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Commercialization of Smallholder Farmers in light of climate change and logistic challenges: Evidence from central Ethiopia

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ABSTRACT

Commercialization smallholder farmer has been taken as one of the frontline strategies to extricate the community out of poverty and distinguish the nation among the middle income economies for the past several decades. Investments have been geared toward the same with only little progresses in the endeavor. Market participation and degrees of commercialization still remains unsolved puzzle. This paper investigates smallholders' market participation, degree of commercialization and factors determining commercialization level using a survey of 453 HH in central part of Ethiopia. Household Commercialization Index (HCI) approach was used to measure degree of commercialization, while a double hurdle regression model was employed to identify the key determinants for market participation and degree of commercialization. The result indicates that significant proportions of HHs were still out of a product market and the degree of commercialization still remains very low. The policy recommendation is that government should focus on the boasting of production and productivity through fertility enhancements, improve access to market information through improved agricultural logistics, increased livelihood diversification, and build resilience to climate change induced shocks and stresses.

Key words: Degree of commercialization, market participation, double hurdle, Ethiopia

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INTRODUCTION

Given the livelihood options outside smallholder farming for the largest set of the population in developing countries and in recognition of the potential for market to unlock economic growth and development gave rise to market led rural development paradigm during the 1980s (Timmer, 1997). For this purpose policies were once again trending in favor to support smallholder farmers and their livelihood development as a key driver of poverty reduction. For several decades, attention was given to the improvement of production and productivity so as to pave the ways for smallholder commercialization. That was based on the evidences from around the word that smallholder farming, which is the predominant source of livelihoods was seen to be as efficient as larger farms when farmers have received similar support services and inputs (seed, fertilizer, and credit) so as to improve their production and productivity (World bank, 2007). That is why many countries and international development agencies were giving due concern to intensification and commercialization of smallholder farming as a means of achieving poverty reduction in their official policies (Leavy, and Poulton, 2007).

Agricultural sector contributes about 43% of the Gross Domestic Product (GDP), 80% of employment, and 90% of export (Demese et al., 2010). Smallholder farmers account for more than 85% of the rural population that relies on agricultural production. Ethiopia has liberalized its economy and developed poverty reduction strategies that underpin market-led strategies for broad based agricultural development and economic growth. Within the broader strategy, smallholder farming is believed to be the key to livelihoods of many rural households. Given the total sum of the population that directly and indirectly make their livelihoods from the sector; its development is viewed as a means to improve the living standards of smallholders and generate economic growth. However, the production is still characterized by low output, poor access to land, poor access to inputs, poor irrigation system, little access to know-how (risk management, technology, and skill), low level of market orientation, poor infrastructure and under developed institutions (Aman et al, 2014 quoted from Bezabih and Hadera, 2007; CSA, 2009; MoFED, 2005; Tilaye, 2010).

The Ethiopia's Growth and Transformation Plan I (GTP I) (2010/11-2014/15) retained agricultural sector growth as the prime driver of economic growth. The sector's strategy was further informed by the Agriculture Growth Program (AGP) and lessons drawn from implementation of the past development plans. The agricultural strategy directed on placing major effort to support the intensification of marketable farm products both for domestic and export markets, and by small and large farmers. Fundamentals of the strategy included the shift to produce high value crops, a special focus on high-potential areas, facilitating the commercialization of smallholder agriculture, and supporting the development of large-scale commercial agriculture where it was feasible. In order to ensure this transformation, ranges of public investments were set within the plan for continued scale-up of the successes registered in the past. Transparent and efficient agricultural marketing system were attempted to be strengthened. Investment in marketing infrastructure was also made to increase (FDRE, 2010). Similarly under current GTP II (2015/16 – 2019/2020) the same plan is made to mobilize all possible efforts to ensure adequate agricultural input supply and strengthen agricultural extension services, so as to boast productivity and then commercialization. This clearly indicates that agriculture continue to be source of growth and poverty reduction. Under the new plan, commercialization of agriculture is given due emphasis in preparation of the path to manufacturing industry led economic growth during the following 5 years' plan.

Smallholder commercialization typically leads to an increased diversity of marketed commodities at the national level and increased specialization at regional and farm levels. Markets allow households to increase their incomes by producing that which provides the highest returns to land and labour and then use the cash to buy household consumption items rather than being constrained to produce all the goods that the household needs to consume. In the long run, subsistence agriculture may not be a viable activity to ensure sustainable household food security and welfare. In this regard commercializing smallholder agriculture is an indispensable pathway towards economic growth and development of Ethiopian farmers in their progress out of poverty. Therefore, there is a need to identify the degree and driving forces of commercialization of smallholder farming and possible areas of intervention. Such analysis will help to design appropriate instruments, institutions and other interventions for sustainable economic development of smallholder farmers (Pingali and Rosegrant, 1995).

