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Creating new markets via smallholder irrigation:

The case of irrigation-led smallholder commercialization in Lume district, Ethiopia

By

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1. Background

Following the 2008 global food crises, the agenda of agricultural development has come back into the international arena. Alerted by global shortage of major food grains like rice and wheat which pushed global food prices to its record level budgetary commitment to expand agricultural output especially in major food importing countries increased and investors from these countries were encouraged to lease farm lands in relatively land and water abundant' countries in Africa and other parts of the developing world.

Though outsourcing agricultural investment from these countries was considered as a solution, many other multilateral donors like the World Bank and FAO¹ pointed out that the potential for finding sustainable solution to the problem lies in helping Africa and other potential countries (like countries South-east Asia, Brazil and Central Asia) to become global players in world agricultural trade through raising the productivity and competitiveness of their agriculture. Along with promotion of appropriate technologies for small farmers and particular crops they grow², commercialization of small family based agriculture is also considered as a key to stimulate agricultural growth in Africa and avert future global crises.

The commercialization of African small family farms in particular and raising their competitiveness that can help them to be a key player in the value chain especially at international level is, however, not without controversy. Two points are at the centre of disagreement. First, there is a view promoted by scholars like Paul Collier that small-scale farming in Africa is not capable of meeting the challenges of contemporary agricultural development, hence could not be able to take part in the global value chain³. On the other hand, there is a growing body of evidence (e.g. Sharp et al, 2008) that found that small farmers, even in "subsistence-oriented" areas, are as entrepreneurial as any other group of people when they find opportunities that suit their conditions.

Success stories generated from such studies, however, faced difficulties to inform highly-debated issues and to attract the interest of patronage mainly because findings from such studies relies mostly on data generated from small village-level surveys where drivers and conditions for successful commercialization partly associate to some village-specific factors⁴. Though this argument is partly true, what is important is to analyse and put in proper context implications generated from such village-level studies so that lessons on issues like under what conditions, and with what encouragement from policy small farms could be commercialised can be drawn.

2. Objectives

Following the foregoing discussions, and based on household-level surveys conducted in four villages in central Ethiopia where government intervene to enhance the commercialization of small farmers, the study tries to generate insights that improve our understanding of the ways in which small scale farming may become commercialised, and the prospects and challenges for further commercialization. The study also looks at other factors that drive the commercialization process and how these vary vis-à-vis key household characteristics and objectives like food security. As

commercialisation of agriculture is identified (in Ethiopia) as a means to reduce poverty among small farmers, the study also looks at some key outcomes of the intervention that indicates the effect of the commercialization interventions on poverty and income of participant farm households.

In general, the key issues this work addresses include:

- how commercialization scheme affects household food security: Does the intervention improve or worsen food security? Does household priority to achieve food security affects their participation in initiatives to commercialise smallholder farming?
- how abilities to bear risk (measured in terms of initial access to assets) relates to commercialization or farmers capacity to take opportunities for commercialization? and
- the degree to which the intervention resolves potential failures in factor and product markets.

By answering these questions the study tried to assess the implication of the scheme to those with little or no land or those with little food (food insecure) or sufficient food and to identify the forces that derives and strengthen the commercialization process.

3. The study area and the commercialization scheme

3.1. Background on the program

The Ethiopian government (see MOFED, 2005) revised its rural development strategy some five years ago. This revision has given agricultural commercialisation a central place in the country's second Poverty Reduction Strategy Paper. The strategy aims to rebalance earlier 'food self-sufficiency' first strategy into a broader strategy that recognize the need for integrating smallholder agriculture into market in particular and the commercialization of agriculture in general. Following this change in the government rural development policy, many rural districts revised their agricultural development and intervention strategies. The case this study investigates is a program implemented by the Lume district agricultural office to realize this revised strategy.

The district agricultural development office introduces irrigation-supported production of perishable horticultural crops like onion, tomatoes and green pepper (that are primarily produced for markets) into predominantly grain-dominated cropping pattern of the district. The program was started in 2005 with intervention in 2 villages (peasant associations), then it added two more villages in 2006, and another 3 villages in 2007. Last year, 4 more villages were incorporated, though all farmers in an intervention area didn't take part in the program.

3.2 The study area

Lume district is located at the central part of the country in East Shoa Zone of Oromiya Region. The district located on high altitude (1500 – 2300 meter above sea level) and receives adequate rainfall. It is very near to major national and regional markets and highways that connect the country to ports in the neighbouring countries. This proximity to urban centers (Addia Abeba, Nazareth and Bishoftu) and major road

networks create market opportunities. Emerging demand for vegetables in the nearby cities also offers a huge potential for expansion of the cash crops production and sustainable intensification of existing cropland.

