefits from such investments is low (Gebre-Medhin, 1998; Teklu, 1998; Alemu, 2000). These results conform the findings in other African countries (Place and Hazell, 1993, for Ghana, Kenya and Rwanda; Lawry and Steinbarger, 1991, for Nigeria; and Gavian and Fafchamps, 1996, for Western Mali; Hayes et al., 1997, for Gambia).

Application of improved or new technology such as chemical fertilisers is sparse and low in intensity. Evidence in Holden and Yohannes (2001) shows that tenure insecurity has little effect on intensity in Southern Ethiopian villages.

The productivity gap between farms held under different tenure arrangements (PA-land, fixed cash, share tenancy) is small (Gebeyehu, 1999; Gavian and Ehui, 1999). Gavian and Ehui (1999), for example, found a total factor productivity (TFP) gap of 10–13% on land held under fixed rental and share contract, as compared with PA-land. These small differences in productivity are not related to differences in factor intensity. Gebeyehu (1999) found that technical inefficiency tends to be slightly higher among tenant farmers, particularly among the most efficient group of farmers. The reasons for lower technical efficiency are not found in differences in education, market participation and non-farm assets between tenant farmers and 'own-operators' (Croppenstedt and Mammo, 1996; Gebeyehu, 1999). Gavian and Ehui (1999) ascribe differences in technical efficiency to youth, limited farm experience and knowledge, and the quality of the land used by tenant farmers. The results in Gavian and Ehui (1999), Gebeyehu (1999) and Croppenstedt and Mammo (1996), particularly the lack of a substantial productivity gap between tenure types, are in conformity with the case studies in Ghana, Kenya and Rwanda (Place and Hazell, 1993).

To conclude, the evidence so far suggests that mainly informally arranged short-term land rental markets are growing in different parts of the county. Recent policy changes, especially the easing of restrictions on rental land markets to operate in some

regions, have a favorable effect on their growth. They function as a venue for land acquisition and as a means of balancing factors of production at the farm level. Transactions on these markets also tend to reduce inequality in the area of land operated. Production losses due to tenure are small although the short-term horizon and the associated insecurity of tenure constrain investment in land conservation and improvement.

3. Factors affecting land transaction

In an environment in which factor markets are incomplete (missing or imperfect), a farm household's initial factor endowment such as size of PA-land, ownership of livestock, availability family labour, household demography (household size and age/gender composition), and access to credit will influence its position on the land rental market. The supply side of land rental markets is largely characterised by land-abundant farm households with larger PA-allocated land relative to important complementary inputs such as labour and oxen. These households use sharecropping land contracts to acquire these inputs, including access to credit, or rent out land using fixed rental contracts.

Gebeyehu (1999) establishes the importance of household demographics and factor endowments in influencing the decision whether to rent-in land or not. The decision to lease in land is positively related to the availability of draught animals and household wealth. It is negatively related to the size of PA-land, the quality of land, and female-headship. Hence, male-headed, land-constrained farm households that possess draught animals and other wealth are more likely to rent-in land.

The same factors are hypothesised to influence the decision to lease out land but in the opposite direction. Farmers with large PA-land (relative to family labour or oxen) are more likely to lease out land. The effect of land size is, however, conditional on land quality. It is probable that farmers with large land-areas are selective and lease out poor quality land. But this is contingent on the motive for land transaction and type of contractual agreement (Gavian and Teklu, 1996). Hence, the effect of land quality can only be empirically determined.

As the number of dependents in a household increases, it is probable that land-abundant farmers, particularly the poor, lease out land to acquire cash or food. This is consistent with the hypothesis of subsistence pressure. On the other hand, increasing size of the family workforce induces these farmers to lease out less land and cultivate it themselves. Improvements in the nutritional condition of working adults will reinforce the decision to lease out less land, especially in Ethiopia where malnutrition is widespread.

The effect of age and education—the other labour quality attributes—is less certain. The age of a farm household captures three elements—ability to farm, managerial experience and degree of risk-tolerance—all of which tend to change with age. Their effects on land rent decisions are mixed. A young farmer with more PA-land relative to his labour is more willing to trade on the land rental market. But his propensity to trade may diminish in later years, as he gains farm experience and skill.

The effect of education is also ambiguous. As a farm household acquires more education that enhances its ability to obtain, process and utilise new information, it may choose to lease out less of its land and work on its farm efficiently (Asfaw and Admassie, 1996). But the propensity to lease out may increase as the opportunity cost of farming increases especially in areas where market access is developed and farmers have off-farm employment opportunities. The effect of education can be positive on the decision to rent out land in such an environment.

