Cereal Marketing and Household Market Participation in Ethiopia: The Case of Teff, Wheat and Rice

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Abstract:

Teff, wheat and rice are becoming important market oriented crops in Ethiopia. This study aims at analyzing the market participation of farm households, market actors, market channels and determinants of household market participation for these crops. Results are based on analysis of data collected from community and household surveys in three districts in three regional states of the country in 2005. Analysis of descriptive information and econometric analysis are used. About 65 - 77% of households produce these market oriented commodities, on about 27 – 44% of the total cultivated area. About 47 – 60% of the produce of these market oriented commodities is sold. The important market places for producers of these commodities are the district town markets and markets located at the peasant associations. Markets in other district towns or regional markets are not important for producers. Wholesalers and retailers are the most important buyers from producers. Average distance to market places for these commodities is about two walking hours. Econometric analyses showed that access to markets as measured by distance to market places does not have effect on market orientation of households in the study area. We find evidence of an U-shaped relationship between age of household head and market orientation of households in the cereal crops. Availability of cultivated land, traction power and household labor supply are important factors that induces households to be market oriented. The resource poverty of female headed households seems to detract from market orientation. While household size tends to favor food security objectives, number of dependents is associated with market orientation. Our results imply that improvements of markets to benefit producers need to be targeted at the district level. Improving the operations of factor markets of land, traction and farm labor could contribute to enhancing market orientation of farm households. Special attention is needed to female headed households to induce them to be market oriented.

Introduction

Subsistence agriculture is not a viable activity to ensure sustainable household food security and welfare (Pingali, 1997). In line with this fact, the Government of Ethiopia (GoE) has adopted commercialization of subsistence agriculture as the basis of the Agricultural Development-led Industrialization (ADLI) development strategy of the country. As a result of the economic reform that took place in Ethiopia in 1991, grain markets have been liberalized and restriction on grain trade have been lifted, and official pricing have been eliminated (Gabre-Madhin, 2001).

Economic development, coupled with rising per capita incomes, technological change, and urbanization is causing significant changes in food markets in developing countries (Reardon and Timmer, 2005). Ethiopia is not an exception. Commercialization of subsistence agriculture is a process and commercializing subsistence farmers do not instantly move on to high value crops. Often times, increased market orientation of staple crop production offers a more pertinent option to small holders, at least in the medium term until infrastructural facilities are developed to accompany the production, processing, transportation and marketing of high value crops. Commercial transformation of subsistence agriculture can not be expected to be a frictionless process, as it is likely to involve substantial equity issues (Pingali and Rosegrant, 1995). Small holders can be left out from benefiting from the commercialization process due to inadequate services and infrastructure, and new set of transactions costs that emerge from new market institutions and actors. Hence, governments and development agencies are confronted with the challenge of ensuring that small holders and the rural poor benefit from commercialization either by participation in the market or providing exit options for employment in other sectors. Understanding of the marketing behavior, market channels used and the determinants of market participation of small holders is required to aid in designing appropriate technological, policy and institutional strategies to

ensure small holders and the rural poor benefit from the process of commercialization. In spite of the policy decision of the GoE to commercialize subsistence agriculture, there is a dearth of information on the commercialization process and marketing behavior of small holders in Ethiopia. This paper attempts to contribute to redressing this gap of knowledge for the three market oriented cereal crops of teff (a grass-like staple food crop), wheat and rice.

Methods

Results are based on analysis of data collected from community and household surveys in three districts of Ethiopia in 2005. Data was collected from the three districts of Ada'a (about 45 km east of Addis Ababa), Alaba (about 310 km south of Addis Ababa) and Fogera (about 610 km north west of Addis Ababa). The study districts are areas where these crops are selected as market oriented commodities by the Improving Productivity and Market Success (IPMS) of Ethiopian Farmers project, implemented by the International Livestock Research Institute (ILRI) on behalf of the Ethiopian Ministry of Agriculture and Rural Development (IPMS, 2005). The data pertain to the 2004/05 production season. Analysis of descriptive information is used to determine the rate of market orientation, markets and market channels used by small holders. At community level, econometric analyses are used to analyze the determinants of the proportion of households who grow the market oriented commodities and proportion of area covered by these commodities. Interval regression models (with robust standard errors) and OLS models were used for these regressions. Interval regression model is a generalization of the Tobit model, and is estimable with robust standard errors (StataCorp, 2001). At the household level, econometric analyses are also used to analyze the determinants of household choice to produce these market oriented crops (Probit models) and the proportion of produce sold, a measure of market participation (interval regression models). Several factors affect market orientation of households by affecting the conditions of commodity supply and demand, factor and output prices, and marketing costs and risks faced by producers, traders and other market actors (Pender, 2006). Hence, access to markets, rainfall, agricultural labor wage, proportion of female headed households in community, population density, cultivated land per household, number of bullocks per household, other livestock holding per household, average altitude, availability of credit and market