The predominant occupation of the study population is sedentary mixed farming which heavily depends on the use of chemical fertilizers. Today more than 90% of households use chemical fertilizers (Fikru, 2008). Agriculture is mainly rain-fed, but water harvesting and small scale irrigation technologies has been practiced for the production of high-value vegetables, and sometimes for watering livestock and domestic uses.

Farmers own on average about 2.3 hectare of farm lands which is far higher than the national average of about a hectare, but the youth and poor experienced acute land shortage. Grazing land has dwindled due to population pressure and led farmers to keep most essential animals only.

The major source of livelihood in the area is farming of different annual crops (teff, wheat, maize, and barley), fruit and vegetables, and livestock raising (cattle, sheep, and goat). Tef and vegetables (mainly onion, tomatoes and green pepper) are the main cash crops, while Tef and wheat are the major subsistence crops. Farmers in the district are also engaged in various non-farm activities besides their farming occupation. These include waged labor (in emerging large private flower farms and other establishments), trade, pottery, sale of local liquors, and quarrying of stones, gravel and river sand. Fishery is also practiced on Lake Tute which is found in the woreda (Fikru, 2008).

Results from group discussion indicates that non-farm business activities contribute on average about 22 percent of total income, while wage and salary and other income sources were estimate to contribute for 14 percent and 8 percent of total income on average. Though diversification into non-farm livelihoods is important, literatures (e.g. Fikrue, 2008) indicates that diversification into high value, high return activities are virtually absent and current diversification is limited to petty-trade and family-level small-scale activities.

4. Methodology

The study uses structured household questionnaire and qualitative methods that include focus group discussion and key informant interview for data collection. As it intends to examine households' behavior and how this behavior responds to the commercialization scheme, the study uses household as its unit of analysis.

A two stage stratified random sampling method was adopted for the selection of sample households for the survey which includes 160 farm households residing in 4 intervention villages⁵. First, farm households in selected villages were stratified by their status in the commercialization program (i.e. their participation) – as participants and non-participants. This is followed by stratification of farm households into three groups based on their wealth status. Farm size is as a proxy for households' wealth status as discussion with community members during the scoping study reveals that farm size is the major indicator of wealth farmers (if not the single)⁶.

Subsequently, using a 50:50 ratio, 40 farm households (20 participant and 20 non-participants) were selected randomly from each wealth strata until the quota (defined as

ratio of the number of farmers in each wealth group over the total sample size) was filled. Following similar procedure sample farm households from non-participant group which were consisting of farmers didn't participate in the intervention but live in intervention villages were selected⁷.

Table 1: Sample farm households based on their wealth/landholding status

Wealth Status	Participants	Non-participants	Total
Poor (cultivate < 2 ha)	25 %	29 %	27 %
Medium (2 – 4 ha)	38 %	36 %	37 %
Better off (> 4 ha)	37 %	35 %	36 %
Total (N)	80	80	160.0

On the other hand, for the focus group discussion four groups from participant, non-participant farm households, and youth and female groups, which represent different segments of the society, were formed. Each group consist of five to eight persons and effort was made to include household members with different background. Similarly, key informant interview was conducted with representatives of district agricultural office, local traders and heads of cooperative association.

As part of data processing, quantitative data collected through household survey were sorted and coded which followed by data cleaning and entry. The analysis was conducted primarily using descriptive statistical procedures like frequency distributions and cross tabulations which provides analytical information about a variable of interest, e.g. changes in the commercialization status of farmers and on the relationship between two or more variables of interest which helps, for instance, in exploring, the possible causes of disparity in accessing and benefiting from the new interventions among different farm household groups (defined in terms of farm size or food-security).

5. Results

The study shows that diversification into high-value horticultural crops is one potential avenue for commercialization of small farmers while helping participant farm households to improve their income given diminishing land/labor ratio. The study also generates some empirical evidence and insights that can enrich the debates and arguments on the commercialization of small farms operated by poor farm households. The following sections presented more of the findings, but first discuss socio-economic characteristics of the study population.

5.1 Some characteristics of the study population

The majority of sample farm households were male-headed, though the share of females is significantly higher among non-participant group. It is not clear whether this low participation of female households in the commercialization initiatives is the consequence of their multiple responsibilities – household and farming or gender-related barriers⁸. Similarly, illiteracy and incidence of migration are higher among non-participant farm households.

BOX 1: Gender and commercialization

A Pearson chi-square coefficient was computed to look the relationship between gender and participation in the commercialization scheme. If there is no relationship between gender and participation in the commercialization scheme, which are both categorical variables, one expects an equal number (proportion) of choices to participate (or not) between female- and male-headed households.

On null hypothesis that participation in the commercialization scheme is independent of gender, a χ^2 value (1) of 3.9373 and Pr = 0.047 indicates that participation in the commercialization scheme is not independent of gender or sex of head of farm households, keeping other factors constant, though participation was reported as the result of random selection.

