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CONTRIBUTION OF RURAL NON-FARM INCOME TO TOTAL HOUSEHOLD INCOME: THE CASE OF TIGRAY, NORTHERN ETHIOPIA

ZAID NEGASH
UNIVERSITY PRESIDENT
ADIGRAT UNIVERSITY
ADIGRAT

ABSTRACT

By allowing for income diversification, the rural non-farm economy plays a crucial role in supplementing rural farm income and consequently helping for improved livelihoods and poverty reduction. This study is conducted to determine the contribution of rural non-farm income to overall income of rural households in Tigray, northern Ethiopia. Data for the study were gathered from a sample of 2463 rural households using a structured questionnaire undertaken in 2011. We principally used a descriptive method of analysis along with statistical tests of significance as well as the Lorenz Curve and the Gini Coefficient to measure levels of inequality. We found in the study that the contribution of non-farm income amounts to 24% of total income, which is smaller than the African average of 30-50% indicating that more needs to be done towards boosting the rural non-farm economy. Comparing female headed and male-headed households, we found significant difference in favour of male-headed households in terms of land holding size, farm income, non-farm income, and livestock possessions.

KEYWORDS

Tigray, non-farm income, gini coefficient, female-headed households.

1. INTRODUCTION

Rural non-farm activities include all those non-agricultural engagements that generate income to rural households. Non-farm activities help rural households (including the landless) to diversify their sources of income and improve their livelihoods. Also known as rural non-farm economy (RNFE), these activities may include petty trading, construction works, manufacturing works, handcrafts, service provision works, as well as wage employment. The terms off-farm and non-farm may appear to be confusing and sometimes difficult to differentiate. While the former relate to those activities undertaken away from the household's own farm, the latter refer to any non-agricultural activity that can be undertaken on or away from the household's own land (Davis, 2003; Hossain, 2004).

Farm households participate in non-farm activities to supplement their farm income. In many rural areas in Africa, agriculture alone cannot provide sufficient livelihood opportunities. On the other hand, abandoning rural areas in favour of migration to urban areas may not provide the required answer or it may not be a preferred option by policy makers in a bid to limit the worst effects of unplanned urban expansion. The rural non-farm economy can provide part of the answer to dealing with rural poverty and limiting unwanted rural-urban migration. Although agriculture is still the mainstay of the Ethiopia economy, rural non-farm livelihood diversification is believed to improve coping mechanisms of rural households by providing alternative and additional sources of income. Landless rural households, in particular, will largely rely on the non-farm economy as their major source of income.

Various studies indicate that rural non-farm activities contribute between 30-50% of household income of rural households in African (see Davis, 2003; Holden *et al.*, 2004). The rural non-farm economy is very important not only in terms of generating additional income to particular households but also in terms of lifting local economic growth through production linkages (Zaware, 2012) and employment effects. In view of this brief backdrop, the main objective of the study is to analyze the contribution of the rural non-farm economy to the total income of rural households in the northern Ethiopian region of Tigray. Moreover, we intend to evaluate the differences between male headed and female headed households in terms of ownership and household income.

2. DATA AND METHODOLOGY

Data for this study were obtained from a household survey containing a sample of 2463 rural households as summarized in the table below. The data were gathered from all six zones of the region and all 34 rural *weredas* (districts) using a structured interview conducted in 2011. Average household size of rural areas in the region was found to be 5.35 and it was bigger than the average family size of urban households which was computed as 4.25 (Fredu, *et al.*, 2011). The method of analysis utilized for this study is largely descriptive. In addition to the descriptive tables, we used statistical tests of significance as well as the Lorenz Curve and the Gini Coefficient to understand and test levels of inequality among male headed and female headed households.

TABLE 1: SAMPLE HOUSEHOLDS BY GENDER OF HOUSEHOLD HEAD

	Male Headed		Female Headed		Total
Zone	N	%	N	%	N
Central	467	77.4	136	22.6	603
Eastern	317	66.9	157	33.1	474
North Western	373	83.1	76	16.9	449
Southern	305	77.8	87	22.2	392
South Eastern	251	73.2	92	26.8	343
Western	166	82.2	36	17.8	202
Total	1879	76.3	584	23.7	2463

3. RESULTS AND DISCUSSION

3.1 AVERAGE LAND HOLDING SIZE AND NUMBER OF PLOTS OWNED

Rural and urban land as well as all natural resources is under public ownership in Ethiopia. The Ethiopian Constitution (Article 40) provides land use rights but not ownership rights. Selling and mortgaging of land are prohibited. Land happens to be one of the three most important resources at the possession of rural households in Tigray; the others being labour and livestock. Out of the total sample of 2463, some 185 households do not own land. This means that 7.5% of the rural households in the region are landless.