Even though smallholder commercialization as means of agricultural sector transformation in Ethi-

opia is said of received huge investment for many decades, and in spite of the increasing trend in food crop production, commercialization of smallholder farming is not yet high enough to enable farmers benefit from increased income and stimulate rural growth in the study area as well as in the country as a whole. Farmers are still undertaking subsistence farming and unable to cop up with price and climate change induced shocks and stresses. In view of this, the paper is devoted to address the following specific objectives: to examine households' market participation decision, measure the degree of commercialization among smallholder farmers, and to analyzes the determinants of smallholder commercialization.

METHODOLOGY

The Study Location

The study area is North Shewa Zone of Oromia national regional state. North Shewa Zone is found in north-west direction of Addis Ababa. Fiche town which is located at 147km away from Addis Ababa is the capital of the zone. The zone has 13 rural districts with a total land area of 10,323 km^2. It is situated between $9^0$30N and $38^0$40E. The zone is bordered by Amhara region in the north and the east, West Shewa zone in the west and Addis Ababa in the south. The topography of the area is mountainous in the highland and midland, while it is plain in the lowland areas. The altitude of the area ranges between 1300-2700 meters above sea level. It is divided into three agro-ecologies, namely, 15% highland (>2500 meter above sea level), 40% midland (1500-2500 meter above sea level) and 45% lowland (500 -1500meter above sea level) (CSA, 2007). The area gets rainfall during both *Belg* (February to April) and *Meher* (June to September) seasons. The average annual rainfall of the area ranges from less than 840 mm to 1600 mm while the mean annual temperature varies between 15^0C and 19^0C.

The population of the zone is estimated to be 1,431,305 with population density of 138.7 persons per km^2 and average of 4.6 persons per household. The community practices mixed farming of cereal crops, pulses and oil crops. Livestock production also constitutes an important part of agricultural activities. The average land holding is 1.1 hectare per household. Due to the continuous reduction of farmland to degradation by frequent flooding and drought, farming was intruded into steep sloping areas, forest lands and expanded to marginal lands and communal lands covering 81% of the total area of the zone. Only 3% of the total land is put under grazing, 3.7% forest land, 11.33% degraded and bare land and 0.65% is other form of land (CSA, 2007). The crops, livestock and other livelihoods of the community are subjected to damage to climate change induced hazards. This coupled with the continually decreasing farm size had serious impact threatening farmers' adaptive capacity and livelihood improvements

Source and Types of Data

The data for the research was obtained from a survey of 453 farm households in three districts namely; Yaya Gullele, Hidha Abote and Derra. A multi stage random sampling technique was used to select the ultimate respondents from the districts proportionally to their population size. A structured questionnaire was used to interview the farmers. Data collected from the farmers include demographic, socioeconomic, climate, natural resources, services access, market, agricultural logistics, etc. In order to substantiate the quantitative data with qualitative information, several focused group discussion (FGD) and Key informant interviews (KII) were conducted.

Method of Data Analysis

Methods of measuring degree of commercialization

Commercialization of agriculture takes many forms and is defined in different ways. Generally, smallholder commercialization in agriculture can be defined in terms of smallholder participation in commercial input and output markets, type of crops grown by smallholder farmers and goals of smallholder farmers. This variety of meaning emerges from the way the researchers perceive the concept. However, the core of most definitions of agricultural commercialization is the degree of participation in the (output) market, with the focus being too much on cash incomes (Strasberg *et al*., 1999; von Braun, 2005). According to these authors, commercialization is supplying higher amount or percentage of surplus product to market. But, the meaning of commercialization goes beyond supplying surplus products to markets; and it has to consider both the input and output sides of production, and the decision-making behavior of farm households in production and marketing simultaneously (Pingali, 1997; von Braun et al., 1994). Moreover, commercialization is not restricted only to cash crops as traditional food crops are also frequently marketed to a considerable extent (Berhanu *et al*., 2006; von Braun *et al*., 1994).