Difference between the two groups in cultivated land, household size or age of household head was found statistically insignificant. The likelihood of migration and diversification of livelihood into non-farm activities, however, appear to be significantly high among non-participant farm households. Survey data indicates that the likelihood of participation and duration of off-farm employments exceeds by ratio of 2 to 1 in favor of farm households didn't engage in the commercialization scheme.

The aforementioned differences between participant and non-participants could be attributed to mere chance or selection bias. The lack of statistical significant difference in landholding, a major indicator for small farmers' aspiration for commercialization, between the two groups could lower the likelihood for selection bias.

Table 2: Key socio-economic profile of the study population

Demographic and social characteristics	Participants		Non-participants		T-value/ Pearson chi2(1)
	Mean	Median	Mean	Median	
Age (year)	40 (12)	40	42 (13)	45	1.00
Sex (% of male headed households)	98	-	90	-	3.94**
Household size	6.8 (3.6)	6	6.5 (2.6)	7.0	0.34
Illiteracy among heads (%)	15	-	27	-	3.38*
Migration					
- % households having members migrated	29	--	39	--	2.82*
- Number of persons migrated (No./hh)	2.2 (1.2)	2.0	2.0 (1.2)	2.0	--
Asset and economy					
Cultivated land (ha)	3.5 (2.2)	3.0	3.0 (1.9)	2.5	1.43
Households worked off-farm (%)	24%	-	45%	-	8.67***
Number of days worked off-farm	45	-	90	-	2.14**
N		80		80	

*, ** and *** indicates statistical significance at 10%, 5% and 1% respectively. For continuous variables like age t-test was conducted. For categorical variables like sex and literacy, the Pearson chi2 (1) value indicates the result of a chi-square test performed to see if two variables (e.g. sex versus participation in the commercialization scheme) are independent.

Note: Figures in parenthesis are standard deviations.

Farm Assets

Farmers in the study area are generally own farms a little above 2 hectare⁹. But they have ample opportunities to rent-in land, expand their farming area and engage in the production of high value cash crops. On average, one third of land cultivated by

participant farm households are rented-in lands; similarly non-participant farm households rented-in on average about 0.78 ha, roughly a quarter of their farm size.

Survey data shows that participant farm households own and cultivate slightly more farm lands. Farm size, however, didn't affect participation in the commercialization scheme in all three villages except in one where, keeping other factors constant, participation in the commercialization scheme is significantly depends on farm size.

5.2 Smallholders responsiveness to the commercialization scheme

Responsiveness to the commercialization scheme is measured in terms of changes in value of crop sold both compared to the pre-intervention period and differences in cash income between participant and non-participant farmers. The analysis, however, holds true if the assumption of insignificant selection bias holds true. Similarly, other factors (i.e. excluding participation) are assumed to affect both groups similarly.

5.2.1 Comparison of participant versus non-participant farm households

The introduction of vegetable crops production apparently led to a significant improvement in the commercialization of smallholders in the study area. The new crops (onion, tomato and green pepper) became the major source of cash income, and crops like Tef which was the major cash crop before the intervention turns to be more of subsistence crop. Cash cropped area also expanded (both in absolute terms and relative to land allocated to staple food crops).

As shown in Fig. 1 participant farm households responds well to the initiatives and operate at higher degree of commercialization, though the distribution is highly skewed especially compared to non-participant farm households. About one-third of non-participant farmers operate at low level of commercialization¹⁰, while the corresponding figure is only 2% for participant farmers. Similarly, the percent of farm households operated at high degree of commercialization¹¹ varies between 54% and 30% in favour of participant farmers. In general, the result reflects the positive role of targeted public investment in creating an enabling environment for commercialization of small farmers, though the study didn't control the effect of other factors such as the distinctive features of the study area.