When a female adult becomes the head of a household in the Ethiopian rural milieu, she often starts from a disadvantageous position because of her limited physical and managerial ability to farm, especially if she is poor, lacks assets such as oxen power and is constrained in getting access to credit. Female-headed households are thus more likely to share out land while male-headed households are more likely to seek more land to cultivate. The importance of gender differentiation, however, can be expected to fall if differences in experience, factor endowments and asset position are controlled in a regression framework.

Ownership of livestock has multiple benefits as a source of animal traction for farming, storage of wealth and a substitute for insurance. Because land and oxen are complementary inputs and the market for oxen is thin, farmers with livestock endowments

are able to expand and cultivate large areas. Having livestock also reduces the pressure to lease out land to meet consumption need, especially in periods when farm income slackens (Gavian, 1996). Both these factors are likely to have a negative effect on the supply of land for rent.

Physical access to market lowers the cost of marketing and encourages commercialisation of agriculture. This substantially increases the volume of land rental transactions. We therefore expect increased participation in rental markets in areas close to major market places. With the effect of infrastructure and physical access to market controlled, village dummy variables mainly capture variation in ecological characteristics, population distribution, and land size and distribution. Farmers living in villages with high population density and unequal land distribution are more likely to participate in rental land markets.

The econometric estimates below identify which of these factors influence whether or not to lease out land and how much land to lease out. In addition, two related research questions are addressed. Are the factors influencing participation in land markets and intensity of transaction the same? Which of these factors are the most influential in these sequential dual decisions?

4. Econometric specification

Farmers in the survey villages are assumed to follow sequential decisions; first, whether to transact or not and second, how much land to transact. The censored regression model (tobit) captures both the limit (zero) and non-limit (continuous) observations. By capturing the limit observations, the procedure captures the latent level of intensity of potential participants who decide not to transact. Let the land transaction function be given by;

$$L_i^* = \beta' X_i + U_i. \quad (1)$$

where β is the vector of parameters to be estimated, X_i a vector of regressors, and U_i the error term. For farmers transacting in rental land market, L_i^* equals the actual level of transaction (L_i). For those who are not transacting (roughly 40% of the sampled households), L_i^* is an index reflecting willingness to

participate. That is;

$$L_i = \begin{cases} L_i^* & \text{if } \beta' X_i U_i > 0 \\ 0 & \text{if } \beta' X_i U_i < 0 \end{cases} \quad (2)$$

The specification of the tobit model (Eq. (2)) imposes the assumption that the same set of factors influences both the decision to lease or not, and the amount of land to lease. This may not be a plausible assumption since these two sequential decisions may be influenced by different sets of factors, and variables common to these decisions may have different directions and degrees of influence. For instance, body mass index (BMI) may have little effect on the decision to participate, but a stronger impact on the intensity of land transaction, controlling for all other factors. The age of the household head is expected to have a positive effect on the decision to transact in early years and then turn negative as age progresses and farmers become more risk averse. But it can have the opposite effect on the extent of land transaction. As they become older, farmers become less physically able and hence more willing to lease out land.

Where the sets of factors affecting participation and intensity of land transaction differ, the appropriate procedure is the Heckman (1979) two-stage, which allows at least one variable to affect participation but not the intensity of participation. The appropriateness of each of these models can be tested by comparing the log likelihood estimates of the tobit, probit and truncated models (Greene, 1997). The underlying assumption of the tobit model may be tested using the following likelihood ratio statistic (LRT):

$$\text{LRT} = -2 [\ln L_T - (\ln L_P + \ln L_{TR})] \approx \chi^2(k), \quad (3)$$

where L_T is the likelihood of the tobit model with the same coefficients, L_P the likelihood of the probit model, L_{TR} the likelihood of the truncated regression model, and k the number of regressions without the constant term.

The procedure involves separate estimation of the probability model for the decision to transact or not (probit model), OLS with zero observations excluded (truncated regression model) and a regression with zero observation included using maximum likelihood technique (tobit model). The test is based on the fact that the tobit log-likelihood is the sum of the

log-likelihood for the truncated and the probit models separately.

If LRT is significantly higher than the theoretical χ^2 distribution, this leads us to reject the null hypothesis that the regressors have the same effect on the decision to transact and the level of transaction.

If the null hypothesis is rejected, Heckman's (1979) two-stage procedure allows for different factors to influence decisions to transact or not to and amount of land transaction. This procedure involves estimation of the probability model for the decision to transact or not, calculation of the sample selection bias (the inverse Mill's Ratio), and incorporation of this selectivity bias variable into the model for the OLS estimation of the amount of land transacted.