information services in community are used as explanatory variables in the community level regression models (description of the hypotheses about the effect of these variables is not presented in this paper due to space limitations and can be obtained from authors upon request). At the household level, population density, access to markets, household characteristics (age and sex of head, household size, number of dependents, and household labor supply), wealth factors (land ownership, and ownership of livestock), involvement in extension program and access to credit during the previous year, and rainfall are used as explanatory variables in the regression models. A sample selection problem arises in the regression for the proportion sold by the household, since proportion sold is observed only for households who produce the crop. Hence, Heckman's two-step estimation procedure is used. The probability of growing the cereal crop was predicted in the first stage, a predicted value of the inverse Mills ratio (IMR) is obtained and the ratio included as an explanatory variable in a second stage regression (Maddala, 1983). However, since the second stage regressions for teff and wheat are censored regression (censored at both ends) the predicted IMR introduces hetroskedasticity because its errors depend on the values of the explanatory variables. Unlike in the linear model, hetroskedasticity results in inconsistent estimators (Maddala, 1983). In the second stage, interval regressions with robust to hetroskedasticity standard errors are used. The regressions for rice are not significant (perhaps due to small sample size) and are not reported. Identification of the second regression is an important issue. The problem of identification is resolved by finding variables that are correlated with the decision to grow a cereal crop, but not correlated with the decision to sell. Altitude and walking times to nearest milling service are used as instruments in the Probit model. Intuitively, these variables explain the decision to grow a cereal but not to market it. Altitude determines the suitability of the agro-ecology for the crop, while distance to milling service affects cost of consumption. Descriptive statistics of explanatory variables are given in Annexes 1 & 2.

Results and discussion

Marketing, market places and buyers

Teff

Teff has become an important market oriented crop in Ethiopia. In the study area, about 77% of households (or 485 households per peasant association (PA)) produce the crop, on an average of about 31% of the total cultivated area (or about 692 ha per PA). On average, among the households that produce teff, a household produces teff on about 1.5 ha.

About 60% of teff produce is sold, although there were significant variations among the districts. The proportion of teff produce sold ranged from 42–80 %. Results also indicate that areas where proportion of cultivated area covered with teff was lower showed significantly higher proportion of teff produce sold, indicating the relative role of staple food crops in market participation for particular crop.

On average across the study area, about 560 kg of teff per household was sold, with a monetary value of about Birr 1450 (USD 170.00). Analysis of the household market participation level showed that about 32% of households sold 46-60% of their teff produce, and about 25% of them sold more than 90% of their teff produce (Figure 1).

The average distance to teff market in the study area was 2 walking hours, although there were variations across the study districts. The most important market places for teff producers are the nearest market outside the PA (where about 42% of households sold their teff produce) and the district town markets (where close to 40% of producers sold teff) (Figure 2).

Markets outside woreda and regional markets are not important for teff producers in the study area. On average across the farming systems, about 65% of producers of teff sold to wholesalers, followed by retailers (31%), and only about 2% of teff producers sold directly to consumers (Figure 3). The role of rural assemblers and processors in the teff market chain is quite insignificant.

Hence, the most important market channels for teff producers appear to be producer → wholesaler, and producer → retailer → consumer. All teff is sold in cash.