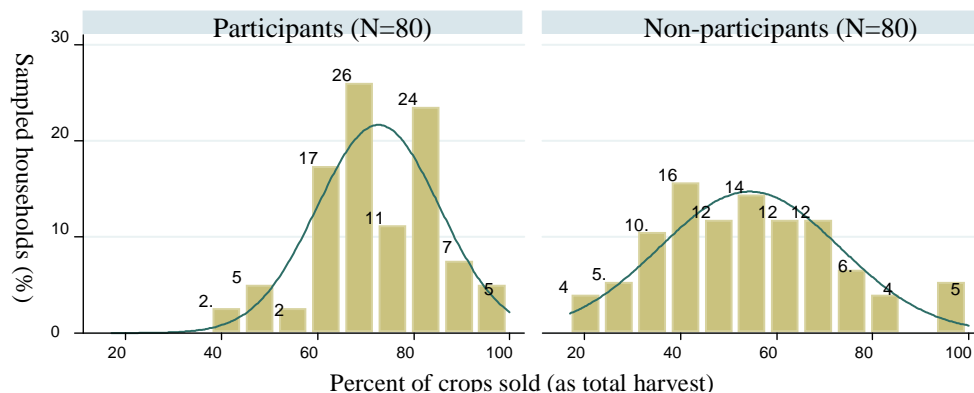
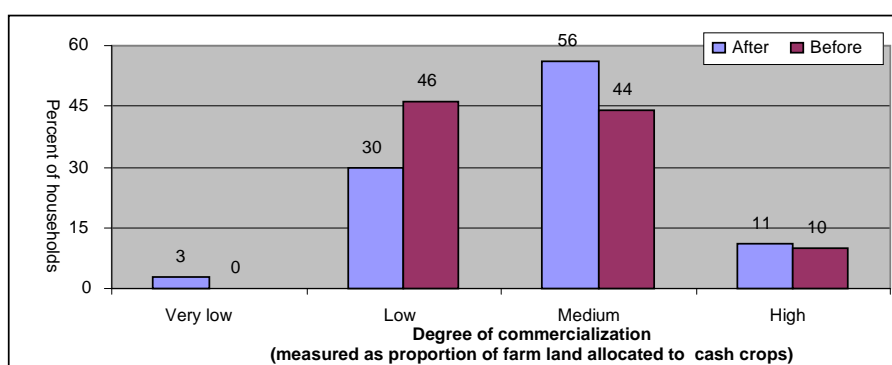


Figure 1. Commercialization status of sample farm households

5.2.2 Responsiveness of participant farm households

The study shows that all participant farmers respond positively to the intervention as both cash cropped area or the number of cash crop growers increased after the intervention. As shown in Fig. 2, about 14% of farm land allocated (by farmers operated at low level of commercialization) for production of food crops in pre-intervention period turned into cash crops production in post-intervention period. Similarly, the proportion of farmers allocated half or more of their land to cash crops increased by about 23% and reached 68% after they took part in the commercialization scheme.



Pearson $\chi^2(3) = 4.5571$ Pr = 0.087

Figure 2. Changes in cash cropped area among participant farm households

The program, through its positive impact on employment and productivity, also helped to counteract the negative effect of the diminishing trend of land/labour ratio. However, without further investment on existing or new irrigation infrastructures, the program seems to lose its momentum as farmers' capacity to expand their production of vegetables (onion, tomato and green pepper) which contributed over 70% of farm cash income has declined because of stiff competition for the use of irrigation water.

Table 3: Average crop area allocated to three cash crops

	Villages				F-value
	Ejersa Jero	Arifeta Jegola	Shera-dibandiba	Biyo-bisk	
Year village joined the program	2006	2007	2008	2008	--
Cash cropped area to new crops	0.44	0.34	0.22	0.24	3.78***
Cash income (Br./farm)	21,681	24,195	7,473	12,096	8.71***
Cultivated land (ha)	3.67	3.33	2.18	3.22	89.7***
N	20	20	20	20	

*** indicates statistical significance at 1% .

5.3 Farm asset and commercialization

Asset-rich farmers expected to engage more and better in commercialization initiatives. The study tried to look how farmers managed different farm sizes respond to the commercialization initiative. Though access to irrigation water seems critical especially to relatively large farmers, farm size was taken as a proxy for risk that might push the poor to a subsistence oriented production. To assess the relationship between farm asset and commercialization, sample farm households were classified into different groups. Accordingly sampled farm households were classified into four groups for the first analysis which include both participant and non-participant farm households and into three groups for the next which focuses exclusively on participant farm households¹².

As indicated in Fig. 3, the likelihood to generate cash income improves consistently as the size of farm increases. Large farmers (both participants and non-participants) in general and especially those who cultivate above 5 hectares of land generate substantially large cash income. Keeping the effect of other factors constant, the result implies the positive effect of operation at higher level in coping with the risk of higher variance of returns in cash crop production.

The income effects of shifts from subsistence to commercial crop production, however, widen as the size of farm declines. Keeping in mind any pre-intervention difference, small farmers, for instance, generates 57% more cash income than their counterparts who did not take part in the program¹³. The difference between the two groups narrowed to 33% as the scale of operation grows to over 3 hectares and further to 18% when the size of farm climbs to 5 hectares.

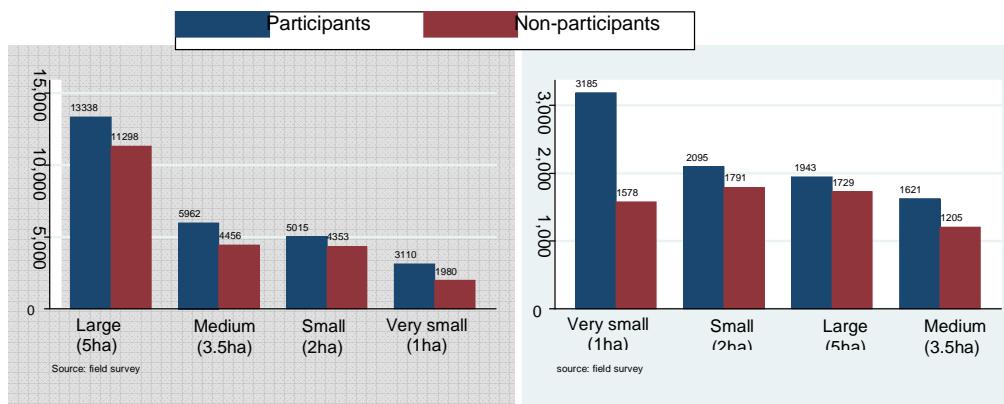


Figure 3. Household cash income (Br/household)