The decision to transact, P_i , is estimated as:

$$P_i = \gamma' Z_i + \varepsilon_i \quad (4)$$

where $P_i = 1$ if $L_i^* > 0$ and $P_i = 0$ otherwise. For this, the inverse Mills Ratio is:

$$\lambda = \frac{\phi(\gamma' Z_i)}{\Phi(\gamma' Z_i)}, \quad (5)$$

where ϕ and Φ are density and cumulative density functions, respectively. This ratio is included as an additional regressor in the land intensity regression $L = L_i^*$ conditional on $P_i = 1$:

$$L_i^* = \beta' X_i + \theta \lambda_i + U_i,$$

where the variables in X_i are allowed to differ from those in Z_i .

5. Survey data and variables

The study draws on primary data collected from the 1990/1991 rural household survey that was conducted in three districts (Alaba-Siraro, Sike and Omo-Shelleko) of southern Ethiopia by the Ethiopian Nutrition Institute (ENI) and the International Food Policy Research Institute (IFPRI). All the villages in the three districts were stratified by elevation and distance to the closest major road. Eleven villages were randomly sampled from elevations between 1600 and 2000 m above sea level. A total of 650 households were randomly sampled from these 11 villages in proportion to their populations. The survey comprised

Table 1
Differences in farm endowment, socio-economic characteristics and extent of land transaction by participation status

Description of variables	Transacting households		Non-transacting households
	Sharing out	Sharing in	
Percentage of transacting households	47	12	–
Percent of area: shared out	51	5	–
Percent of area: shared in	2	36	–
Area of transacted cropped land per capita	0.14	0.11	0.0
Percentage of sampled households: high elevation villages	79	76	35
Percentage of sampled households: high elevation villages	21	24	65
Soil type (1: black, 2: red, 3: sandy)	1.86	1.88	2.21
Age of household head (year)	48	45	43
Percent of de jure female-headed households	12	14	03
At least grade 1 education (%)	17	27	21
Value of livestock per capita (birr)	148	175	183
Share of non-farm income (%)	23	25	15
Per capita daily calorie consumption per adult	2399	2388	2738

10 rounds. The same sampled households were interviewed at intervals of 4–6 weeks. Except for the crop survey, information on other socio-economic characteristics was collected at varying intervals. Ferro-Luzzi et al. (2001) provide detailed description of the survey sites and data collection.

Nearly 60% of the sampled farmers reported transacting in informal land rental markets in the 1990–1991 crop year (Table 1). Forty percent of the sampled farmers shared out on average 51% of their PA-land, which averaged 0.14 ha per holding. And 12% of the sampled farmers reported sharing in land. This accounted for 36% of the land they cropped and averaged 0.11 ha per holding.

Close to 80% of these transacting farmers were from high elevation villages (1800–2000 m).³ Less than a quarter of the transacting farmers were from low elevation villages (1600–1800 m). There were more non-transacting farmers in the low elevation villages (65%) than in high elevation villages (35%). The high elevation villages had more and stable rainfall and fertile soil. Farmers also had more choices of crops to grow, especially in the intermediate zone where black soil dominates. But, farm sizes were smaller at higher

altitudes, which reflects higher population densities in villages where there is more and stable rainfall, and suitable land for agricultural use.

The socio-economic profile of the transacting farm households shows some distinct variations from the non-transacting households. The share of transacting female-headed households was slightly higher (12–14%) than their share in the sample (11%). While the level of literacy was generally low in the surveyed villages, the incidence of illiteracy was higher among the farmers who shared out land. Ownership of assets, level of income, and daily calorie intake were lower for transacting farmers. These farmers exhibit many characteristics of the rural poor in Ethiopia: low asset ownership (land, traction power and access to credit), low income and low food consumption. These asset-poor households are under great food-subsistence pressure to lease out land and engage in non-farm income activities.

The variables used in the empirical model are reported in Table 2 with their means and standard errors. The three village dummies (DECOL, DV11, DV1) represent high elevation villages, the village purposely selected (DV11) and the village that was targeted for a government extension program (DV1), respectively. The variable PAAREA measures the area of government allocated land (PA-land). The degree of inequality of land holding is captured by the village-level Gini coefficient (VGINI). Two indexes

³ Sixteen hundred to two thousand meter represents part of the mid-elevation zone in the Ethiopian agro-climatic classification. High and low in this paper refer to the upper and lower range of this middle elevation, respectively.