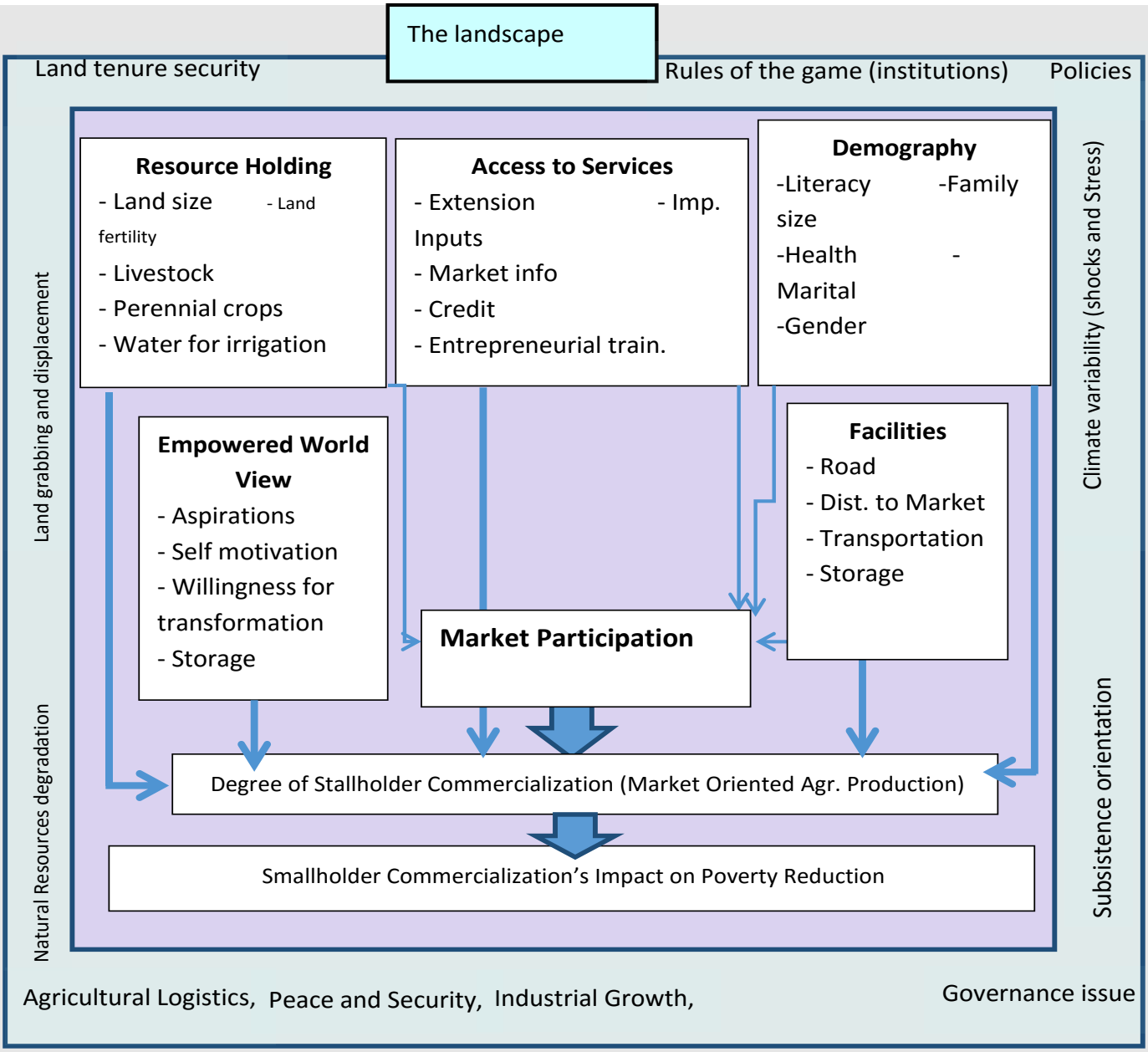

Figure 1. Conceptual framework for measuring level of commercialization and its impact

Table 1. Smallholder farmers' participation in output market

Participation in product market	%
No	13%
Yes	87%
Total	100%

Source: Computed from HH survey data

A line of thought followed in this study is that, generally agricultural commercialization is the integration of farmers into input and output markets. Therefore we follow the definition by Gebremedhin and Jaleta, (2010) i.e. produce offered for sale and use of purchased inputs in the production process. However, the later component of this definition (use of purchased inputs) is beyond the scope of this study and secondly as illustrated by Pingali (1997), commercialization on the input side is likely to proceed in tandem with the degree of participation in output markets. Based on this adopted definition, a more comprehensive household commercialization index (HCI) that incorporates all crop enterprises on the farm was developed as opposed to some of the past empirical studies that focused on the output side of one or a few selected crop enterprises, especially for cash crops only. Therefore, the comprehensive HCI that was developed gives a more accurate picture of smallholder agricultural output commercialization thereby enabling a more in-depth understanding of agricultural transformation process than before.