Wheat

Like teff, wheat is also an important market oriented commodity. On average, wheat is produced by about 65% of the households (or 406 households per PA) on about 27% of total cultivated area (590 ha per PA).
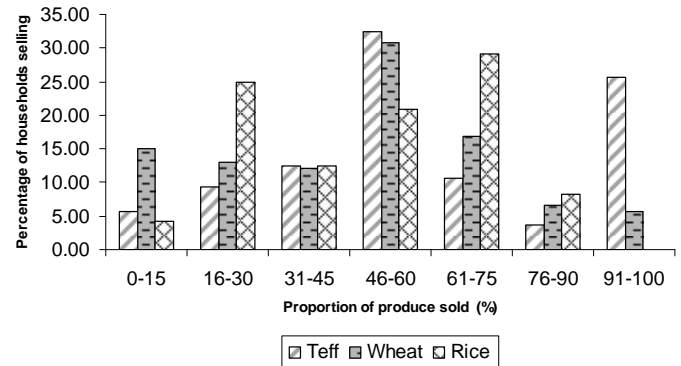

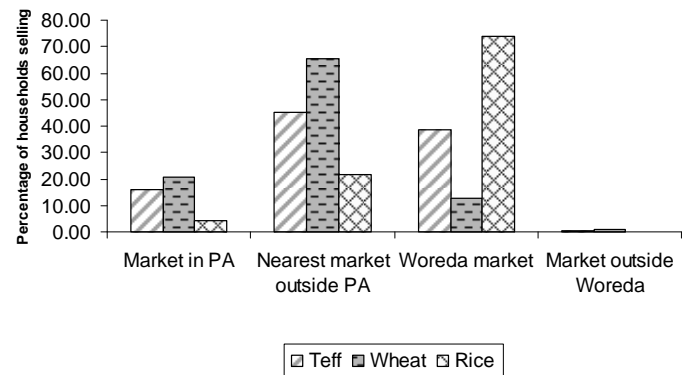**Figure 1:** Percentage of produce sold by percentage of households selling

Figure 2: Percentage of households selling at different markets
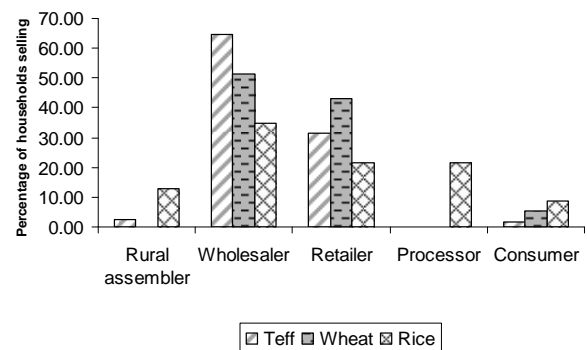

Figure 3: Percentage of households selling to different buyers

On average of up to 1.5 ha of land is allocated for wheat by a household. About 47% of wheat produce is sold (or about 600 kg of wheat per household) for a sales value of about Birr 1000.00 per household (ranging from Birr 640 to 1300). About 31% of households sold 46-60% of their wheat produce, while about 17% sold 61-75%, and about 10% sold 6% of their wheat produce (Figure 1). The average distance to market for wheat was 1.5 walking hours. The most important market place for wheat producers in the study are were the nearest market outside PA (where about 66% of producers sold their wheat), followed by markets in PA (where about 20% of producers sold wheat), and district town markets (where about 11% of producers sold wheat) (Figure 2). Markets outside woreda and regional markets are not important for wheat producers.

Wholesalers and retailers were important buyers for wheat producers. On average, about 51% of producers sold to wholesalers, 43% sold to retailers, and 6% sold directly to consumers (Figure 3). No producer sold to rural assemblers or processors. Hence the important market channels for wheat producers were producer → wholesaler, and producer → retailer → consumer. As with teff, wheat sale is effected only in cash.

Rice

Rice, which has relatively recently been introduced to Ethiopia, is also fast becoming an important market oriented crop in one of our study districts, in the Amhara region. About 72% of households (or 1225 households per PA) produce rice in the district, on about 44% of the total cultivated area (or 782 ha per PA). About 68% of households producing the commodity offer part of the produce for sale.

Among the households who produce the crop in the district, an average household produces rice on slightly more than half a hectare of land. About 50% of rice produced was sold (or an average of about 880 kg of rice) with a sale value of about Birr 1566. About 28% of households sold 61-75% of their rice produce, while about 26% sold more than 90% of their rice produce, and 22% sold 46-60% (Figure 1). The average distance to market place for rice was about 2 walking hours.