Table 2
Parameter estimates of the probit and sample selection corrected OLS Heckman two-stage models

Variable	Definition	Probit		Sample selection corrected OLS	
		Coefficient (t-ratio)	Marginal effects (t-ratio)	Coefficient (t-ratio)	coefficient (t-ratio)
Constant		0.0993 (0.215)	0.0386 (0.215)	135.35 (1.921)	
WATREL	Water lodging index (1: none, ..., 0.25: severe) (\bar{X} = 1.448, S.E. = 1.32)	0.0776 (0.934)	0.0301 (0.934)	0.0547 (1.476)	
EROSI	Erosion index (1: none, ..., 0.25: severe) (\bar{X} = 1.370, S.E. = 1.60)	-0.1700 (-1.719)*	-0.0662 (-1.719)*	-0.0948 (-1.928)**	
DECOL	Dummy for ecological zone (1: higher elevation, 0: lower elevation) (\bar{X} = 0.469, S.E. = 0.502)	0.7073 (3.526)***	0.2748 (3.532)***	-	
PAAREA	Land area (ha) distributed by PA (\bar{X} = 1.489, S.E. = 1.228)	0.2012 (2.991)***	0.0782 (2.995)***	0.4334 (11.024)***	
DEDU	Education dummy, 1 if household head education is greater than one school year and 0 otherwise (\bar{X} = 0.213, S.E. = 0.140)	0.1705 (0.987)	0.6628 (0.987)	-	
VCINI	Village Gini coefficient (\bar{X} = 0.485, S.E. = 0.075)	-	-	2.128 (4.825)***	
DV11	Dummy for village 11 (\bar{X} = 0.249, S.E. = 0.433)	1.0188 (4.333)***	0.3959 (4.346)***	-	
DV1	Dummy for village 1 (\bar{X} = 0.07, S.E. = 0.256)	1.9848 (3.773)***	0.7712 (3.781)***	-	
HHSEX	Household head sex (1: male, 0: female) (\bar{X} = 0.893, S.E. = 0.309)	-0.2545 (-1.217)	-0.0988 (-1.217)	-	
HHSIZE	Number of family members (\bar{X} = 6.983, S.E. = 3.343)	-0.1933 (-2.776)***	-0.7512 (-2.776)***	0.01067 (0.870)	
HHSSQ	HHSIZE square	0.0054 (1.572)	0.0022 (1.572)	-	
HHHAGE	Household head age (\bar{X} = 44.324, S.E. = 14.383)	0.0091 (1.798)*	0.0035 (1.798)*	0.0192 (1.342)	
RADULTJ1	Proportion of adults to total family size (\bar{X} = 0.498, S.E. = 0.178)	-	-	-0.3568 (-2.091)**	
DROAD	Distance of household from road (\bar{X} = 7.465, S.E. = 4.918)	-0.0533 (-1.708)*	-0.0207 (-1.709)*	-	
VLIVES	Value of livestock (\bar{X} = 828.796, S.E. = 744.477)	-0.0007 (-0.704)	-0.0003 (-0.704)	-0.0001 (-0.016)	
PBMIF ^a	Predicted body mass index of household head (\bar{X} = 18.736, S.E. = 0.321)	-	-	-14.86 (-1.948)**	
PBMISQ	Square of PBMIF	-	-	0.4044 (1.963)**	
LAMBDA	Inverse Mills Ratio	-	-	-0.281 (-2.243)**	
log Likelihood		-268.6	-	186	
N		441	-	-	
χ^2		63.3	-	-	
Adjusted R ²		-	-	0.5495	
F statistics		-	-	19.81	

S.E. stands for standard error.

^a BMI = $18.832 - 0.1218RDEP + 0.2167HHSEX - 0.1116HHHEDU + 0.0164HHHAGE - 0.0004HHHAGESQ$, where RDEP = dependency ratio, HHHEDU = household head's years of schooling and all other variables are as defined in the table.

* $P < 0.05$.

** $P < 0.01$.

*** $P < 0.001$.

were created to reflect subjective assessments of soil erosion (EROSI) and water lodging (WATERL) problems. Each index reflects four categories of land degradation: 1 for none, 0.75 for slight, 0.5 for moderate and 0.25 for severe.⁴ DROAD measures the distance of each village from a main road.