Mathematical specifications

Degree of commercialization: *Household Commercialization Index (HCI)*

Finally, to analyze the commercialization level of households, household agricultural output marketed index is used as proxy of degree of commercialization. The index is measured by the proportion of the value of agricultural sales to total value of agricultural production. Mathematically it follows:

$$\text{COMPi} = \frac{\sum_{k=1}^{K} P_k S_{ik}}{\sum_{k=1}^{K} P_k Q_{ik}} * 100 \text{ ----(1)}$$

Where S_{ik} is quantity of output k sold by household i evaluated at an average community level price (P_k), Q_{ik} is total quantity of output k produced by household i. After calculating this index households were categorized into different groups based on their level of commercialization and this helped to classify farmers as subsistence, semi-commercial and commercial based on market orientation. The main purpose of subsistence system is to maintain household food self-sufficiency. The semi-commercial system is focused towards generation of marketable surplus and maintaining household food-security. In commercial system, profit maximization is the main motive of the entrepreneur.

Determinants of degree of commercialization

Based on the exercise of most studies that have modeled agricultural commercialization as a two-step analytical approach involving the unobservable decision to commercialize and the observed degree or extent of commercialization, Tobit regression model, with a hybrid of the discrete and continuous dependent variables was used to draw inferences on the causal factors for commercialization of households. The first step is a discrete outcome of participating in the market or otherwise. This is because from the household response to the question of as to whether they participate in the product market, their responses were 'yes' or 'no'. For the HHs with a 'no' response the HCI yield a zero value. Therefore, this group does not need to involve in the second layer of analysis, hence sample selection is posed. The second level then involves the determination of the level of commercialization. The level of commercialization was made continuous rather than discrete by being censored at zero. In this data set, considerable percentage of households has value of 0 for the dependent variable, as they did not participate in the product market. In such a data set, the use of OLS is inappropriate. An appropriate alternative for this type of data set is Tobit. Tobit model was originally developed to deal with corner solution outcome; however, it can be used to estimate models of both cases; censored and corner solution (Wooldridge, 2009). In this connection, Tobit model for determinants of level of commercialization is given as:

$$Cl_i^* = X_j'\beta + U_j \text{ ------ (2)}$$

$$Cl = Max(0,\ Cl^*) \text{ -------(3)}$$

The observed variable Cl equals Cl* when Cl* > 0, but Cl =0 when Cl*≤0. That is:

$$Cl_i = \begin{cases} 0 \ \ if\ Cl^* \le 0 \\ Cl^*\ if\ Cl^* > 0 \end{cases} \text{ ..... (4)}$$

Where, X is K vector of regressors which included HH characteristics (age, sex, educational level), land size, labor, livestock ownership, extension services, credit services, income level, diversity of income sources, availability of perennial crops, agricultural logistics (market access, access to all weather road, market information, communication technology/ radio, mobile phone/), entrepreneurial training, area under irrigation, technology (improved seed, fertilizer), crop diversification, vulnerability to CC shocks and stresses, level of adaptation to climate change/ variability (indexed), agro-climatic zone and perception of CC were entered into the model, Cl_i^* is the

dependent variable, which in this case is degree of commercialization. β_s are parameters to be estimated and U_j is HH specific disturbance term.

FINDINGS

Market Participation and Degree of Commercialization

The economy of the community in the study area is mainly subsistence farming. The community practices mixed farming of crop production and livestock rearing. The average land holding is 1.1 hectare per household. Cereal crops, pulses and oil crops are the dominant grown in the area. These include teff, sorghum, millet, oats, barley and wheat. Besides, vegetables such as onion, potato, green pepper and cabbage are grown only in few peasant associations where irrigation water is available. Vegetables are relatively less prevalent in the food basket consumed and primarily produced to be used as a source of cash for the households to meet extra cash needs for children's school fee, medical expenses, and other HH social obligations. Due to the continually decreasing farm size livestock holding has become is very small per HH, yet it still constitutes an important part in agriculture system.

It is apparent that staple food crops and livestock are the prime agricultural outputs with which smallholders participate in the market. Given the fact that staple food market is characterized by many small sellers, competition among farmers is likely to be fierce. This problem arises mainly due to low per capita production as confirmed by small land holding per household and with only few farmers having access to irrigation for small proportion of their farmland. These could not allow the smallholders take part in output markets as required. Among those who do take part, the degree of participation also varies. This section investigates the microeconomic relationships between market participation (on-participation) and household-level factors, using the household survey data and assuming the macroeconomic conditions are constant.

Large majority of those smallholders who take part in the output markets is out of necessity (to obtain cash for the purchase of essential consumption goods and agricultural inputs), whereas only very small proportion of them take part either to capture the gains from specialization or that is the only means of existence. As it is rare to find a farmer who is not influenced by either of these factors, it is unusual to observe farmers who do not market any of their output. This circumstance happens in the study area where a farmer has either nothing to sell or his/her products could not go beyond household consumption. For those farmers the household's cash needs are basically met from non-farm income including remittances and aid. Table 1 presents the output market participation, while table 2 presents the degree of participation.