The most important market place for rice was the woreda market (where more than 74% of the households sell the commodity), followed by the nearest market outside PA (where 22% of households sold rice) (Figure 2). The market channel for rice seems to be broader than that of teff or wheat. About 35% of households sold to wholesalers, and 22% of households sold to retailers and processors each (Figure 3). While about 13 % sold to rural assemblers, the remaining 9% sold directly to consumers. Hence, The important market channels for rice producers appear to be : producer → wholesaler , producer → processor, producer →retailer → consumer, producer → rural assembler, and producer → consumer. As with teff and wheat, rice sale is effected only in cash.

Determinants of market participation

Teff

At the community level, proportion of female headed households is negatively associated with proportion of households who produce teff, while size of cultivated land per household is positively associated (Table 1). The resource poverty of female headed households (both in labor and capital) seems to detract from growing the market oriented commodity. Availability of cultivated land is associated with higher proportion of households producing the market oriented commodity, due to the land scarcity and also the land market imperfection that exist in the study areas. Amount of rainfall, wage of farm labor and availability of credit have significant effect on proportion of cultivated land covered with teff. Higher opportunity cost of labor as reflected in higher wage rates appears to induce communities to shift to market oriented commodities (Pingali and Rosegrant, 1995; von Braun and Kennedy, 1994). Availability of credit service, by easing liquidity constraints of households, also contributes to market orientation.

The negative association between rainfall and proportion of area covered with teff may be due to the water logging problem that results from high rainfall and black vertisols. Interestingly, non of the market access factors have significant impact on either the proportion of households who produce teff or the proportion of cultivated land covered by teff.

Table1: Community level regression results for proportion of households producing Teff (interval regression) and proportion of area covered (OLS) under Teff

Variable	Interval (proportion of households producing)	OLS (proportion of area covered)
Distance to nearest market place (km)	-0.0031 (0.0044)	-0.0009 (0.0022)
Distance to nearest market town (km)	0.0033 (0.0025)	-0.0004 (0.0012)
Rainfall (mm)	-0.0006 (0.0004)	-0.0011*** (0.0003)
Average adult male daily local wage (Birr)	0.0068 (0.0044)	0.0091*** (0.0033)
Proportion of female headed households in community	-1.0506*** (0.3033)	-0.2155 (0.1848)
Population density (persons/ha)	-0.0128 (0.0323)	0.0018 (0.0208)
Cultivated land per household (.25 ha/household)	0.0431* (0.0228)	0.0036 (0.0165)
Number of bullocks per household	-0.0087 (0.0157)	0.0139 (0.0087)
Number of other livestock per household	-0.0011 (0.0048)	-0.0016 (0.0029)
Average altitude (meter)	-0.0002 (0.0002)	0.00005 (0.0001)
If credit service is availability in the PA	-0.0132 (0.0555)	0.1053*** (0.0293)
If market information service is available in the PA	-0.0576 (0.0498)	0.0026 (0.0240)
Constant	1.7519*** (0.4035)	1.1009*** (0.2851)
Chi^2/F	79.77	26.36
Prob > Chi^2/F	0.0000	0.0000
R^2	-----	0.71
Number of observation	85	84

Household level regression analysis also shows that community level factors, household characteristics, and access to services are important in explaining household decision to produce teff and the rate of household's participation in teff market among those who produce the commodity (Table 2). The Probit model of household decisions to produce teff shows that male headed households, number of dependents in household, household labor supply, ownership of equines, involvement in extension and rainfall have significant positive effect on the probability of household producing teff. On the other hand, population density, household size, ownership of other cattle than bullocks, and altitude have negative significant effect. All significant variables have the expected signs.

Male headed households are more likely to produce teff because they are more resource rich compared with female headed households, and that teff requires relatively more traction power and labor compared to other crops. Higher number of dependents implies higher need for cash to cover household expenditures such as school fees and other expenses, inducing households to grow market oriented commodities. Teff is a laborious crop and households with higher familylabor supply are more likely to grow it, given the labor market imperfection in the study area. Involvement in extensions increases likelihood of growing teff, since Teff is one of the crops for which a few improved varieties are available from the national research system. Population density, as a proxy measure of land degradation in the highlands of Ethiopia is associated negatively with growing teff. Households with higher household size would have higher household consumption needs and perhaps are more likely to produce cheaper but more productive staple food crops relative to teff. Ownership of other cattle than bullocks appears to compete with teff production for resources such as labor.

