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Participation in land market and technical efficiency in Southern Ethiopia: A case study after 2005 land proclamation of Ethiopia

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Agriculture is the mainstay of the Ethiopian economy contributing 45% to GDP and 80% to employment opportunity. Majority of the farmers in Ethiopia are smallholder farmers possessing less than a hectare of land. Land transfer mechanism in Ethiopia is limited to temporal land rental market and lease. Land sale and long term lease by farmers is outlawed by proclamation. The present study examines the technical efficiency of farmers who are operating under different tenurial structures and explains why some farmers (plots) are more efficient than the others. A stochastic frontier was used to estimate technical efficiency using data from 1786 parcel of land from 3 districts located in Oromia and Southern Regional Sates of Ethiopia The result of the analysis revealed that, the plot level technical efficiency ranged from 0.208 to 0.932 with mean value of 0.809. The study contested Marshalian conception of share tenancy as an inefficient institutional arrangement; it was found that, both share cropped in and out plots were more efficient than pure owner operated plots. The possible explanation for this finding is that, most of the share cropping arrangement was made between blood relatives that might evade the pervasive moral hazard problem in such tenurial arrangements. In addition most of the share cropping recipients was near landless and the productive use of the land is the only-option for them to meet their food security. The results of technical inefficiency model showed that, with the exception of slope other plot level characteristics which include; soil type and soil quality have significant positive effect on technical efficiency. While receiving land certificate, investment on soil conservation measures significantly reduces technical inefficiency, shallow soil depth has positive effect on technical inefficiency. The result accentuates that; the government should encourage temporal land transfer from less productive to efficient and from land surplus to land constrained households through land market.

Key words: Smallholder, stochastic frontier, technical efficiency, land tenure reform.

INTRODUCTION

The overwhelming population of Ethiopia are residing in rural area and eke out a living from farming. Arable land is becoming scarce and precious and the per capita landholding showing a consistent and declining trend. Over the last four decades the per capita land holding has shown a half cut (Jayne et al., 2002). Ethiopia is the only country in Sub Sahara Africa where its land policy remains static after the radical 1975 land reform which nationalized all rural land and made a state property. The 1975 land reform has brought mixed outcomes in the country. On the one hand, it abolished the exploitative tenant-landlord relationship and provided tenants'

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usufruct (non-free hold) right to land. In this regard, the reform was applauded for its egalitarian distribution of land and social justice.

However, its long term significance in improving the agricultural sector growth had fell short of the expectation mainly due to tenure insecurity and misguided socialist policy. Following the down fall of the Derg regime in 1991 a contested debate was opened on land policy among scholars, policy makers and donors. The debate has largely been carried out along two antagonistic arguments concerning property rights to land which include; privatization versus public land ownership (Samuel, 2006).

The Federal Democratic Republic of Ethiopia (FDRE) government has maintained the status quo of state landownership and overruled the privatization of land. The constitution which was erected in 1995 reaffirms the state ownership of land in Ethiopia (FDRE, 1995). It continues its predecessor regime land policy whereby only usufruct rights are bestowed upon landholders while the state enjoys eminent domain. The usufruct rights exclude the right to sell or mortgage the land. The government justifies its decision from the point of view of protecting farmers from losing their holding by distress selling and to avoid the possibility of resurgence of tenancy through land concentration on the hands of the wealthy.

Although the government position has attracted some support it has been attacked by advocates of a privatization of land. The latter argued that, state ownership of land prevents the development of a land market that facilitates the transfer of land to most efficient users, discourages farmers to invest on land, and thereby holds down land productivity as well as encourages unsustainable land use practices. At the heart of the land policy debate the government of Ethiopia introduces land proclamation at federal and regional level (FRLAUP, 2005; OR, 2007; SNNPR, 2007). The major departure in the new land proclamation ranges from decentralization of land administration to regional level to the introduction of land certificate to improve tenure security. It also allows land rental market and share cropping which is outlawed in the previous regime. The present study proposed to fill two gaps. First, it investigates the technical efficiency among the different landownership arrangements[1]. Secondly, it provides policy feedback for further refinment of the existing land policy.