Farming plots owned by rural households are generally small and found in different locations. While this pattern may negatively affect land productivity in view of difficulties for investment, it, on the other hand, ensures some sort of equity by staggering land ownership among different areas of soil fertility within the particular village. Taking only those households possessing land, the average number of plots per household is found to be 2.05. Thus, on average, every household possesses around two plots of land.

TABLE 2: AVERAGE NUMBER OF PLOTS AND LAND HOLDING SIZE PER HOUSEHOLD BY ZONE

Zone	Number of plots owned			Land holding size (by *tsimad**)		
	N	Mean	Sd	N	Mean	Sd
Central	561	2.28	1.20	603	2.80	2.17
Eastern	425	1.97	1.18	474	2.83	9.51
North Western	423	2.01	1.08	449	4.88	5.75
Southern	373	2.08	0.87	392	3.58	3.84
South Eastern	329	2.17	1.00	343	3.37	2.24
Western	167	1.32	0.60	202	5.28	5.02
Total	2278	2.05	1.08	2463	3.59	5.52

* A *tsimad* is a local unit of land size amounting to about a quarter of a hectare

Perhaps more important than the number of plots is the actual land holding size. Keeping other factors constant, one can safely imagine that the larger the size of land a household owns the more the total produce it generates. However, land holding size in Tigray has remained small because the size of arable land in the region is quite small relative to population size, and more so in some zones than in others. One needs to note, in the meantime, that higher levels of land productivity can be attained by introducing appropriate technologies and, accordingly, reap higher levels of harvest even if land remains of relatively small size.

Alike to previous studies, this survey shows that average land holding size remains below one hectare per household. In precise terms, and including landless households, the average land holding size is reckoned as 3.59 *tsimad* (or 0.9[1] hectares) per household. There exists wide variation in terms of zonal land holding sizes as shown in the table above. Land holding size in the North West and Western zones is much higher than the regional average, while, on the other hand, households in the Central and Eastern zones possess much smaller sizes. The remaining two zones are much closer to the regional average.

Dividing the rural population into five groups in terms of landholding size, we obtain that the lowest 20% have an average ownership of 0.71 *tsimad* (0.18 hectare) per household. On the other hand, the highest quintile has an average ownership of 9.19 *tsimad* (2.3 hectares) of land per household. The remaining quintiles range between the two figures. We therefore observe that there exists wide disparity among rural households in term of landholding size.

TABLE 3: LANDHOLDING SIZE IN *TSIMAD* BY QUINTILES

Quintiles	N	Mean	Sd
lowest 20%	570	0.71	0.56
second 20%	480	1.99	0.04
third 20%	439	2.86	0.25
fourth 20%	549	4.24	0.51
highest 20%	425	9.19	11.38
Total	2463	3.59	5.52

Comparing land holding size of female headed and male headed households, we found that there exists significant difference in favor of male headed households as shown in the table below with a difference of one and a quarter *tsimad*. This is one of the factors that believed to have contributed to the fact that female headed households are poorer than their male headed counterparts.

TABLE 4: DIFFERENCE IN LAND HOLDING SIZE BY GENDER OF HOUSEHOLD HEAD

Households	N	Mean	Std. Err.	T
Male Headed	1879	3.88	0.1417	4.62***
Female Headed	584	2.67	0.1007	
Combined	2463	3.59	0.1112	
Difference		1.20	0.2603	

*** Significant at 1% level

3.2 LAND CERTIFICATION

As indicated above, land in Ethiopia is under public ownership. In a direction towards helping ensure land security, government policy allows for renting of land, transferring land use rights to legal heirs, and compensation for land improvements in case of expropriation by government or other bodies. The land certification practice in the country, which began in Tigray region in 1998/99 and later expanded to other regions of the country, is also designed as an additional move towards enhancing land security and, consequently, productivity (Holden *et al*, 2007).