An interesting association is observed between age of household head and probability of growing teff. There is a U-shaped relationship between age and probability of growing teff. The turning point on this relationship is 38 years, well with the age range of household heads in the sample.

Table 2: Household level regression results for decision to produce Teff (Probit) and proportion of produce sold (Interval regression)

	Probit (produce/ not produce)	Interval (proportion of produce sold)
Population density	-1.2129***(0.4035)	0.0676***(0.0211)
Nearest market place (km)	-0.1252(0.0883)	0.0023(0.0033)
Nearest market town (km)	0.0556(0.0525)	0.0001(0.0018)
Age of household head	-0.3641* (0.1903)	-0.0150*** (0.0057)
Age^2	0.0048** (0.0023)	0.0001** (0.0001)
Sex of household head	1.4820** (0.6134)	-0.0117 (0.0439)
Proportion of household heads literate	-0.9789 (0.6350)	0.0209 (0.0302)
Number of household size	-1.7346*** (0.6288)	0.0114 (0.0266)
Number of dependents	1.9483*** (0.7298)	-0.0167 (0.0297)
Number of labor supply	1.5934** (0.6556)	-0.0116 (0.0275)
Land owned (1/4 ha.)	0.0567 (0.0748)	0.0073** (0.0037)
Number of bullocks	0.8123** (0.3784)	0.0270** (0.0130)
Number of sheep & goats	-0.0485 (0.1090)	-0.0073* (0.0042)
Number of other cattle	-0.2373** (0.1211)	0.0016 (0.0059)
Number of equine	0.4072* (0.2373)	0.0237 (0.0174)
Number of local poultry	-0.0322 (0.0600)	0.0009 (0.0037)
Involvement in extension (2003/04)	1.7536** (0.7933)	-0.0725* (0.0389)
Access to credit (2003/04)	-0.7179 (0.8118)	-0.2513*** (0.0477)
Rainfall (mm)	0.0252*** (0.0084)	0.0010*** (0.0003)
Average altitude (meter)	-0.0108*** (0.0025)	----
Nearest milling service (km)	0.0885 (0.0561)	----
Inverse mills ratio (IMR)	----	-0.0065 (0.0585)
Constant	4.8645 (8.2649)	0.0574 (0.3742)
F	1.58	16.36
Prob > F	0.0609	0.0000
Number of observation	164	156

The U-shaped relationship between age and probability of growing teff indicates the learning required to be involved in teff production. Interval regressions of the determinants of the proportion of teff produce sold shows that population density, age of household head, ownership of land and bullocks, ownership of small ruminants, involvement in extension and access to credit the previous year, and rainfall have significant effect (Table 2). Population density is associated with higher proportion of teff produce sold, although it is negatively associated with probability of growing teff. Given the decision to grow teff, households in high population density offer higher amount of their teff produce to market, perhaps to cover for variable expenses such as fertilizer required to make up for the low soil fertility due to higher land degradation.

Interval regressions of the determinants of the proportion of teff produce sold shows that population density, age of household head, ownership of land and bullocks, ownership of small ruminants, involvement in extension and access to credit the previous year, and rainfall have significant effect (Table 2). Population density is associated with higher proportion of teff produce sold, although it is negatively associated with probability of growing teff. Given the decision to grow teff, households in high population density offer higher amount of their teff produce to market, perhaps to cover for variable expenses such as fertilizer required to make up for the low soil fertility due to higher land degradation.

Consistent with the result for the probability of growing teff, we also find an U-shaped relationship

between age and the proportion of teff produce sold. The turning point in this relationship is 65 years, within the age distribution of sample households. About 11% of household heads are 65 or more years old. Ownership of land and traction power are positively associated with selling higher proportion of teff, as expected, because of their effect on volume of production. Contrary to expectation, we find an inverse relationship between involvement in extension and access to credit the previous year, and proportion of teff sold, although involvement in extension is associated with higher probability of producing teff. Investigation of the nature of the extension service and the credit service are required to explain these unexpected results. Households who live in areas of higher rainfall sell higher proportion of their teff produce, perhaps due to the effect of rainfall on volume of production. None of the market access factors have significant impact on either the probability of household growing teff or the proportion of teff produce sold. The IMR is insignificant indicating little sample selection problem.