The statistical result shows that nearly 13% of the farmers are not bringing anything to the product market, while at the other extreme only 3% is making the entire of his/her product meant for the market. That is to say only a maximum of 3% has been fully commercialized after series of decades' effort. The large majority as 80% brings less than 50% of their products to market and out of this; even 57% is supplying less than 25% of their products. Given the fact that these famers are at a near distance to the nation's capital city, Addis Ababa and with relatively better infrastructure, by understanding the factors that is leading them to stay in agriculture but not taking part in output markets should enable policy makers to design programmes either to strengthen farming livelihoods or to facilitate the smooth withdrawal of marginal farmers from the agricultural sector, thus allowing more productive farmers to cultivate larger farms. Hence, it is important to study as to why smallholders have not been well integrated into the output markets as sellers. The cross tabulation with non-farm engagement indicates that the reason for lower level of commercialization, at least for cash source in not primary because their occupations were non-agricultural, but rather because their agricultural livelihood is precarious.

With regard to the financial value of the agricultural products sold in a market for those participating in the product market it ranges from Ethiopian birr 250 (USD 11.63) per year to a maximum of birr 9051 (USD 421), with an average of Ethiopian birr 2,237 (USD 104: Exchange rate 1USD = 21.5 Ethiopian birr at the time of the study). This is a clear indication that market participation is rather to meet certain financial constraints of household instead of specialization and profit driven. Considering commercialized farmers as those offering more than 50% of their product into the market, figure 3 present comparison of key socio-economic variables assumed to determine household's livelihood among the commercialized and their counterparts.

Except for the number of years of farming experience, the farmers said of being commercialized has exhibited better in terms of access to extension services, size of land holding, number of farm plots, area under irrigation, access to credit, access to improved seed, diversity of enterprises, saving, livestock holding, total value of farm earning and engagement in non-farm activities. The probable reason for farmers with more year of farming reserved from being commercialized could be that, they prioritized risk minimization as opposed to maximizing market earning which need risk taking behavior. Even if differences appear to exist for those key variables, it is observed from figure 2 that these differences are not magnificent. This is a clear indication of the level of commercialization among smallholders.

Determinants for Market Participation and Degree of Commercialization

In areas like that of the study location, where the marketing system and facilities are yet to be improved, it is logical to assume that smallholders' participation in market would be very low. In this regard the actions and interactions of many factors will be at the play. That is a smallholder's decision to enter and make use of markets is influenced by macro and micro-level factors. Macro-economic and trade policies, market reform, rural infrastructure improvement, climatic conditions and the development of institutions are those over which a smallholder can have no or influence at all. Table 3 presents the regression result for the determinant factors.

Demographic and Social factors

In rural setting where smallholder agriculture is mainly for substance requirement and as the amount of produce potentially taken to the market is significantly small, it is usually the women who play much role in participating in rural markers. Especially when the household is headed by women, rural women participation in a market is a key activity for achieving the household's economic and social needs. In many of the rural market, vegetables produces, which is used as one of the means of meeting immediate cash needs for households in the central part of Ethiopia, is done by petty traders and retailers supplying such product from their own farm; where such suppliers are largely the women. Moreover, a noteworthy exception, highlighted in this finding is that the products of women headed household are mainly those crops that are grown around homesteads. The main reason for women's high market participation through selling crop products as compared to the male headed ones is because of their lack of storage capacity. The econometric result from this study affirms to this argument by indicating that market participation is in favor of women headed household with a coefficient of marginal effect significant at 5% probability level.

Another important factors common to the study area is the existence of ranges of local institutions established by the community themselves. Some institutions are made up of a well-defined group of people (who either chose to become members or were "born members") and have clear, exclusive criteria for membership. Others are more inclusive, often because they dictate how people in general should behave rather than what particular people should do. In here the engagement in such social institutions is a measure of social networks which helps to build a sense of belongingness. In the study area types of networks that are important include families, friends and community organizations. These groups provide strong bonds within a social group; a sense of belonging, identity and social support; and strong linkages to others outside group that can bring in additional social, financial or political resources. Successful and enduring local institutions create relationships with a common purpose and promote shared interests, but can also have adaptable and flexible functions. They can provide emotional and practical support, information and resource sharing. Some of the semi-formal local institutions include, *Idir, Mahiber, Iqub, Senebte, Debo*, etc. The participation in such local institutions is a strong determinant of household's access to required supports, and information (including market information). This has a great help in enabling someone to participate in the market, as participation requires social, economic and technological (price information) services. From the double hurdle model result the density of participation in local institution is found to be an important factor for market participation with a coefficient of marginal effect 0.3925 significant at 5% probability level.