METHODOLOGY OF THE STUDY

Background of the study area

The study was conducted in two regional states of Ethiopia which are; Southern Nation Nationalities and Peoples Region (SNNPR) and Oromiya Regional State (ORS). Three districts, one from the former and two from the later state were selected for the study. Shashemene and Arisi Negele districts were selected from Oromiya region for their importance as active trading centers along the main road to the capital city, Addis Ababa. The land pressure and conversion of land into non-agricultural purposes is likely to be higher and the land market is also assumed to be dynamic. The third district, Meskan, was selected from the southern region for comparison purpose, the area is also being known for land scarcity and land market was expected to be active in this woreda, and which may facilitate collection of valid and authentic information from the sample farmers.

Sample and sampling design

A multi stage random sampling techniques were employed in selecting the samples. In the first stage districts were selected purposefully. In the second stage eleven Peasant Associations[2] (PAs) were selected purposefully from the three districts. In the third stage a sampling frame was prepared comprising all households resides and cultivating farm land that is, own land or leased-in or share cropped-in land. A total of 394 households were selected using simple random sampling techniques.

Well structured and pre-tested questionnaires were used to elicit information from the selected sample households and their operational farm plots pertain 2007 to 2008 production year (mainly main season following June to August monsoon and whenever appropriate the small season which follow after the shower of March to April rain). A structured questionnaire which had three actions was used for the purpose. The first section was designed for collecting basic household socioeconomic information such as demographic, consumption, expenditure and marketing activities. The second section covered all the relevant information from individual farm plot such as input use and output levels, investment, land rental activity etc.

The plot level data also complemented with the information obtained from land certificate. The last one is partner schedule which was meant to collect information from land market partner to the main sample households. All information concerning the farm plots which were rented out by the main sample household to the land market during the 2007 to 2008 production year was collected by using partner questionnaire. A total of 1786 plots[2] (owned and rented in/share cropped in plots) were covered in the analysis. While rented in/share cropped in plots information were obtained from the main household, information regarding rented out/share cropped out plats were obtained from partner households (tenants). Hence, the partner households are identified after information was obtained on the status of the plot from the main household.

Analytical procedure

In this study, stochastic prduction function (SPF) was employed. The most important advantage of SPF approach is that, it allows for

[1]The federal land proclamation of 2005 states that, land redistribution may be used in relation to irrigation investment to ensure equitable distribution of irrigable land and land of deceased without hire will be distributed to landless. OR and SNNPR also adapted the two federal land proclamation cases of land redistribution in their 2007 land proclamations.

[2]Peasant Association refers to the smallest administration unit in Ethiopia. It was formed during the former socialist regime for the mobilization of rural community and to facilitate the trickle down of socialist ideology. Basically, peasant association has similar size. However, the population size is different from one peasant association to another as historically more people settled in fertile areas. Peasant association continued as the smallest administrative unit in the current regime too. [4]The price of agricultural commodity this year affects the supply (production) on the same commodity in the following year. Market guilt occurs when food aid or import coincides with harvest time affect pricing wrongly.

the introduction of statistical noise resulting from natural events which are outside the control of economic agents' such as the incidence of drought which is common in Ethiopia and other factors including market guilt[3] and luck. The SPF treats the disturbance term (ε) as being comprised of two components which are; standard independent statistical noise term (υ) and one sided non-negative random disturbance (μ), that is, ε = υ- μ. The white noise component, υ, that accounts for non idiosyncratic random effects, stands for a systematic error term assumed to be indenpendently and identically distributed (iid) as N[0, σ^2_u). The second error term, μ, represents systematic effects that are not explained by the production fucntion and therefore are attributed to the agents' technical inefficiency. The inefficncy term μ is one sided since if μ = 0, the agents would be lying on the production frontier, obtaining maximum production given the level of inputs. Where as, if u_i >0, then, the agents would be operating at some level of technical inefficiency. The inefficiency effect term assumed to follow 'half normal[4]' being identically and independently distributed as N|(0, σ^2_μ)|.