The household demographic variables, particularly household size (HHSIZE), gender of household head (HHSEX), and age of household head (HHHAGE) were as reported in the survey module. The dummy variable for education (DEDU) is 1 if the head of the household has at least 1 year of schooling, and 0 otherwise. The only variable that was created was RADULT, the ratio of adults in the age category of 15–64 years to total household size. The availability of draught animal power that complement human labour in farming is proxied by the value of livestock owned by a household (VLIVES).

The variable PBMIF and its square term (PBMISQ) represent predicted values of the Body Mass Index (BMI), which is an indicator of adult nutritional status. The BMI was measured using data from adults who were in the 15–59 years of age category and excluding pregnant and nursing women. Forty-six percent of the adults or 49% of the household heads had BMIs below 18.5, which James et al. (1988) consider a cut-off point below which chronic energy deficiency is indicated. The high share of adults with such low BMIs indicates potential problems of high incidence of morbidity and functional impairment.

6. Regression results and discussion

The first task was to test the assumption that the same set of factors influences participation and amount of land transaction. This involved estimating three equations with the same explanatory variables—probit, truncated and tobit regression equations.⁵ The log likelihood estimates of these regressions were used to compute the likelihood ratio statistic, in

(Eq. (3)). The computed χ^2 (143.68) is substantially greater than the critical chi-squared statistic (30.58) at the 1% level. Hence, the assumption of the same set of factors could not be sustained.

As shown in Table 2, there are differences in the factors that explain participation and intensity of land transaction. For example, adult nutrition (PBMI), the proportion of working adults in a family (RADULT) and village-level land inequality (VGINI) are only statistically significant in the intensity equation. On the other hand, the village dummy variables (DECOL, DV1, DV11) and distance from main road (DROAD) have a significant impact on the participation decision but not on intensity of transaction.

Because of the differences in factors affecting participation and amount of land transaction, the Heckman two-stage procedure was followed. The first stage was to estimate a dichotomous probit model (Eq. (4)). The parameter estimates, and the marginal effects and their respective t-statistics are reported in Table 2. The dependent variable equals 1 if the farmer leases out land, and zero otherwise. The chi-square test for the fit of the model is statistically significant. That is, the null hypothesis that the coefficients are all zero is rejected. The model correctly predicts 32% of the observations.

Table 2 also reports Heckman's second stage sample selection corrected least squares estimates and the associated t-statistics. The dependent variable equals the area of land leased out at the farm level. The F-statistic and adjusted R^2 indicate that the sample selection corrected OLS model is significant. The lambda coefficient on the inverse Mill's Ratio is statistically significant, which indicates a significant sample selection bias. That is, estimating OLS with zero observations excluded would bias the regression coefficients towards zero.

Participation in informal land markets is positively correlated with village elevation and associated ecological characteristics. Farmers living in higher elevation villages (DECOL, DV1, DV11) were more likely to lease out land than other farmers. The signs of the coefficients are consistent with expectations. Although farmers in higher elevation have more production choice, they are limited by scarcity of land to produce enough to meet consumption needs. Farm households in these areas are more likely to transact in land markets where land is scarce and the pressure for food subsistence is high.

⁴ These weights are used to adjust land size for quality differences. One hectare of land with no erosion is indexed 1. One slightly eroded hectare of land is equivalent to 0.75 ha of un-eroded land, etc.

⁵ These regression results are not presented here but are, together with the data used for these regressions, available from the authors on request.

Distance away from a major road (DROAD) reduces the likelihood of leasing out land. As the distance from a major road increases, the opportunity cost of farming tends to fall and, hence, farmers are less likely to lease out land, all other factors constant. Put another way, farmers who live close to a major road or market are more likely to opt for better paying non-agricultural activity and partly or fully lease out their land.

Farmers with more PA-land (PAAREA) are more likely to enter informal land markets and lease out a larger area of land, holding the effect of complementary inputs such as family labour (RADULT) and livestock (VLIVES) constant. The effect of land size is, however, conditional on its quality. The erosion variable (EROSI) is negative and significant in both probit and sample selection corrected OLS models. That is, farmers with eroded land are more likely to share out their land. And the more eroded land they have, the more land they lease out, keeping the less eroded land for their own cultivation. This explains why large areas of land are rented in villages with red/brown soils where problems of soil erosion are severe. Water logging severity has no significant impact on either participation or intensity of transaction.

Household size (HHSIZE) has a negative but diminishing effect on the decision to participate in land markets. However, when the effect of household composition is controlled (RADULT), the effect of household size on the intensity of land leased out is weak but positive. That is, increasing household size, holding demographic composition constant, has a positive effect on the area of land leased out. As the number of dependents in a household increases, farmers tend to lease out more land. On the other hand, an increasing proportion of adults in a household decreases the area of land leased out.