Natural and Agro-climatic zone

Households in the lowland and midland agro-climatic zones compared to highland benefits largely by growing crops that can be marketed because the land receives sediments and other soil nutrient components coming from the highlands by floods. This has resulted in a positive impact on farmer's income where their living standards have changed through time. Due to the flooding of the lowland catchment,

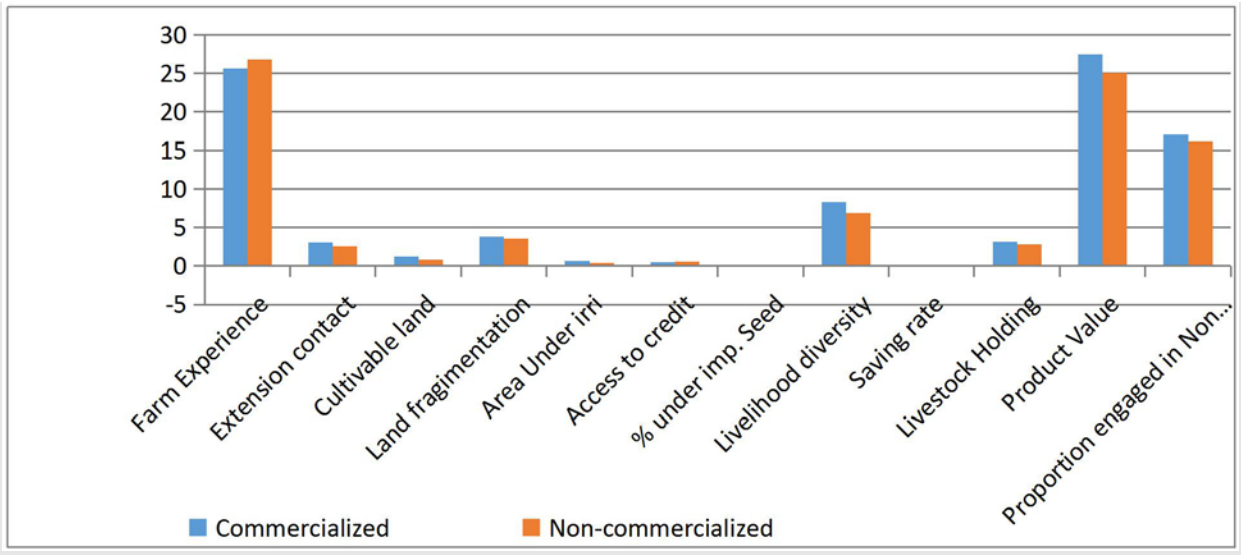

Figure 2. Comparison of commercialized and semi-commercialized farmers with regard to key variables.

Sources: Computed from HH survey data

Table 2. Degree of smallholders' commercialization in the output market

Level of Commercialization	Percentage
No participation in the output market at all	13%
Supply less than 25% of their produce	57%
Supplying 25 - 50% of their produce	10%
Supply 50 -75% of their produce	9%
Supply more than 75% of their produce	11%
Total	100%
100% Market oriented	3%

Source: Computed from HH survey data

farmers also benefit from production of verities of crops, which have a high market value. Especially during normal rainy seasons the areas have benefited the farmers in planting marketable crops by providing fertile soil, but farmers residing in those areas have also listed drought and flooding to be as few of the major biophysical constraints they face in agricultural transformation where un-timely frequent rainfall failure and flooding have destroyed the grown crops. Interventions by the government and the households have been seen in order to control the damage flooding may have by applying water harvesting methods which in return have resulted in a positive impact to the community and the households from which they were able to harvest multiple time. In terms of market participation communities residing in the lowland areas perform better, with a coefficient 1.5608, which is significant at all conventional probability levels, whereas for the degree of commercialization both the midland and lowland has got coefficient of 0.1301 and 0.2525 respectively; both significant at 1% probability level.

The level of land fertility and the implementation of conservation system on farm are important factors to enhance production and productivity, which in turn render the capacity to produce in excess of HH consumption and supply to the market. In this country, there is a situation where several million tons of soil is taken by erosion to the neighboring countries every year. This being the case, however, there has been relatively little or no studies on national-scale analysis of the cost of land degradation to the national economy done, but the extent of the problem is getting worse from year to year, showing an impact on the declining of soil fertility, particularly on fields away from the homesteads of smallholder farmers. The level of physical and biological conservation done across the nation is very low compared to the policy set for the purpose, ministerial offices opened to ensure the same, and the propagandas done through mass medias.