Figure 4. Household cash income (Br/hectare)

The above analysis reveals, however, only part of the story on the positive relationship between farm size and commercialization as the study reveals an inverse relationship between the intensity of commercialization¹⁴ and the size of cultivated land¹⁵. As shown in Fig. 4, farmers with the smallest land holdings (less than 1 ha), for instance, earn Birr 3185 from a hectare of farm land which exceeds by over 63% when compared to cash earned from the same size of farm but managed by relatively land-rich farmers (this difference is statistically significant at 10%).

5.4 Asset and participation in the commercialization scheme

Though the study shows that even the smallest farmers¹⁶ respond positively to outside interventions that aim to enhance the integration of their farm to markets, differences in asset holdings are likely to be a big determinant of who responds better to incentives for commercialization. Ascertaining the existence of an association between farm households' assets and the degree of their participation in the scheme is important to measure how effective the program is targeted toward poor farmers, though the direction of causality can run in both directions¹⁷.

Table 4: Participation in farm output and input markets among different farm households¹⁸

Landholding and indicators of commercialization	Initial land holdings			F-value
	Low (1-2ha)	Medium (2-4 ha)	Large (>4 ha)	
Farm size (ha)	1.13 (0.64)	3.11 (0.58)	5.8 (1.4)	167.4***
Share of new cash crops	ha	0.36	0.70	1.02
	%	32%	22%	18%
Indicators of commercialization				
Crop sold (kg/household)	1291 (898)	1394 (1885)	3544 (7412)	2.66*
Cash income from new cash crops	5327 (4178)	7192 (10964)	13721 (24944)	2.54*
Fertilizer use – kg/farm	110 (59)	189 (172)	571 (1467)	2.98*
Hired labor – persondays/farm	53 (50)	65 (64)	104 (99)	3.74**
Other farm expenses (Br/farm)	1283 (1344)	1179 (1182)	2772 (3013)	3.26**
N	43	14	16	74

***, ** and * indicates statistical significance at 1%, 5% and 10% respectively.

Figures in parenthesis indicate standard deviations.

Farm size influences household responsiveness positively and significantly¹⁹. As indicated in Table 4, crop area allocated to the new high-value cash crops increased as the size of farm land increases. Farmers with large farm allocated three times more land to new cash crops when compared to small farmers; and by about 30% when compared with farmers with middling land holdings²⁰. Similarly, farm cash income rise gradually when land holdings increases. Empirical evidence from other studies, such as Heltberg's 2001 study of smallholder farmers in Mozambique, also indicates that capital accumulation as an important stimulus to commercialisation (see Poulton & Leavy, 2008).

Box 2: More land means higher commercialization.

The commercialization process in the study area is primarily the result of public investment. As reflected by its positive role both among participant and non-participant farmers, farm size is also a key deriving forces of the commercialization process. Though relatively large farmers are suited better for commercialization initiatives in absolute term, small farmers generate more cash income from a unit of farm area, indicating that larger farmers confront a problem to expand their cash cropped area or the technology is not neutral to farm size²¹.

Similar to the effect on participation in the output markets, farm households' use of purchased farm inputs that include the use non-family (hired) labour and fertilizer rises as their farm size increases. This positive association between farm size and commercialization, however, is valid as long as the unit of analysis remains at

household level. In terms of a hectare of cultivated land, small farmers were found to apply more purchased inputs on a hectare of farm land than relatively larger farmers who operate at relatively higher level of commercialization²². As small farmers were found to allocate larger percentage of their land to cash crops, the result reflects again the positive effect of commercialization on the use of purchased inputs.

5.5 Commercialization, diversification and specialization

The commercialization scheme leads to the diversification of the farming system. Over 90% of participant farmers changed their cropping pattern, though nearly all farmers continue to grow food crops and, in most cases, they try to ensure their food needs from own production. Tef and wheat continue to be the most popular crops. Onions and tomatoes, however, took the position of maize and barely as the third and fourth most frequently grown crops.

The effect of the intervention, however, was marked more in the changing role of crops. Tef turned from commercial to subsistence crop. As cash and also a food crop, Tef brought on average about 60% of the cash income prior to the intervention. Its share, however, declined to only 13% after the intervention. Similarly, the share of wheat and haricot beans in generating cash declined from 14% and 10%, respectively, to less than 5 percent. In contrast, the new crops like Onion and tomato contribute about two-thirds of household cash income, and become the most important commercial crops.