TABLE 5: LAND CERTIFICATION BY ZONE

Zone	Plots without Certificate	%	Plots with Certificate	%	Total
Central	117	9.16	1160	90.84	1277
Easterm	68	8.23	758	91.77	826
North Western	81	9.55	767	90.45	848
Southern	107	13.79	669	86.21	776
South Eastern	143	19.97	573	80.03	716
Western	90	41.10	129	58.90	219
Total	606	13.00	4056	87.00	4662

As shown in the table above, about 87% of the plots held by households have certificates of holding. This translates to the fact that 4056 plots are issued land certificates out of the total sample plots of 4662. The number of plots without certificates is thus 606. Virtually all households possess land certificates for their land use rights. In comparative terms, Central, Eastern, and South Western regions have the highest proportion of certification while the Western zone has the least proportion of certification with 41% of the plots yet to receive certification.

3.3 CROP YIELD

The results here indicate the average crop output earned by households in quintals irrespective of whether they rent out or rent in land. In other words, it shows crop income by households in physical amount. Moreover, we have included all households whether they are land owners or landless. Consequently, we found that the average crop earning by households stands at 10.4 quintals in the current production year. This means that on average rural households obtained nearly ten and a half quintals of crop income in the current production year. As one can expect, the biggest share, i.e., 9.7 quintals or 93%, of the crop income is attributable to the *kiremt* (main rains) season while irrigation and *belg* (secondary rains) related income constitute only 7%; i.e., 0.7 quintals, of the total crop income. In other words, of the total crop harvest of 10.4 quintals per household, 9.7 quintals come from the main *kiremt* rains. Only 7% of the total crop harvest comes from irrigation and *belg* rains related agricultural activities.

In terms of zonal comparisons, total crop produce ranges from the lowest per household average of 7.24 quintals in the Eastern zone to the highest average of 15.57 quintals in the Western zone. In general, crop harvests in the Central, Eastern, and South Eastern zones are below the regional average while that of the North Western, Southern, and Western zones are above the regional average. Taking household level crop harvests mainly from irrigation but including *belg* related agricultural activities (i.e., non-*kiremt* harvest), we find that the Eastern zone, whose overall average output is smaller, has the highest produce of 1.53 quintals per household; with the lowest average coming from the South Eastern zone.

TABLE 6: CROP PRODUCE IN QUINTALS BY ZONE

Zone	Kiremt	Irrigation and Belg	Total
Central	7.45	0.53	7.98
Eastern	5.70	1.53	7.24
North Western	10.46	0.52	10.98
Southern	14.71	0.79	15.50
South Eastern	9.20	0.21	9.41
Western	15.22	0.35	15.57
Total	9.70	0.70	10.40

Although the main unit of analysis in this study is the household and our principal focus has been to obtain average crop income earned by households, this result can also be used to provide an indirect albeit rough estimate of productivity per unit of land. Accordingly, given the fact that average land holding stands at 0.9 ha per household, a simple manipulation shows that average land productivity stands at 11.56 quintals per hectare. However, this figure needs some adjustment as it assumes not only that land rented in and rented out are equal, but it also considers absence of fallowed land during the production season. Moreover, all households, including the landless, are included in the computation. Thus while keeping the assumption that land rented in and rented out are the same, if we exclude 3% of the crop land which is estimated to have been left fallow in Tigray during the same season (see CSA, Statistical Bulletin, May 2011) and leaving the landless out of our computations, we obtain a more realistic estimate of 13 quintals per hectare as average productivity of land. Similar productivity figures have been reported for Tigray by CSA (Statistical Bulletin, May 2010). According to this Bulletin, productivity per hectare of the major crops is given as: Teff (10.86), Barley (13.49), Wheat (15.6), Maize (12.72), Sorghum (18.07), and Finger Millet (11.48).