Following Farrell's (1957) techncial efficiency (TE) notation, a measure of TE for any given economic agent i would be given by the following ratio:

$$TE_i = \frac{E(Q_i \mid \mu_i, x_i)}{E(Q_i \mid \mu_i = 0, x_i)} \quad (1)$$

Where, Q_i, x_i and μ_i are the vectors of output, input and ifnefficiency effect terms, respectively. Intern, the general stochstic frontier production function is usually defined by:

$$Q_i = F(x_i; \beta)\, \varepsilon^{(v_i - \mu_i)} \quad (2)$$

Despite its well known limitation, a Cobb Douglas type of production function is used in the present study. Taylor et al. (1986) argued that, as long as interest rests on efficiency measurement and not on the analysis of the general structure of the production technology, the Cobb-Douglas production function provides an adequate representation of the production function. Moreover, in one of the very few studies examining the impact of functional form on efficiency, Kopp and Smith (1980) concluded that, "the functional specification has a discernible but rather small impact on estimated efficienc" (pp. 1058). That is why the Cobb-Douglas functional form has been widely used in farm efficiency analyses both for developing and developed countries (Battese, 1992; Coelli et al., 1998).

In the present study, technical efficieny analysis was computed at plot level. Since the status of the plot pricesely defined whether it was cultivated by owner operators or tenants, it enabled us to examine perfomence of technical efficency across various tenacy arrangements. The emperical model for plot level production function is specified as follows:

$$\ln Q_i = \beta_0 + \sum_{i=1}^{7} \beta_i \ln X_i + v_i - \mu_i \quad i=1,2,\ldots 7 \quad (3)$$

Where, Q_i is the dependent variable in the production function showing total output value for the i^{th} plot. ln represents the natural logarithm. Both the output value in ETB and inputs quantity are expressed in logarithms. Six input categories are defined as explantory vaiables in the production function. X_i is a vector of k inputs used in the production of i^{th} crop and it is defined as follows:

x_1 = quantity of manure applied (kg/M^2), x_2 = draft animal power used in pair (oxen days), x_3 = fertilized applied (kg/M^2), x_4 = family labour (person day), x_5 = size of plot in ha, x_6 = value of seed (ETB[5]).

β_is'are unknown parameters to be estimated and V_i and U_i are random error term and non-negative random variables associated with technical inefficiency respectively. U_i is assumed to be independetly distributed such that, the technical inefficiency effect for the i^{th} plot is obtained by truncation (at zero) of the normal distribution with mean μ_i and σ^2 such that:

$$u_i = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + \delta_6 Z_6 + w_i \quad (4)$$

Where, Z_1 = represent a dummy variable for plots registration in land certificate (1 = if it is registered in the land certificate, 0 otherwise), Z_2 = represent the soil type (1 = black, 2 = Dark brown, 3 = red, 4 = white, 5 = sandy), Z_3 = soil depth (1= shallow, 2 = medium 3 = deep), Z_4 = slope (1 = plain, 2 = foothill 3 = midhill 4 = steephill), Z_5 = plot qulaity (1 = poor 2 = medium 3 = good 4 = very good) Z_6 = dummy variable showing the presence or absence of soil conservation parcatice (1 if soil conservation structure is constructed, other wise 0).

The δ's are unknown parameters to be estimated. w_i is composed of υ_i and u_i as defined earlier. It is assumed that, some farmers produce on the frontier and others do not. For this study the parameters of Equations 1 and 3 were estimated using the Maximum Likelihood (ML) method, following the likelihood function estimation by Battese and Corra (1977). Where, $\sigma^2_s = \sigma 2 + \sigma^2_v$ and $\gamma = \sigma^2 / \sigma^2_s$, and σ^2_u is the variance of u_i and σ^2_v is variance of υ_i. And γ is defined as, the total variation of output from frontier which can be attributed to technical (in) efficiency.

RESULTS AND DISCUSSION

The prevailing tenancy structure

The sample households were found operating in eight types of tenancy structures. The majority (66%) was pure owner operator who cultivates their own farm holdings while the rest of 34% of households participated in the land rental market as a tenant or lessee or both. About 46% of the household participated in the share cropped type of tenancy while 40% of households took part in fixed rental land market. The remaining 14% was participated in both fixed and share cropped rental market. Examination of the tenancy structure shows that, of all the households that participated in the land rental market, 50% of the respondent household were situated at the demand side whereas, 46% participated as

er, the population size is different from one peasant association to another as historically more people settled in fertile areas. Peasant association continued as the smallest administrative unit in the current regime too. [4]The price of agricultural commodity this year affects the supply (production) on the same commodity in the following year. Market guilt occurs when food aid or import coincides with harvest time affect pricing wrongly.