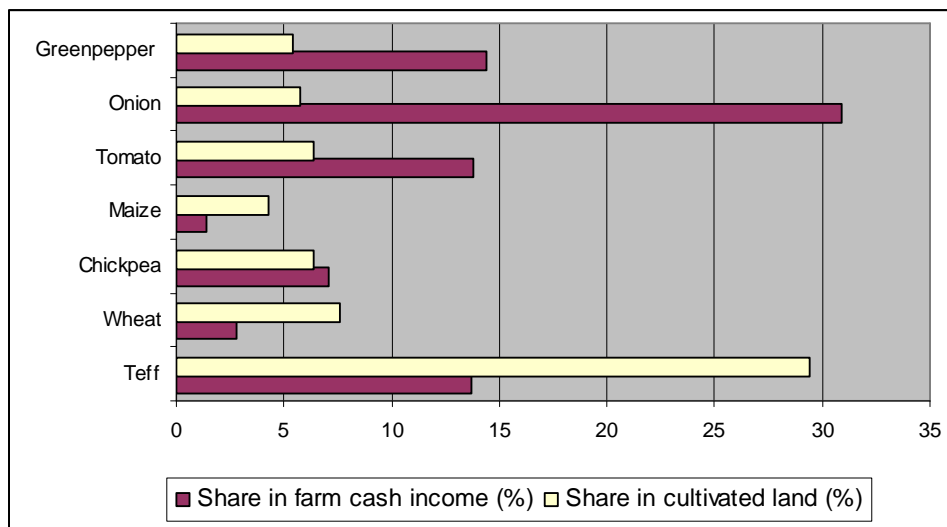


Figure 5: The changing role of crops

While enhancing the commercialization and diversification of small farmers, the initiative doesn't compromise households' food security objectives. Though both crop land expansion and improved productivity have contributed for this improvement in food security, the most reliable option especial for farmers to join the program in the future is to enhance the productivity of food crops. The result supports a growing body of evidence throughout sub-Saharan Africa that argues for the pursuit of a food security strategy based on diversification of smallholder agriculture into high-valued cash crops (Jayne, 1994).

As commercialization and diversification emerged simultaneously, the finding indicates that commercialization doesn't necessarily mean specialization especially among smallholders working in under uncertain market environment and at the early stages of the commercialization process. On the other hand, the co-emergence of commercialization and diversification indicates that smallholder agricultural commercialization may not yield the expected gains from specialisation and economies of scale especially at the early stages of commercialization.

The reluctance of small farmers to compromise their food security has an important policy implication especially if the commercialization program intends to extend its activity among net grain-purchasing households. In general, it might be worthy to look reliability of local food markets or food supply along any future plan for expansion of the commercialization program.

5.6 Commercialization and Food security

Though the question how food security status of farm household have changed positively while they engage in cash crop production activities is interesting, the question how the need to achieve household food security affects the extent of their participation in commercialization scheme is, however, more interesting.

5.6.1 Participants self-assessment on their food security

As shown in Fig. 6, about 15% of participant households reported that the food they produce prior to the commercialization scheme can't feed the household for a year, compared with only 3% after the intervention. Similarly, the proportion of households that classified themselves as highly food secure²³ increased from 15% to 37% after the intervention. These differences are statistically significant (pr. 0.008). This positive effect on household food security is, as discussed earlier, the effect of both increase in acreage allocated to food crops (though this is also true among non-participant farmers) and productivity improvement in food crops production.