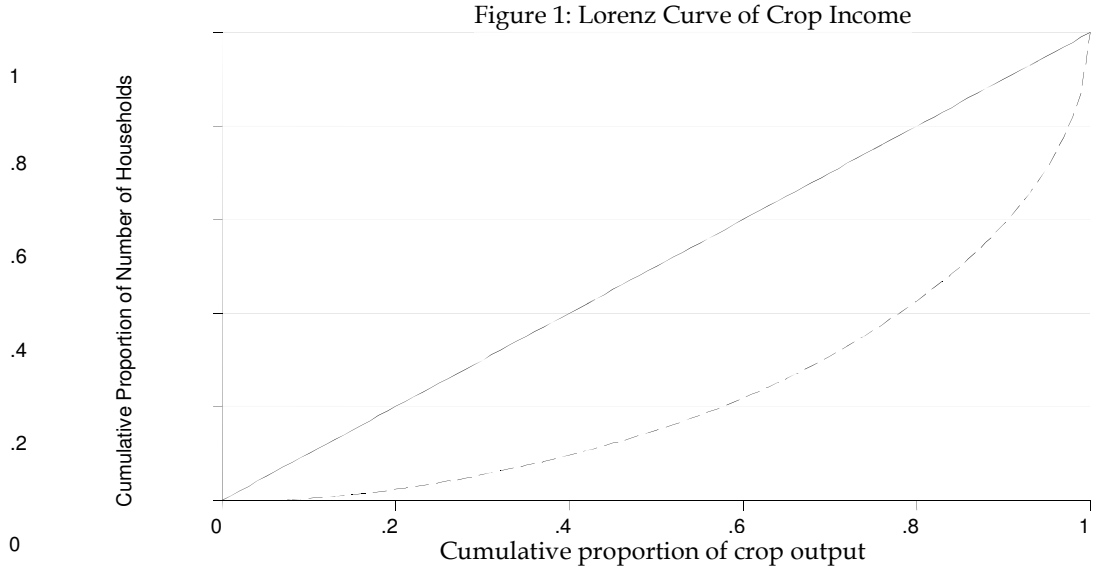
Putting crop output in deciles could give us a better picture into the level of inequality existing within the rural households. As summarized in the table below, out of the total crop harvest of 25622.24 quintals, the lowest 10%, which contains 248 households (i.e., 10% of the households) only get 81.08 quintals or 0.33 quintals per household. On the higher side, 9.9% of the households (i.e., 243) had an average crop harvest of 43 quintals per household. This means that while the lowest 10% obtained only 3% of the total output, the highest 10% earned 41% of the total produce. The remaining 56% of the output is shared among the other 80% of the rural population. Dividing the sample into the lower half and the higher half in terms of crop harvests, we find that the former had a share of 15% of the total while the latter had 85% of the total output. One can therefore conveniently see the existence of wider disparities among households in terms of their crop income. However, we need to note that crop income in physical units does not tell the whole story as it constitutes part of the total household income.

TABLE 7: CROP PRODUCE (QUINTALS) IN DECILES

Deciles	N	Sum	Mean
Lowest 10%	248	81.08	0.33
Second 10%	245	497.33	2.03
Third 10%	358	1258.94	3.52
Fourth 10%	215	1034.14	4.81
Fifth 10%	184	1060.31	5.76
Sixth 10%	247	1807.53	7.32
Seventh 10%	284	2776.33	9.78
Eighth 10%	198	2516.13	12.71
Ninth 10%	241	4141.77	17.19
Highest 10%	243	10448.69	43.00
Total	2463	25622.24	10.40

We can put the distribution indicated above in terms of the Lorenz curve for a graphical presentation. Accordingly, we find the following curve which gives us a good visual image of the level of inequality. The associated Gini Coefficient is also reckoned as 0.54 showing high level of income inequality in terms of crop output in physical units.

Figure 1: Lorenz Curve of Crop Income



Considering gender of household heads, we found significant difference (t=5.885) of average crop earnings with 11.52 quintals for male headed households and only 6.81 quintals for female headed households. One can understand that part of this difference can be explained by the fact that female household heads have significantly lower land holding sizes compared to their male headed counterparts.

TABLE 8: CROP OUTPUT BY GENDER OF HOUSEHOLD HEAD (t-TEST)

Households	N	mean	Std. Err.	T
Male Headed	1879	11.52	0.381	5.885***
Female Headed	584	6.81	0.751	
Combined	2463	10.40	0.343	
Difference		4.72	0.801	

*** Significant at 1% level

4. LIVESTOCK HOLDINGS

Agriculture in Tigray is typically of a mixed nature. Livestock holdings play crucial role in the livelihood of farmers. In fact, in most cases possession of livestock in general and oxen in particular is used as an important yardstick to define poverty levels of households with those having larger possessions considered as richer compared to those with a few or no possessions. Livestock holdings can be measured in terms of Tropical Livestock Units (TLU) where every animal is converted into its ox equivalent or in terms of their pecuniary value. The table below shows livestock holdings measured both in TLU and in monetary terms.