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[5]Plot in this study refers to a specific parcel of land allocated for the production of one type of crop or intercepting. In the latter case most inputs are commonly used as the result the figures are divided equally for the two crops while yield data is collected separately.

[6] ETB refers to Ethiopian Birr. Birr is the name of Ethiopia currency.

Table 1. Type and structures of tenancy (%).

Tenancy type	Household level (N = 394)	Plot levels (N = 1786)
Pure owner operator	65.99	83.76
Fixed rent tenants	5.84	4.03
Fixed rent lessors (land lord)	7.87	3.70
Share tenants	8.88	4.70
Share lessors	6.60	3.81
Fixed and share tenants	2.28	-
Mixed (lessors and tenant)	1.27	-
Fixed and share lessors	1.27	-
Total	100	100

supplier of land. Only 4% of the household were participated at both supply and demand side simultaneously. The plot level data reveals that out of the total 1786 plots, 290 plots (16%) were supplied to the land rental market. For the details of input-output information at plot level and the major crops grown in the study area refer Table 1A and 2A of the appendix (Table 1).

The land tenure structure most often indicates the level of land rental market participation and the direction of tenancy. Swamy (1988) and Chattopadhyay and Ghosh (1983) has shown that, the term and structures of tenancy prevailing in a given area influence the condition of demand and supply in the land lease market. The demand for land is a function of labour endowment that is, the extent of unemployed or underemployed family labour within the tenant household in relation to landholding size. The terms of tenancy such as arrangements of inputs allocation and output sharing in share cropping and also obligation of tenants and the duration of contract in the fixed rental market influence the demand for land.

The supply of land on the other hand depends upon the state of the art or methods of cultivation and the ground rent in relation to the marginal product of investment through direct cultivation. Under perfect condition tenancy equilibrium is attained, when the marginal product of capital equal to rent and when wage rate is equal to the excess of marginal product of land over rent while the former make the landlord indifference between self cultivation and renting out the latter makes the tenant indifference between renting in and working as labourers.

However, in most of the cases the land and labour market are less than been perfect and it prevents these conditions to be happened. The actual scenario is that, there are too many aspirant tenants at the demand side and few landlords are at the supply side. Hence, the land rental market is characterized by near monopoly at the supply side and near perfect competition at the demand side. However, when the landlord is poorly endowed with resources and rent out land under distress situation to respite this situation or due to lack of labour employment as in the case of the study areas, the supply and demand of land governed by not as such due to surplus or deficit of land at household level but due to the prevailing interlocked (such as social capital, resource transfer) and imperfect factors market (credit and labour).

Estimates of parameters for SFP function and inefficiency determinants

In the present study prior to proceeding to the analyses of technical efficiency and its determinants (Table 2); the presence of technical inefficiency was detected. The test was carried out by estimating stochastic frontier production function and conducting a likelihood ratio test assuming the null hypothesis of no technical inefficiency. The test statistics confirmed that the inefficiency component of the disturbance term (u) is significantly different from zero at 5% level suggesting that the null hypothesis of the technical inefficiency is rejected. Hence in the production input-output data for plot level inefficiency exist and it is indeed stochastic. The value of gamma (γ) (Table 2) further indicates that, there is 38% of variation in output is due to technical inefficiency. This means that, technical inefficiency is likely to have an important effect on in explaining output among the plots in the sample[6].

Following a one step approach of Coelli (1996), a stochastic frontier production function was estimated using Cobb-Douglas formulation where, the natural logarithm of output value per hectare is considered as dependent variable. In plot level crop production, technical efficiency is likely to be affected by a wide range of plot level characteristics, plot ownership (tenancy), tenure security and plot level investment in conservation measures.

The result as presented in Table 3 indicates that, the coefficients which denote the output elasticity of inputs

[7]Therefore, Maximum Likelihood Estimate (MLE) gives appropriate results rather than ordinary least square estimator (OLS).

Table 2. Detecting the presence of inefficiency.