The extent of land transaction is also influenced by the quality of labour, as measured by BMI. In order to assess the effect of chronic dietary deficiency on the extent of land leased out, predicted BMI is used. This was necessary to avoid a potential simultaneity problem: low BMI causes farmers to lease out land and leasing out land causes low BMI. A regression model for BMI as a dependent variable was first estimated using variables that predict BMI. The predicted BMI was then used in Heckman's second stage regression model. The linear coefficient is negative (PBMIF) and the quadratic term (PBMISSQ) is positive, and both are

statistically significant. Households with better quality labour, as measured by higher BMI, lease out less land. And this decrease in the area of leased land occurs at an increasing rate at the margin, which is indicative of a strong preference for working on one's own farm, as opposed to leasing out land. In other words, households with malnourished adults are physically constrained and hence tend to lease out more land. The effect of this physical condition is critical since farming intensifies in the rainy season when the problem of food shortage is acute.

The positive coefficient for the measure of village land inequality (VGINI) indicates that farmers in villages with initial high degrees of inequality transact more land through informal land rental markets. The scope for such rental transactions is larger in villages where the size and distribution of PA-land is more unequal. The informal land market provides a mechanism for farmers with unequal holdings to trade. This has a potential to equalise the distribution of operated land holdings if those who are at the lower end of the land distribution are able to get more land to operate.

The effect of age (HHAGE), sex of household head (HHSEX), education (DEDU) and livestock (VLIVES) is statistically weak, but they have the expected signs. The age of the household head has a positive effect on the decision to participate in land markets. Farmers who are young adults are more likely to participate in informal land markets. But its effect on the intensity of land transaction is weak. There is apparently an offsetting process involving three elements that the age variable captures—physical ability, farm experience and risk-tolerance. Female-headed households are more likely to transact in informal land markets than male-headed households (HHSEX). This gender related effect, however, diminishes as factors that reflect differences in physical ability, experience and wealth are controlled in the regression models.

The effect of education (DEDU) on the decision to participate is statistically weak but positive. This may be due to the limited variation in the level of education in the sample. An increase in the level of education tends to increase the opportunity cost of participating in farming, especially in villages close to major towns (as proxied by distance from road (DROAD)).

The value of livestock owned (VLIVES) has a negative but weak effect on the likelihood and level of land leased out. Holding land size and quality con-

stant, an increase in livestock reduces the incentive to lease out land. An increase in available livestock reduces the need to lease out land in exchange for oxen. As the ownership value of livestock increases, farmers are more willing to work on their farms and bear the risk of production rather than pooling risk through land sharing.

7. Concluding remarks

Farmers in the study region of Ethiopia access land mainly through a state-mandated non-market mechanism. But this allocation mechanism fails to meet continuous demand for land, especially among farmers who seek to equalise factor proportions at the farm level. Hence farmers are increasingly transacting on informal land rental markets. As many as 60% of the farmers in southern highland villages transact on these markets, which is significantly higher than the 15–30% reported in other parts of the country. Farmers participate to get access to land, to correct imbalances in factor proportions at the farm level, and use to these markets as substitutes for incomplete factor markets such as credit and labour.

On the supply side of these markets are farm households who lease out land because of shortages in healthy working adults and traction power and due to subsistence pressure. In the survey villages, these households were concentrated in areas with high population density, low land holding per capita, and large inequality of land distribution. Within these villages, farmers with more PA-land relative to their own labour or traction power tend to lease out land. They often lease out lower quality land. An increase in the number of household members is associated with an increase in leasing out land. But an increase in the number of adult members and improvement in adult nutritional conditions reduce the intensity of leasing out land. Female-headed households, more than male-headed households, share out land, especially when poor, because of their limited physical and managerial capacity to farm, shortage of assets, and constrained access to credit. Ownership of livestock, which functions as a source of traction power and wealth, lowers the likelihood and extent of leasing out land.

Because farming dominates as a source of livelihood and due to the subsistence orientation of produc-

tion in the Ethiopian rural milieu, farmers are willing to work on their farms provided they are able to cultivate and produce to support their families. When they are unable to cultivate because of a lack of working family labour and other complementary inputs, they tend to use the informal land rental markets to 'release' land. Some also lease out their land if they find better off-farm employment opportunities or need cash or credit to meet immediate consumption need. The main source of concern is when these transactions involve transfer of land to less efficient farmers or efficient farmers are forced to lease out their land at unfavourable terms because of subsistence pressure.