Considering TLU conversions[2], the results of the computations show that on average a rural household in Tigray possesses 3.17[3] TLU or oxen equivalent. Zonal comparisons show that South Eastern, Eastern, and Central zones have livestock possessions smaller than the regional average, with the South Eastern zone displaying the smallest average TLU possessions. Livestock holdings in the Southern zone are quite similar to the regional average. On the other hand, we have the North Western and Western zones whose possessions are much larger than the regional average.

TABLE 9: LIVESTOCK HOLDINGS IN TLU AND IN VALUE BY ZONE

Zone	N	TLU		Value (Ethiopian *birr*)	
		Mean	Sd	Mean	Sd
Central	603	2.89	2.03	8022.92	6646.19
Eastern	474	2.55	2.21	8013.76	8826.93
North Western	449	4.38	3.49	15758.82	14793.39
Southern	392	3.07	2.77	9907.69	11501.71
South Eastern	343	2.42	2.46	7105.31	9830.53
Western	202	4.25	4.99	20018.36	28576.74
Total	2463	3.17	2.97	10587.37	13546.94

Alternatively, and as stated above, livestock holdings can be measured in terms of their financial equivalent. This is reckoned based on the Ethiopian *birr (ETB)* value of each of the animals as provided by respondents in their nearest market areas. Accordingly, the average value of livestock holdings per household stands at Br. 10587.37. This means that on average a household in Tigray owns livestock assets whose monetary value amount to ten thousand five hundred Ethiopian *birr*. As expected, the North Western and Western zones have possessions much higher than the regional average and in the case of Western zone amounting to double of the regional average. South Eastern, Eastern and Central zones reported below regional average holdings.

5. NON-FARM INCOME

Another important source of income for rural households relate to earnings from non-farm activities. Three sources of income related to non-farm activities; namely, employment, small informal businesses, and transfers (such as remittances) are identified in the study as the principal income sources associated with non-farm activities. The survey results show that 41% of the households are involved in non-farm employment. This means that 41% of the sample households have one or more of their members participating in one or another type of wage earning jobs. Employment can take place within the same *tabia (*sub-district), *wereda* (district), zone, or though migration to other regions or even countries.

As shown in the table below, the proportion of households involved in some kind of non-farm employment varies from zone to zone. Zonal comparisons indicate that participation in non-farm employment ranges from a high of 62% in the Eastern zone to a low of 12% in the Western zone. We have above regional average levels of participation and income in the Eastern, Central, and South Eastern zones; and these happen to be the zones where crop output is below the regional average. Thus there appears to be an inverse relationship between crop output and participation in non-farm employment.

TABLE 10: HOUSEHOLDS INVOLVED IN NON-FARM ACTIVITIES

Zone	N	Non-farm employment			Number of HHs involved in informal businesses
		Number of HHs involved	% involved	Average number of days worked	
Central	603	305	50.58	74.53	102
Eastern	474	293	61.81	95.28	60
North Western	449	84	18.71	36.26	101
Southern	392	142	36.22	60.12	52
South Eastern	343	154	44.90	64.94	42
Western	202	25	12.38	24.52	42
Total	2463	1003	40.72	63.82	399

In terms of number of man days worked, the regional average stands at 64 indicating that on average every rural household spends 64 man days working on non-farm employment. In a similar fashion to the participation rate, Eastern, Central and South Eastern zones have average man days spent on non-farm employment larger than the regional average. Cash earning from non-farm employment also show similar results with Eastern, Central, and Southern zones securing average income levels above the regional average. In all three yardsticks (i.e., number of households involved, man days worked, and income), we have these three zones, whose average crop output in physical terms is smaller than the regional average, trying to compensate for the shortfalls through non-farm employment.

The other principal source of non-farm income is engagement in self owned and operated small businesses such as petty trade (grain, livestock, wood and charcoal, food and drinks, etc.) and handicrafts (including spinning, hairdressing, and embroidery). The average household income generated from informal businesses turns out to be ETB 2010.62 per year as shown in the table below. Zonal comparisons show that the average income generated from such informal businesses is higher in the North Western and Western zones.