Explanatory variable	Coefficients	Std. Err.	Z
Manure	0.006	0.009	0.66
Seed	0.114**	0.054	2.08
Fertilizer	0.050***	0.009	5.58
Draftanimal	0.425***	0.050	8.46
Plotsize	0.496***	0.047	10.54
Tlabout	-0.033***	0.013	-2.67
_constant	1.432***	0.203	7.06
Number of observation	1786		
Wald chi-square (χ^2) (6)	2196.13		
Prob.>chi2(6)	0.000		
σ^2_v	0.328	0.028	
σ^2_u	0.203	0.095	
$\sigma^2 = (\sigma^2_u + \sigma^2_v)$	0.532	0.058	
$\lambda = (\sigma^2_u / \sigma^2_v)$	0.787	0.121	
$\gamma = \frac{\lambda^2}{(1+\lambda^2)}$	0.382		
Likelihood-ratio test of sigma _u = 0: chibar2(01)	2.65**		

*** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level.

Table 1. Plots level estimate of stochastic frontier for C-D type production function.

Variable	Coefficients	Standard error	t-ratio
Constant (β_0)	2.72	0.153	17.75***
ln manure (β_1)	0.001	0.009	0.038
ln draft animal (β_2)	0.514	0.039	13.18***
ln fertilizer (β_3)	0.598	0.009	4.89***
ln family labour (β_4)	0.044	0.049	12.27***
ln seed (β_5)	-0.010	0.012	-0.877
ln plot size (β_6)	0.277	0.027	2.84***
Technical inefficiency			
Constant (δ_0)	-5.260	3.526	-1.92**
ln land certificate (δ_1)	-1.736	0.752	-2.31**
ln soil type (δ_2)	-1.796	0.911	-1.97**
ln soil depth (δ_3)	0.533	0.251	2.13**
ln slope (δ_4)	-0.092	0.254	-0.364
ln plot quality (δ_5)	2.632	1.120	2.35**
Lnadoption conservation (δ_6)	-0.850	0.402	-2.12**
$\sigma_u/\sigma_v = \lambda$	0.590		
$(\sigma^2_u + \sigma^2_v) = \sigma^2$	0.532	0.401	3.56***
σ^2_u	0.203		
σ^2_v	0.329		
Gamma (γ)	0.382	0.071	10.47***
Log likelihood	-1756.1		
N	1786		

*** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level.

included stochastic frontier estimation were all positive except for seed. The negative sign for value of seed has indicated that farmers have over expended for seed. This is quite often the case as in mixed farming areas of

Table 4. Technical efficiency of plots under different tenancy arrangements (N %).

Technical efficiency	Technical efficiency				
	Owner operated plots	**Rented in plots**	**Rented out plots**	**Share in plots**	**Share out plots**
Below 75	238 (16)	2 (2.78)	7 (10.6)	10 (11.9)	5 (7.35)
75.1 to 90	1242 (83)	69 (95.83)	59 (89.4)	72 (85.7)	61(89.71)
Above 90	16 (1)	1 (1.34)	0	2 (2.4)	2 (2.94)
Mean	0.8071	0.8362	0.8063	0.8152	0.8238
Loss of output value due to inefficiency (ETB)	19.31	16.38	19.37	18.48	17.62
N	1496	72	66	84	68
F statistics	4.05***				

*** Significant at 1% level.

Ethiopia farmers exceed the normal seed rate for some cereals to thin out later to feed their animals as green fodder. The positive and significant value for other inputs implies that there is scope for increasing plot level productivity of crops in the districts under study. Fertilizer, draft animal and land come as the most important factors of production with elasticity of 0.598, 0.514, and 2.77, respectively. This implies that, ceteris paribus, an increase in the extent of fertilizer application, increase in oxen days and cultivable plots under crop production would significantly lead to increased output of crops. Similar results are reported by Barnes (2008) and Basnayake and Gunaratne (2002) among Scottish cereal producers and Sri Lanka tea smallholders respectively. The returns to scale (RTS) value, 1.424[7] obtained from the summation of the coefficients of the estimated coefficients of elasticity confirm that, plot level production in the study area is in Stage I of the production frontier. This stage is characterised by increasing return to variable inputs (Table 3).

Plot level technical efficiency

The model overall explanatory powers are good with significant log likelihood ratio test ($\chi^2 = 21.51$, $p < 0.05$). The null hypothesis which specifies the technical inefficiency effect is not present ($H_{o:}$ γ=0) can be rejected as the gamma value 0.38 is significant at 1% level implying that inefficiency exist and is indeed stochastic. The estimated value of σ^2_u and σ^2_v were 0.204 and 0.329, respectively. The estimate of the total error variance sigma square (σ^2) value of 0.532 implying that, 53% of the difference between the observed and the maximum possible production for the plots considered are due to existing differences in the technical efficiency levels or management practice among the producers.