From the qualitative information collected through FGD and KII with household heads, farmers perceive their lack of ability to fallow on the implementation of fertility restoration method to be a more important reason for declining fertility than erosion, though they do regret the loss of good topsoil from their fields, which is being deposited on the fields below, owned by other farmers. When a bund is cut down, the topsoil collected behind it is shared by the owners of the fields above and below the bund. This regular practice reduces the attraction of more long-term erosion control practices such as planting grass lines or hedgerows of agroforestry species. As the system becomes more intensive, however, the benefits of such practices in terms of fodder production and soil fertility should increase relative to their labour costs. When fertility declines the productivity declines and farmers could not produce what is sufficient for their household, let alone supplying to the market.

In line with this, the regression result indicated significant positive relation of the degree of commercialization with soil fertility level and the intensity of soil and water conservation measures. The coefficients for the level of soil fertility and for the intensity of conservation level were 0.039 and 0.1055 respectively. Both coefficients were significant at 5% probability level. Thus a unit increase in the average soil fertility score of all operated plots is likely to increase their degree of commercialization by about 3.9%. Similarly a unit hectare of land brought under appropriate soil and water conservation measure increase the degree of commercialization by 10.55%.

Even though ownership of different farm plots allows variability and risk minimization opportunities, fragmentation of land holdings is severe when it is too much and the plots are distant from one another. In the study area land is highly fragmented into many pieces up to maximum of 9 plots per household, in which a parcel go as small as 0.15 hectare or less. This challenges the production of uniform output for market purposes as the agronomy of the plots differ and create inconvenience for the cultivation of same or similar crops. Moreover, it challenges the employability of economy of scale for some of the farm resources. Similarly available organic materials, such as manure and crop residues, are used only on fields nearest the homestead. The fields farther from the home receive no inputs but are left fallow more often. Besides being difficult to reach, the far fields are also difficult to guard against incursion by grazing cattle. The regression result for land fragmentation is negatively related to the market participation decision. It indicates a unit increase in the level of fragmentation of available land reduces the probability to participate in a market by 42.22%, with 95% significance level.

One of the others critical constraints in the effort of commercializing smallholders are the unpredictability of varying climatic conditions temporally and the impact of global climate change. All the earlier works done failed to grasp climate variables in their analy-

sis of smallholder commercialization, whereas global warming and climate change have also affected agriculture with adverse effects on temperatures, rainfall patterns and water availability. These conditions and the net production deficit make traditional smallholder agriculture less rewarding, hence the need for adapted approaches and market-oriented productivity revolution to meet the growing demand. Climate change impacts not only the production and productivity of agricultural enterprises, but also the quality of produced supplied to markets. The mounting temperature from year to year has significant negative implication on the perishable agricultural products supplied, subjecting significantly to post harvest losses. Especially, at the home of smallholder farmer where there is a lack of appropriate storage facilities and freezing equipment, produces are highly vulnerable from rotting, loss to rodents, and infestations.

Therefore, as the environment becomes more dynamic and susceptible to climate change induced shocks and stresses; the viability of subsistence agriculture in guaranteeing livelihoods declines and the potential to commercialize smallholders is challenged. This needs a very integrated mitigation and adaptation measures to be instilled into the farming system. In line with this, the study area is found to be highly vulnerable to a range of shocks and stresses like drought, flood, epidemics, wind, landslides and other events. Annually 21.1% of the farm households and 13% of farmlands are affected by one or combination of these shocks and stresses (Gutu *et al*, 2012). The econometric result from the Tobit regression model also affirms to this finding that household's ability to anticipate rainfall, temperature and climate change induced shocks and stresses have positive impact on commercialization. The variable has a coefficient of 0.1624 significant 5% probability levels. This means that households who have a good perception of the current climatic conditions have probability of commercializing their farms by 0.1624. Therefore, there is a need for appropriate climate information management system, designing of appropriate mitigation and adaptation strategies depending on the agro-climatic zones.

Agricultural Logistics and Facilities

The business challenges in the commercialization of smallholder agricultural are both more complex and broader with respect to those who will be taking part in a market as a smallholder. Some of the challenges arise from the agricultural logistics, which are outside the control of rural market participants. The quality of agricultural logistics, which includes but not limited to access to road, storage facilities, transport facilities, access to price information and communication services are key in prompting the market participation decision and enhance the degree of commercialization. In a situation where these factors are either lacking or underdeveloped, the rate of creating rural transformation through market integration and improvement of the degree of commercialization is less likely. Asfaw et al. (2010) revealed that distance, poor rural road networks, lack of appropriate transportation facilities and poor communication system are negatively correlated with marketed surplus because of the increased transaction costs associated with marketing.