The econometric evidence in this paper suggests that farmers with low asset positions, especially traction power, large numbers of dependents and poor nutritional status are more likely to lease out land raises concerns about the extent to which such farmers are engaged in distress transactions. To the extent that these farmers substitute land for cash or food loans under subsistence pressure, public policy needs to address the causes of distress behaviour. The solution lies not in restricting these markets or using administrative land allocation mechanism as a safety net, but rather in fostering growth in non-land markets, promoting growth in returns to agriculture, and devising targeted transfer programs for the working poor in times of food distress.

References

- Abate, T., 1994. Land scarcity and landlessness in north Shewa: a case study from Wayu and Anget Mwegiya PA. In: Rahmato, D. (Ed.), *Land Tenure and Land Policy in Ethiopia after the Derg*. Institute of Development Research (IDR), Addis Ababa University, Ethiopia.
- Adal, Y., 1997. Rural land holding readjustment in West Gojjam, Amhara region. *Ethiopian J. Develop. Res.* 19, 2.
- Admassie, Y., 2000. Twenty years to nowhere: property rights, land management and conservation in Ethiopia. The Red Sea Press, Inc., NJ.
- Alemu, T., 2000. Insecure land tenure and soil conservation. In: *Proceedings of the Symposium on Reviewing Ethiopia's Socioeconomic Performance, 1991–1999* (paper presented). 26–29 April 2000, Addis Ababa, Ethiopia.
- Andre, C.P., Platteau, J.P., 1998. Land relations under unbearable stress: Rwanda caught in the Malthusian trap. *J. Econ. Behav. Org.* 34, 1.
- Asfaw, A., Admassie, A., 1996. The impact of education on allocative and technical efficiency of farmers: the case of Ethiopian small holders. *Ethiopian J. Econ.* 5 (1), 1–38.