The value of gamma (γ) further indicates the presence of inefficiencies in the production of crops. In other words, about 38% of the difference between the observed and the frontier output was mainly due to the inefficient use of resources, which are under the control of farmers. The result corroborates with the findings of Rama Rao et al. (2003), Bhende and Kalirajan (2007) from India, Kariuki et al. (2008) from Kenya; Getu (1997), Ahmed et al. (2002), Gavian and Ehui (1999); Tesfaye et al. (2005); Kassie and Holden (2007); and Bamlaku et al. (2009) from Ethiopia, they reported the prescience of inefficiency in smallholder farming. Table 4 shows the frequency distribution of estimated technical efficiency and mean plots efficiency by tenancy types.

The results of technical inefficiency model shows that, except slope all plot level characteristics and other explanatory variables included in the model have significant effect on technical efficiency. Receiving land certificate, soil type and adoption of soil conservations have a significant positive effect on technical efficiency. On the other hand, shallow soil depth and poor soil quality have a significant negative effect on technical efficiency. Taking each of these technical inefficiency variables in turn we find that, receiving land certificate is significant (t-ratio = - 2.31), showing thatfarmers who received land certificate for their plots are more efficient than those who did not receive certificate. Soil type of the plot is also found to be significant (t =-1.970) which suggest that, black and dark brown soils contributes more efficient production than white and sandy soils. Soil depth is significant at 5% level (t = 2.13), supporting the argument that, shallow depth soil reduce technical efficiency (Tchale and Sauer, 2007). Likewise poor quality plot found to have a significant negative effect on technical efficiency in that owning poor quality plot lead to technical inefficiency.

As mentioned earlier, the technical inefficiency effect is significant; thus, the technical efficiencies of the sample

[8]The calculated value of return to scale (1.424) is tested for its statistical difference from constant return to scale using t-test approach. The result indicates that the calculated t value 2.92 is greater than the tabulated t value 2.447 at 5% level and 6 degree of freedom. Hence implying the hypothesis of constant return to scale is rejected at 5% level.

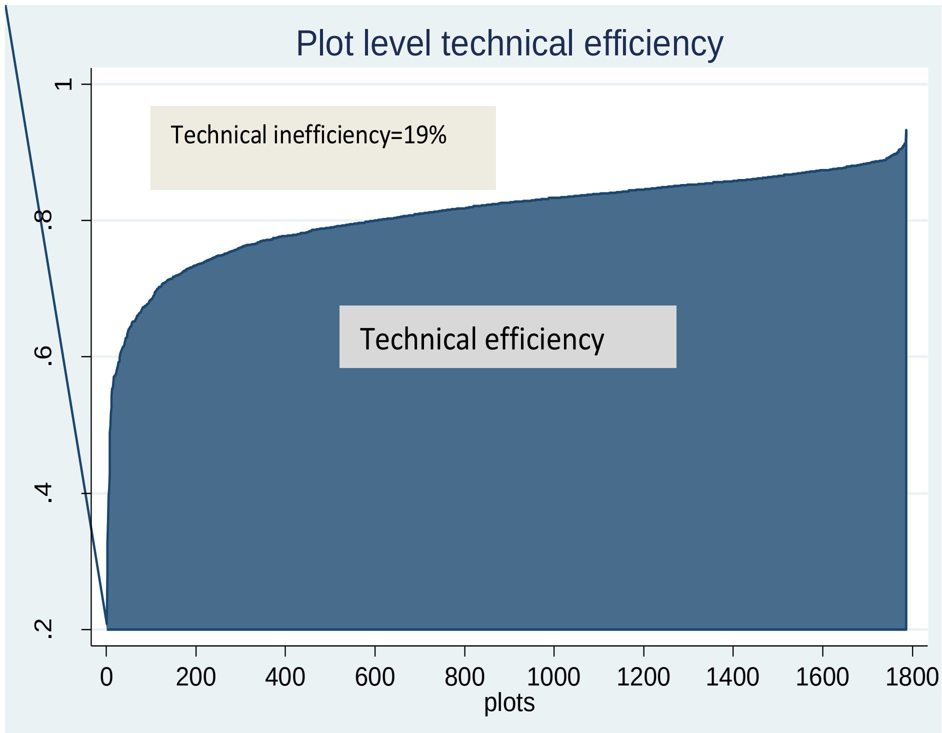

Figure 1. The cost of technical inefficiency.