In this particular study, several variables representing the diverse agricultural logistics were included into the analytical model. The result however, showed significance only for TV ownership, access to market information through social network, and distance from the market. Ownership of TV as a source of information on diverse agricultural issues was found to influence market participation decision with a marginal effect of 1.513 significant at 10% probability level. Of course in Ethiopia TV ownership is one measure for wealth, modernization, closeness to urban sentiments and extricating from subsistence agricultural. As one moves into the remote areas far away from rural villages and towns, the likelihood of encountering a single household with TV or even sometimes a radio is very rare given the lack of power supply, network availability and artisans to maintain. Hence the result states that a household that owns a TV has 151% probability of participating in a market as opposed to a household that does not have.

On the other hand access to market information through the dense of social network, agents, and neighbors is a key determinant of the degree of commercialization. Basically a single household cannot be separated from its neighbor and the surrounding community and become more commercialized given the strong cultural and traditional ties in the rural setting. Hence, the actions and interactions that take place within a community is an important factor for the degree of engagement in agricultural business. The result from the regression shows those households who access market information, especially price information have a 9.53% probability to be more commercialized as opposed to their counterparts. The result is significant at 1% probability level. An-

Table 3. Two step censored regression model output

Variables	Market Participation		Commercialization Intensity	
	Marginal Effect	St. Error	Coefficient	St. Error
Demographic and Social Characteristics				
Sex (Male =1)	-1.3450**	0.6072	-0.0038	0.0531
Participation in Local institutions	0.3925***	0.1509	0.0016	0.0174
Economic and Financial				
Size of cultivable land	0.0113	0.0256	0.0075***	0.0027
Total HH income	- 2.27E-07	1.90E-06	- 02.7E-07**	1.11E-07
Level of diversity of HH livelihoods	0.1598**	0.0724	0.0201***	0.0063
Total volume of annual production	0.0335**	0.0167	0.0138***	0.0027
Natural, Agro-Climatic and Climate Change				
Midland agro-ecology	0.2208	0.4417	0.1301***	0.0484
Lowland Agro-ecology	1.5608***	0.5468	0.2525***	0.0537
Level of land fertility	0.0132	0.1699	0.0398**	0.0165
Proportion of land under conservation	0.2924	0.4823	0.1055**	0.0489
Distance between farm plots	- 0.4222**	0.2149	- 0.0267	0.0293
Level CC Perception (rainfall, temperature, induced shocks and stresses)	0.3687	0.678	0.1624**	0.0762
Agricultural Logistics and Facilities				
Access to market information	0.5394	0.3748	0.0953***	0.0365
Distance from the market place	-0.3928	0.229	-0.0697***	0.0259
Ownership of TV	1.5134*	0.8568	0.0129	0.1129
Const.	0.0031	0.1490	-0.2888	0.2952
Sigma Cons	0.2983			

***, **, * significant at 1%, 5% and 10% probability levels respectively

Source: Model output for Tobit double hurdles

other major factors impeding households degree of market orientation is the distance from the market, which is significant at 1% probability level. A one hour increase from the market brings decreases in the degree of commercialization by 0.0697.

CONCLUSION AND RECOMMENDATIONS

The findings from this study lead us to make certain important conclusions in terms of the smallholders' market participation, and degree of commercialization. In the first place, there is significant proportion of households who do not take part in the product market because of various reasons. Market participation is an important first step in determining the degree of smallholder commercialization. Even if the study area is at a closest distance to the nations' capital and is relatively better in terms of some of the infrastructure, the findings evidence that the degree of commercialization in the area is very low, to the extent that only insignificant proportion of households' have engaged in market oriented production. The degree of commercialization is influenced by a combination of demographic, social, economic, logistic and climate change factors, which indicates the need for a comprehensive approach to commercialization. There is difference among the commercialized and semi commercialized in terms of some of the important factors influencing the degree of commercialization. Based on the findings of the study, the following recommendations were made:

- The degree of commercialization of the smallholder in the central part of the country should be significantly improved through appropriately designed policy. The level of growing commercial crops in all of the three agro-climatic zones is very low and even non-existent in some cases. Households are rather using staple food to meet cash needs. Therefore, there must be an intervention strategy by the government to improve the engagement of HH in market oriented agriculture through affirmative and supportive actions;

- The commercialization of smallholder farmers is constrained by a variety of factors. Hence, the government should be able to design strategy that boost HH access to climate information, improved adaptation to climate change induced shocks and stresses, improve access to agricultural logistics, and improve service provision such as access to credit, access to market information, institutional strengthening and more. More specifically, the agricultural extension package should include the improvement of rural entrepreneurship, climate change related awareness, and creation of market linkages;

- The ever decreasing size of land and the frequency of land fragmentation are instilling a serious bottleneck to promote any sort of commercialization. Hence means should be sought to make an exit from the farming system so that the land that would be left behind enables the remnants and productive households to commercialize.

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