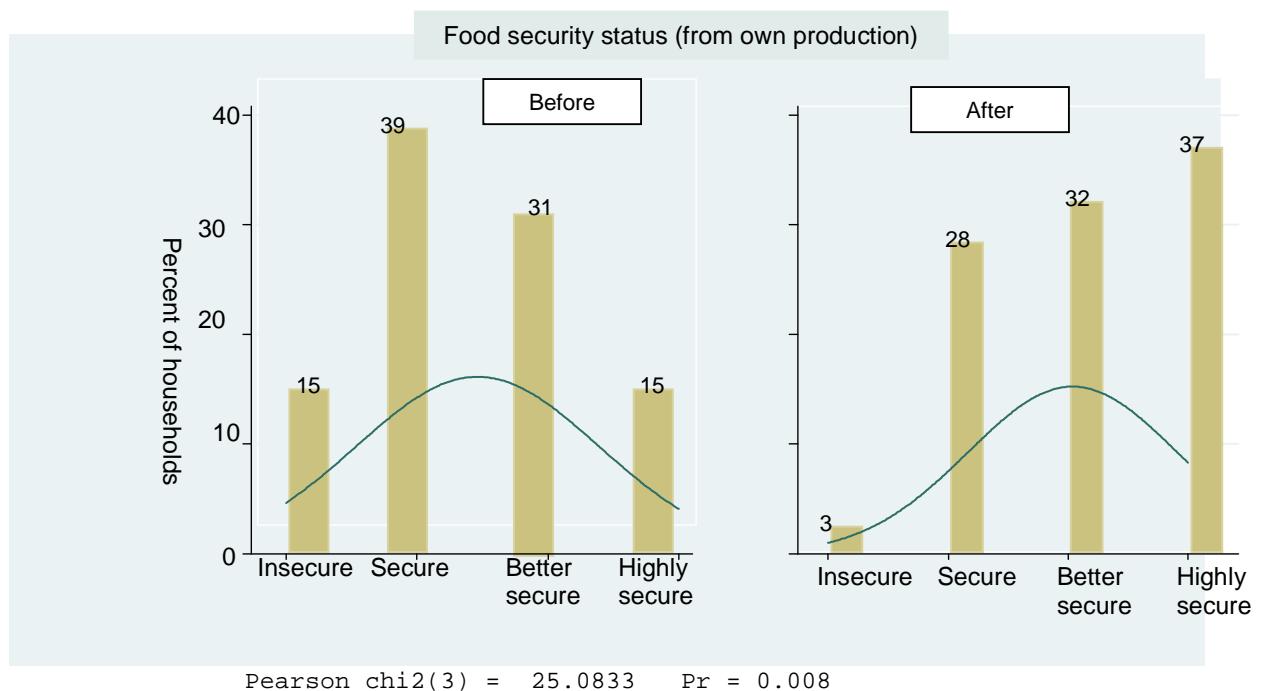


Figure 6: Changes in food security status among participant farm households

Survey data also shows a wide gap in food security between participant and non-participant farm households in favour of the prior group. Only three percent of participant farmers, for instance, were reported that they are food insecure, compared with about 13% of non-participant households. Similarly, close to 70% engaged in the commercialization scheme describes themselves as highly secure against 50% of non-participant households. These association are statistically significant ($P=0.023$). Though the intervention has contributed for significant improvement in food security status of participant households, it is, however, difficult to attribute the wide gap in post intervention food security status to the intervention alone as the analysis lack to control the effect pre-intervention period, if any²⁴.

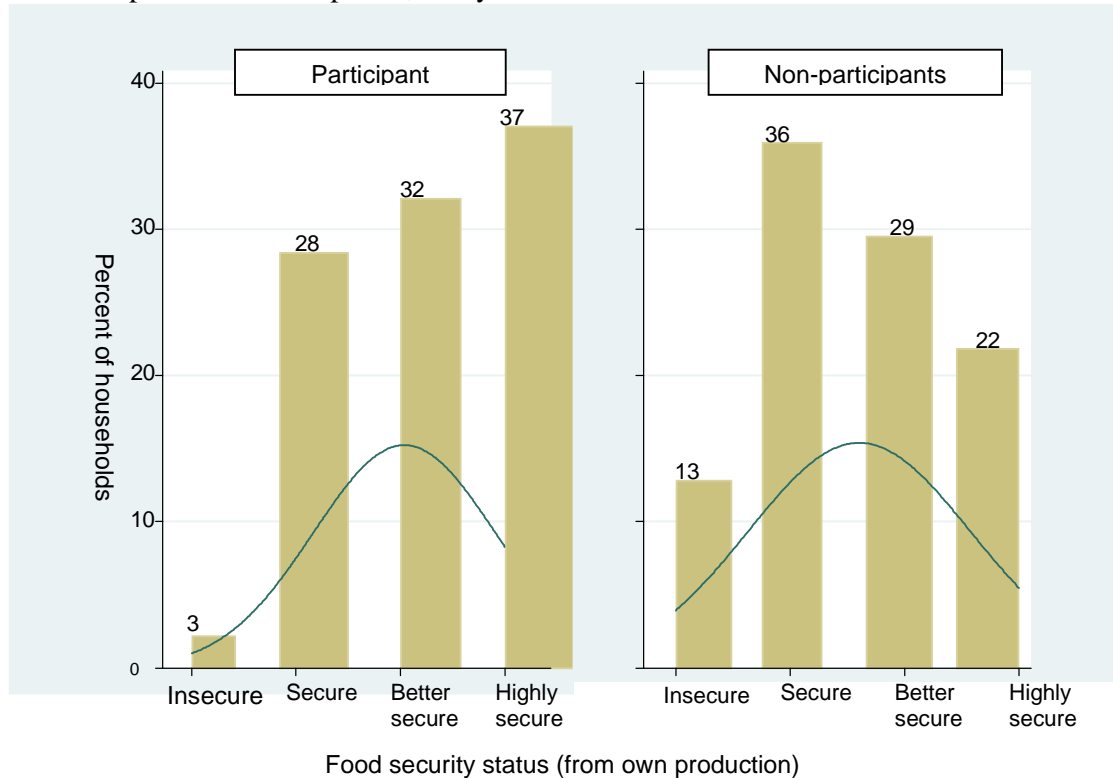


Figure 7: Status of food self-sufficiency among participants and non-participant households

5.6.2 Evidence from household survey

Participant farmers didn't reallocate their food crop land either to traditional or new high-value cash crops as they adopt new high-value horticultural cash crops. Contrary to what is expected, they expand both their cash and food crops area. After the intervention, total cultivated land expanded on average by 55% to 3.53 ha²⁵, and, as shown in Table 5, over 44% of this land went to the production of staple food crops, while 16% and 40% allocated to the production of 'traditional' and the new high value cash crops, respectively.