households are equal to 1 when the plot level production was on the frontier or less than one. The cost accrued to the farmers due to the existence of technical inefficiencies is considerable, ranging from 7 to 79% in terms of loss of outputs value. The area bounded below the concave curve in Figure 1 indicates the technical efficiency, while the upper area represents technical inefficiency. The technical inefficiency area amounts about 19% in the output value on average due to technical inefficiency that can be bridged by efficient use of the existing resources under the prevailing.

Tenancy and plot level technical efficiency

In theory, technical efficiency level ranges between zero and one. The higher the technical efficiency value (close to one) the higher the efficiency of the farm (Coelli, 1994). The efficiency levels in this study ranged from 0.208 to 0.932[8] with a mean of 0.809. This implies that, if an average plot of land to achieve the efficiency of the most efficient counterpart, then the average operator would realize up to 13.2% more output from the same resources[9]. In terms of tenure structure the technical efficiency of the five types of tenancy were examined. The finding indicates that, rented in plots was found to have the highest technical efficiency level with a mean of 0.84. Contrary to the Marshalian conception of share tenancy as inefficient institutional arrangement we found both share in and share out plots were more efficient than pure owner operated with mean technical efficiency of 0.815 and 0.824, respectively. The possible explanation for the share tenant managed plots technical efficiency superiority over pure owner operated and rent out plots might be due to the tenancy arrangement was mostly done between blood relatives and in-laws and this might reduce moral hazard and associated disincentives. For instance Sadoulet et al. (1997), using data from a 1992 survey of three Philippine villages, test for efficiency differences across sharecrop contracts made among kin and impersonal sharecrop contracts and concluded that the technical efficiency of tenancy with kin was superior to that of non-kin. The absence of noticeable difference between share cropping and other tenancy arrangements was also reported by Ashok Rudra (1973) from India.

The observed technical efficiency difference among

[10]Getu (1997) measured the technical efficiency of farmer as well as plot level in Babile area of Ethiopia for 1993 and 1994 production seasons and he reported a technical efficiency ranged from 0.20 to 0.91 in 1993 and 0.30 to 1 in 1994 which is similar to the findings of this study.

[11] $\left(1-\frac{0.809}{0.932}\right)$

various tenancy structures was significant at 1% level indicating positive potential role of land rental market for efficiency (Table 4). It allocates land from less efficient owner operator to efficient tenants which are commendable policy implication from both equity and efficiency point of view. First, since both study regions dissociate from future land redistribution except for irrigated areas and with the community consent, the available best alternative is market oriented allocation of land and should be encouraged through appropriate policy intervention. Second, the existing land ownership inequality between the generation who benefited from last redistribution and the current generation who are near landless was overcome by land rental market. Despite the efficiency and equity merit of land rental market both Oromiyia and SNNP regions put some restrictions on the land market operation. In both regions landholder is allowed to lease out up to half of the land under his or her holding with the justification of protecting household food production. This means under the prevailing average land holding a farmer after leasing out is left out with 0.5 ha or less for self cultivation which is not viable and economical to use modern technologies on the face of chronic production risk (drought, infestation, market etc) and the prevailing methods of production.

In addition this restriction tied up farmers to a tiny parcel rather than contemplating alternative non-farm and migration livelihood options. This mainly because of the land policy is narrowly viewed food security from production perspective and this critically undermines the possibility of acquiring food security from non-agricultural livelihood options. In terms of duration of lease Oromiya region specified three years if the renter use traditional technology and 15 years if the renter uses modern technology. SNNP region relax the duration of lease out up to five years for users of traditional technology and up to 10 years if renter uses modern technology. From the point of view, crop production which enables to reap short term, benefit the lease period can be considered adequate but it can hampers long term investments in agriculture which normally requires longer gestation period.