In addition to income from non-farm employment and informal businesses, households obtained additional income in the form of transfer payments averaging ETB 140.29 per household per annum. Cash and non-cash transfers (including remittances, pensions, and inheritance) are used to compute total transfers; the latter converted into their cash equivalents.

TABLE 11: AVERAGE NON-FARM INCOME (ETB) PER HOUSEHOLD PER ANNUM

Zone	Non-farm Employment	Informal Businesses	Transfers	Total non-farm income
Central	1166.31	1416.48	162.02	2744.8
Eastern	1368.87	1410.38	230.43	3009.68
North Western	652.81	2973.96	48.88	3675.65
Southern	875.22	2138.05	178.33	3191.6
South Eastern	1087.52	1810.57	118.83	3016.91
Western	611.87	3143.82	29.7	3785.39
Total	1008.91	2010.62	140.29	3159.82

As with crop produce measured in physical units (i.e., quintals), total earnings from non-farm sources is higher than the regional average in the Western, North Western, and Southern zones. In the case of non-farm employment, though, the zones performing below average in physical crop produce are the ones with higher levels of participation and income as shown in the previous page.

A summary of all non-farm related earnings is provided by zones in the table above. The overall average earning from all non-farm sources is reckoned as ETB 3159.82 per household per annum. Using the average household size of 5.35, per capita income from non-farm sources stands at ETB 590.62.

It needs to be noted however that the distribution of non-farm income among households does not appear to be fair. The fact that the Gini Coefficient of non-farm income came out to be 0.66 shows the existence of high level of inequality in terms of non-farm earnings among households in the study area. In terms of gender, the t-test undertaken to test the extent of variation indicates the existence of significant difference in favor of male headed households (t=5.15).

TABLE 12: T-TEST OF NON-FARM INCOME BY GENDER OF HOUSEHOLD HEAD

Household Head	n	mean	Std. Err.	T
Male Headed	1879	3459.34	131.30	
Female Headed	584	2196.11	122.81	5.15***
Combined	2463	3159.82	104.86	
Difference		1263.24	245.28	

*** Significant at 1% level

Compared to the average monthly household income of ETB 1100.43 (or ETB 13205.16 per annum) obtained from the same survey (see. Fredu *et al.*, 2011), the average household non-farm income is found to be 24% of total household income indicating that rural households in the study area derive nearly a quarter of their income from non-farm activities. This finding indicates that the non-farm income obtained by households in the study area is smaller than the African average of 30-50% (see Davis, 2003). One can conclude, as a result, that there is greater room to improve the rural non-farm economy so as to help households enhance their livelihood and minimize the extent of rural poverty.

6. CONCLUSION

The rural non-farm economy helps rural households improve their welfare by providing opportunities for additional sources of income. Various studies indicate that rural non-farm income generating activities in Africa contribute 30-50% of household income. Using a sample of 2463 households in rural Tigray, the northern administrative region of Ethiopia, the current study found that the contribution of rural non-farm activities to household income stood at 24%, which is smaller than the African average. Moreover, we also found that male headed households are significantly better in terms of crop income, non-farm income, land holding size, and livestock holdings providing additional evidence to the fact that female headed households are poorer than their male headed counterparts.

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NOTES

1. The Agricultural Sample Survey Report on Land Utilization, of private peasant holdings, produced by the Central Statistical Agency (CSA, Statistical Bulletin, May 2011) shows strikingly similar figures for Tigray. According to this Bulletin and including all types of land use (crop and non-crop), the average land holding size for the whole country stands at 1.18 ha per household and the corresponding figure for Tigray is reported as 0.93 ha per household. Considering crop areas alone, the land holding size per household reported by the Bulletin shows average figures of 0.93 and 0.9 for Ethiopia and Tigray, respectively.
2. The TLU conversion factors used here are: ox (1.0), bull (0.75), cow (0.7), heifer (0.6), calf (0.33), sheep and goat (0.1), horse (0.8), mule (0.7), donkey (0.5), camel (1.4), poultry (0.01), beehive (0.33). For further reference see Dercon (2004) and Ramakrishna and Assefa (2002).
3. CSA provides number of animal holdings based on sex and age; it does not provide holdings in TLU. Our conversion to TLU based on animal holdings reported in the CSA Bulletin (February 2010) shows an average holding of 3.7 TLU. This is higher than our survey result, which stands at an average holding of 3.17 TLU.

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