- Bruce, J.W., Hoben, A., Rahmato, D., 1994. After the Derg: an assessment of rural land tenure issues in Ethiopia. Institute of Development Research, Addis Ababa, Ethiopia.
- Chekun, T., 1994. Land tenure issues in high potential coffee growing areas: overview of south western Ethiopia (Keffa, Illubabor, Wollega). In: Rahmato, D. (Ed.), *Land Tenure and Land Policy in Ethiopia after the Derg*. Institute of Development Research, Addis Ababa University, Ethiopia.
- Croppenstedt, A., Mammo, A., 1996. An analysis of the extent and causes of technical efficiency of farmers growing cereals in Ethiopia: evidence from three regions. *Ethiopian J. Econ.* 5 (1), 39–61.
- Ferro-Luzzi, M., Saul, S., Samson, T., Tsegaye, D., Maurizio, D., 2001. Seasonal undernutrition in rural Ethiopia: Magnitude, Correlates, and Functional Significance. International Food Policy Research Institute, Research Report 118.
- Gavian, S., 1996. Land contracts and livestock activities: a case study from the Ethiopian highlands. In: *Proceedings of the Sub-regional Workshop on Land Tenure Issues in Natural Resource Management* (paper presented). Economic Commission for Africa, Addis Ababa, 11–15 March 1996.
- Gavian, S., Teklu, A., 1996. Land tenure and farming practices: The case of Tiyo Woreda, Arsi, Ethiopia. In: Mulat, D., Wolday, A., Tesfaye, Z., Solomon, B., Ehui, S. (Eds.), *Proceedings of the Second Conference of the Agricultural Economics Society of Ethiopia— Sustainable Intensification of Agriculture in Ethiopia*. Addis Ababa, Ethiopia.
- Gavian, S., Fafchamps, M., 1996. Land tenure and allocative efficiency in Niger. *Am. J. Agric. Econ.* 78, 460–471.
- Gavian, S., Ehui, S., 1999. Measuring the production efficiency of alternative land tenure contracts in a mixed crop-livestock system in Ethiopia. *J. Agric. Econ.* 20, 37–49.
- Gebeyehu, W., 1999. Technical efficiency of cereal producing farmers: a comparative analysis of own-operators and tenants. MSc. Thesis, Department of Economics, Addis Ababa University.
- Gebre-Medhin, B., 1998. The economics of soil conservation investments in the Tigray region of Ethiopia. PhD Thesis, Michigan State University, MI, USA.
- Greene, W.H., 1997. *Econometrics Analysis*, 3rd ed., Prentice Hall, p. 1075.
- Habtu, Y., 1994. Land access and rural labour market constraints: a case study of northern Shewa. In: Rahmato, D. (Ed.), *Land Tenure and Land Policy in Ethiopia after the Derg*. Institute of Development Research, Addis Ababa University, Ethiopia.
- Haile-Gabriel, A., 2000. Development strategies and Ethiopian peasantry: supply response and rural differentiation, PhD Thesis. Institute of Social Studies, The Hague, The Netherlands.
- Hayami, Y., Kikuchi, M., 1982. *Asian village economy at the crossroad*. Baltimore, Johns Hopkins University Press.
- Hayes, J., Roth, M., Zepeda, L., 1997. Tenure security, investment, and productivity in Gambian agriculture: A generalized probit analysis. *Am. J. Agric. Econ.* 79, 369–382.
- Heckman, J.J., 1979. Sample selection bias as a specification Error. *Econometrica* 47, 153–161.
- Holden, S., Yohannes, H., 2001. Land redistribution, tenure insecurity, and intensity of production: a study of farm households in Southern Ethiopia. CAPRI Working Paper 21, IFPRI, Washington, D.C.
- James, W.P.T., Ferro-Luzzi, A., Waterlow, J.C., 1988. Definition of chronic energy deficiency in adults. *European J. Clin. Nutr.* 42, 969–981.
- Kaba, M., 1994. Land tenure and resource management in a west Shewa Oromo community. In: Rahmato, D. (Ed.), *Land Tenure and Land Policy in Ethiopia after the Derg*. Institute of Development Research, Addis Ababa University, Ethiopia.
- Kebede, B., Croppenstedt, A., 1995. The nature of sharecropping in Ethiopia: Some preliminary observations. In: Dejene, A., Mulat, D. (Eds.), *Proceedings of the Fourth Annual Conference on the Ethiopian Economy—Ethiopian Agriculture: Problems of Transformation*. Addis Ababa, Ethiopia.
- Kidanu, A., Tadesse, A., 1994. Rapid population growth and access to farmland: coping strategies in two peasant associations in North Shoa. In: Rahmato, D. (Ed.), *Land Tenure and Land Policy in Ethiopia after the Derg*. Institute of Development Research, Addis Ababa University, Ethiopia.
- Lawry, S.W., Steinbarger, D.M., 1991. Tenure and alley farming in the humid zone of West Africa: Final report of research in Cameroon, Nigeria and Togo. LTC research paper 105. University of Wisconsin-Madison, Madison, Wisconsin.
- Otsuka, K., 1993. Land tenure and rural poverty. In: Quibria, M.G. (Ed.), *Rural Poverty in Asia—Policy Issues and Policy Options*. Oxford University Press, Hong Kong.
- Otsuka, K., Hayami, Y., 1988. Theories of share tenancy: a critical survey. *Econ. Develop. Cultural Change* 37, 31–68.
- Otsuka, K., Chuma, H., Hayami, Y., 1992. Land and labour contracts in agrarian economies: theories and facts. *J. Econ. Literature* 30, 1965–2018.
- Place, F., Hazell, P., 1993. Productivity effects of indigenous land tenure systems in Sub-Saharan Africa. *Am. J. Agric. Econ.* 75, 10–19.
- Proclamation 31/75, Proclamation to provide public ownership of rural land. Addis Ababa, Ethiopia.
- Proclamation 89/97, Federal rural land proclamation, Federal Negarit Gazeta. Addis Ababa, Ethiopia.
- Rahmato, D., 1984. *Agrarian reform in Ethiopia*. Scandinavian Institute of African Studies, Uppsala, Sweden.
- Rahmato, D., 1994. *Land tenure and land policy in Ethiopia after the Derg*. Institute of Development Research, Addis Ababa University, Ethiopia, pp. 1–47.
- Sandford, J., Sandford, S., 1994. Land tenure in an onset-growing region. In: Rahmato, D. (Ed.), *Land Tenure and Land Policy in Ethiopia after the Derg*. Institute of Development Research, Addis Ababa University, Ethiopia.
- Teklu, T., 1979. Socio-economic conditions in Shashemene, Dodota, and Dangela 1978. Institute of Development Research, Research Report No. 26, 27, 28, Addis Ababa, Ethiopia.
- Teklu, A., 1998. The effect of tenure security and land fragmentation on productivity and investment in smallholder agriculture: evidence from Tiyo Woreda, Arsi, Ethiopia. MSc thesis, Addis Ababa University.
- Teklu, T., 2003. Rural lands and evolving tenure arrangements in Ethiopia: issues, evidences and policies, Discussion paper 10, Forum for Social Studies, Addis Ababa, Ethiopia.