Conclusion

The findings of this study showed that, there is efficiency gain as a result of land allocation through land rental market (both fixed and share cropping contracts). Contrary to the Marshalian conception of share tenancy as inefficient institutional arrangement, we found that, both share cropped in and out plots were more efficient than pure owner operated plots. However, the restriction imposed on the size and duration of land lease through the land proclamations in the study regions has constrained households from tapping the full potential benefit of land rental market.

The area of land that can be leased and the length of time the rental agreement lasts impede not only the land rental market efficiency but also labour mobility which consequently tied up households on farming sub-economic plots. Lifting the ceiling on the land area to be leased and relaxing the time limit on rental contract is an important step and can serve as a natural experiment to study the responses of households to such changes in terms of land transfer, its direction and the possible negative consequences before embarking to fundamental reforms like land privatisation. In addition removing the restriction on duration of lease will motivate tenants to invest on the land that can improve land management and overall efficiency.

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Appendix

Table 1A. Input and output level at plot level.

Variable	Districts			
	Shashamene	Arsi Negele	Meskan	All
Landholding size (ha)	1.12 (0.070)	1.33 (0.075)	0.78 (0.045)	1.11(0.41)
Output per ha (kg)	1397 (126)	1361 (70.4)	1024 (70)	1286 (58)
Weighted index output value (ETB/ha)	3373.93 (250.83)	3726.40 (98.35)	4013.94 (149.37)	3692.70(102.36)
Seed Value (ETB)	533.64(35.86)	543.87(27.48)	185.67(13.89)	448.84(18.92)
Manure (kg /ha)	875.4 (186.4)	217.4(43.4)	440.2(363)	988.2(312.7)
Draft animal (oxen days per ha)	107.00(2.12)	101.38(1.63)	130.69 (5.02)	111.99(1.784)
Fertilizer (DAP+UREA) (kg/ha)	72.83(4.64)	92.67(8.06)	41.70(4.13)	45.78(0.95)
Male labour allocated (person days per ha)	44.25(1.80)	43.78(0.85)	49.96(2.20)	45.78(0.95)
Female labour allocated (person days per ha)	33.69(2.12)	21.10(0.66)	30.62(1.82)	28.19(0.94)
Hired labour used (person days per ha)	5.63(0.38)	8.30(0.52)	6.80(1.12)	6.95(0.41)
Number of plots (fragmentation)	3.02(0.09)	3.68(0.12)	5.54(0.26)	3.91(0.10)
Total gross income (ETB)	7497.53(801.21)	9283.70(805.05)	6531.64(337.86)	7904.79(433.82)
Per capita income (ETB)	1245.23(114.62)	1397.71(109.91)	1226.66(103.92)	1296.60(64.83)

Figures in the table are mean followed by standard error (SE).

Table 2A. Plots allocation for crop production by districts.

Crop type	Districts			
	Shashamene	Arsi Negele	Meskan	All
Total plot numbers	600 (33.60)	654 (36.62)	532 (29.79)	1786 (100)
Wheat	68 (11.33)	168 (25.70)	24 (4.51)	260 (14.56)
Barely	13 (2.15)	28 (4.30)	12 (2.26)	53 (2.97)
Tef[12]	98 (16.32)	84 (12.90)	144 (27.12)	326 (18.25)
Sorghum	13 (2.15)	15 (2.30)	68 (12.81)	96 (5.38)
Maize	147 (24.50)	208 (31.80)	201 (37.78)	566 (31.13)
Haricot bean	16 (2.65)	13 (2.00)	68 (12.81)	97 (5.43)
Horse bean	1 (0.17)	13 (2.00)	5 (0.94)	19 (1.06)
Chickpea	3 (0.5)	-	-	3 (0.17)
Sweet potato	4 (0.67)	1 (0.15)	-	5 (0.28)
Chilli pepper	-	-	7 (1.32)	7 (0.39)
Potato	220 (36.67)	100 (15.30)	-	320 (17.92)
Kale	12 (1.99)	10 (1.54)	1 (0.19)	23 (1.29)
Cabbage	5 (0.83)	2 (0.31)	-	7 (0.39)
Onion	-	12 (1.84)	2 (0.38)	14 (0.78)
Enset	73 (48.32) †	31 (21.38) †	-	104 (5.82) †
Chat	-	-	17(17) †	17(0.95) †

Figures in the table are number of plots allocated for each crop followed by percentage. † indicate number of households.