Wheat

At the community level, average wage of farm labor, cultivated land per household, and availability of credit have significant positive effect on the proportion of households who produce wheat, while proportion of female headed households and availability of market information in community had significant negative impact (Table 3). Similarly, wage of farm labor, ownership of traction power (bullocks), altitude and availability of credit in community are associated positively with proportion of cultivated land covered by wheat, while proportion of female headed households in community is negatively associated (Table 3). All variables except availability of market information service have the expected effect. As in teff, none of the market access factors have significant effect. Increased opportunity cost of labor induces households to be profit oriented and commercialize. Given the imperfections in the land market in Ethiopia, households with higher cultivated land tend to be more market oriented. Availability of credit services appears to play role in enhancing market orientation by easing credit constraint of liquidity constrained households. The resource poverty of female headed households (both in terms of labor and capital) appears to detract from market orientation of these households. A deeper analysis of the market information service provided at community level is required to explain the unexpected

effect of the variable, including possibilities of measurement error.

Household level regressions of the determinants of probability of producing wheat show that male headed households and households involved in extension program the previous year are more likely to produce wheat than female headed households and households not involved in extension (Table 4). On the other hand, literacy of household heads and access to milling service appear to detract from producing wheat. Literate households heads may be more likely to be involved in off-farm or non-farm activities.

Household level regressions of the determinants of the proportion of wheat produce sold show that age of household head, number of dependents, household labor supply, ownership of cultivated land, ownership of equines and poultry, and rainfall are significantly positively associated with proportion of wheat produce sold, while household size, and access to credit are negatively associated. All variables except credit access have the expected signs (Table 4). As in teff, there seems to be a U-shaped relationship between age of head and proportion of wheat sold, although the coefficient of age is insignificant. The turning point in the relationship is 36 years, well within the age distribution of household heads in the sample. Hence, proportion of wheat produce sold appears to pick up with households whose heads are at least 36 years old, indicating the learning period required for involvement in teff production for the market. Number of dependents increases the need for cash to cover expenses related to services associated with children. Availability of labor supply and cultivated land increase market orientation due to their effect on production as a result of imperfections in these factor markets. Equines are used for transportation of produce to market, thus reducing marketing costs to households who own them. Rainfall also increases proportion sold due to its effect on production. The negative association of credit service with proportion of wheat sold was not expected, especially since credit service is associated with higher proportion of households producing the market oriented crop and the proportion of area covered by the commodity.

Table3 : Community level regression results for proportion of households producing Wheat and proportion of area covered under Wheat

	Interval (proportion of households producing)	OLS (proportion of area covered)
Distance to nearest market place (km)	0.0001 (0.0057)	0.0006 (0.0019)
Distance to nearest market town (km)	0.0027 (0.0024)	-0.0003 (0.0009)
Rainfall (mm)	0.0007 (0.0007)	-0.0003 (0.0003)
Average adult male daily local wage (Birr)	0.0115* (0.0059)	0.0053** (0.0023)
Proportion of female headed households	-0.7242** (0.3188)	-0.1890* (0.1083)
Population density (persons/ha)	-0.0255 (0.0479)	-0.0057 (0.0123)
Cultivated land per household (0.25ha/household)	0.0851** (0.0262)	0.0071 (0.0101)
Number of bullocks per household	0.0099 (0.0267)	0.0207** (0.0102)
Number of other livestock per household	-0.0060 (0.0100)	-0.0051 (0.0035)
Average altitude (meter)	-0.0001 (0.0002)	0.0002** (0.0001)
If credit service is availability in the PA	0.1427** (0.0644)	0.0883***(0.0246)
If market information service is available in the PA	-0.1040** (0.0474)	0.0002 (0.0181)
Constant	-0.1271 (0.4695)	0.0446 (0.1934)
Chi^2/F	99.56	9.95
Prob > Chi^2/F	0.0000	0.0000
R^2	----	0.61
Number of observation	73	73

The IMR is insignificant indicating little sample selection problem.

Conclusions and Implications

Teff, wheat and rice are important commercial staple crops in the study areas. About 60%, 47% and 50% of teff, wheat and rice produce are sold, respectively. The average distance to markets where producers sell their produce is about 2 walking hours. The important market places for buyers are either those located at the district town or in the peasant associations (PAs) within the district. Markets outside the districts (markets at other district towns or regional markets) are not important for producers. Wholesalers and retailers are the most important buyers of these markets oriented commodities from producers. All sales are affected in cash.

Regression results both at the community and household level show consistent results. Access to markets as measured by distance to market places does not effect market orientation of households in the study area. Wage of farm labor, by increasing the opportunity cost of labor, appears to induce market orientation. Female headed households, perhaps because of resource poverty, are less likely to grow

market oriented cereal crops. Given the scarcity of land and the imperfections in the land market in the study area, availability of cultivated land is an important factor that induces households to grow the market oriented commodities. Similarly, ownership of bullocks as traction power and household labor supply induce market orientation. We find evidence of an U-shaped relationship between age of household head and market orientation of households in the cereal crops, indicating the need for a learning period before households embark on producing for the market. Larger households have higher household consumption needs, and so are more likely to grow cheaper but more productive subsistence crops. Number of dependents, through its effect on cash need to cover expenses related with dependents, appears to induce market orientation. The effect of extension and credit services is indeterminate. While availability of credit at the community level is positively associated with proportion of households who produce the market oriented commodities and the proportion of area covered by the commodities, household use of the credit service has negative impact on the proportion of produce sold. Deeper investigation into the nature of the credit is required to

Table 4: Household level regression results for decision to produce Wheat (Probit) and proportion of produce sold (Interval regression)

	Probit (produce/ not produce)	Interval (proportion of produce sold)
Population density	0.1595 (0.1980)	-0.0153 (0.0248)
Nearest market place (km)	0.0600 (0.0395)	-0.0087 (0.0053)
Nearest market town (km)	-0.0043 (0.0151)	-0.0025 (0.0025)
Age of household head	-0.0262 (0.0648)	-0.0097 (0.0081)
Age^2	0.0000 (0.0006)	0.0001* (0.0001)
Sex of household head	0.8672* (0.4426)	0.0043 (0.1000)
Proportion of household heads literate	-1.1162*** (0.3320)	0.0466 (0.0681)
Number of household size	0.1476 (0.2602)	-0.0940** (0.0377)
Number of dependents	0.0038 (0.2742)	0.0768** (0.0373)
Number of labor supply	-0.0433 (0.2543)	0.0792** (0.0391)
Land owned (1/4 ha.)	0.0393 (0.0382)	0.0116** (0.0046)
Number of bullocks	0.1449 (0.1053)	0.0238 (0.0182)
Number of sheep & goats	-0.0670 (0.0449)	-0.0022 (0.0093)
Number of other cattle	-0.0202 (0.0494)	-0.0024 (0.0069)
Number of equine	0.0222 (0.1434)	0.0658** (0.0303)
Number of local poultry	-0.0031 (0.0330)	0.0077* (0.0044)
Involvement in extension (2003/04)	1.0558** (0.4337)	0.0317 (0.0942)
Access to credit (2003/04)	-0.5129 (0.4479)	-0.4528*** (0.0812)
Rainfall (mm)	0.0040 (0.0050)	0.0010** (0.0004)
Average altitude (meter)	0.0014 (0.0013)	----
Nearest milling service (km)	-0.0722** (0.0341)	----
Inverse mills ratio (IMR)	---	0.0782 (0.1577)
Constant	-6.3820 (4.2356)	-0.0925 (0.5932)
F	2.14	9.22
Prob > F	0.0058	0.0000
Number of observation	138	106

offer explanations. Similarly, household involvement in extension service is positively associated with household probability of growing the market oriented commodities, but has negative impact on the proportion of teff produce sold. Our results imply that interventions to improve the gains to producers from the operation of the cereal markets must be targeted at the district level. Improving the operations of factor markets of land, traction and farm labor could contribute to enhancing market orientation of farm households. Special attention is needed to female headed households to induce them to be market oriented, by alleviating the constraints they face. The extension and credit services that were designed to achieve food security objectives need to be re-examined to adopt them to the policy of commercial transformation of subsistence agriculture Ethiopia is following.

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