Whether it shows a 'food-first' strategy of farmers or not, the trend indicates the behaviour of small semi-subsistence farm households in trying to ensure their food security while they diversified their farm into cash crop production. Evidence from other studies (e.g. Von Braun and Kennedy, 1994) also shows that households that invest in cash crops rarely sacrifice their food security.

Table 5: Changes in cropping patten (among participant farmers)

Crop land utilization	Before	After	t-value
Total cultivated land (ha)	2.27	3.53(+55%)	7.46***
- Food crops area (ha)	0.98	1.54 (+57%)	3.83***
- Cash crop area (traditional/old) (ha)	1.29	1.50 (+16%)	3.56***
- New cash crops area (ha)	--	0.50	--

*** indicates significance at 1% level and figures in parenthesis are percentage changes.

The result, though, doesn't imply that success in producing more to market helps for better food security, it indicates that there is every reason to expect such kind of multipliers that reinforce the complementarity than the competing effect of expanding production of cash crops on food production.

Though some specific characteristics of the study area such as increasing chance of renting lands has a role, the complementarity or multiplier effect is also associated with the nature of cash crops introduced. First, as smallholders expand into vegetable crops only marginally, but the expansion led to a significant improvement in their cash income which helps to turn crops like Tef, the major cash crop before the intervention, into more of subsistence crop that has a positive nutritional effect on household members. By promoting high value, relatively labor intensive vegetables, the intervention also helped to counteract the negative effect of the diminishing trend of land/labor ratio.

5.7 Food security and the extent of participation in commercialization

Table 6 examines the dynamics of cash and food crops and it shows that food security status of participant farmers consistently increased as the proportion of farm land they allocated to cash crops increases. Farmers allocate more and more land to cash crops as their food security improved. Controlling for differences in farm assets and location (villages where sample households reside), the proportion of farm land allocated to cash crops exceeds by 42% among highly food secure households. The result suggests that, *ceteris paribus*, the viability of producing cash crops become less and less when household food self-sufficiency status decline. Alternatively, it indicates the difficulty in promoting cash crops among food insecure farm households and/or food unreliable areas.

Table 6: Cropland allocation by degree of food security

Participation		Food security status				F-value	
		Food insecure	Secure	Better secure	Highly secure		
Total cultivated land	Participant	1.6 (1.9)	3.1 (2.3)	3.5 (2.1)	4.0 (2.2)	1.20	
	Non-part.	1.4 (0.8)	2.7 (1.2)	3.0 (1.3)	4.4 (2.7)	12.9***	
Percent of land allocated to cash crops ²⁶	Participant	before	46 (11)	56 (15)	60 (10)	68 (15)	5.79***
		after	42 (13)	46 (9)	57 (11)	66 (16)	11.95***
	Non-part.		29 (22)	43 (16)	59 (16)	69 (17)	12.9***

***, ** and * indicates statistical significance at 1%, 5% and 10% respectively.

Figures in parenthesis indicate standard deviations.

Though cash crop area expanded (in absolute term), its percentage share declined in post-intervention period. As indicated in Table 6, cropland allocated to cash crops declined by 10% and 4% among just-food secure and food insecure households, respectively, in post-intervention period. Similarly, the proportion of cash cropped area declined by up to 3% among better food secure households²⁷.

In general, smallholders' priority to achieve their food self-sufficiency has important implication for the extent of their participation in commercialization schemes. This has strong implication especially if the commercialization initiatives focused on high value but traditional cash and food crops like Tef which, unlike vegetables, generate far less cash income per unit farm area.

5.8. Commercialization and farm productivity

Commercialization program in poverty-oriented communities in general and among net grain-purchasing households should not overlook the role of enhancing productivity of grain crops. Consequently, the study tries to ascertain how the two variables (commercialization and productivity) relate with each other, *ceteris paribus*.

Survey data shows that land productivity in the production of food grains is higher among households engaged in the production of the new cash crops. Productivity of Tef and wheat, the two most important food crops, exceeds by 56% and 48% in favour of participant farm households, keeping in mind any pre-intervention difference between the groups²⁸. This positive relationship, however, didn't prevail in production of pulse crops like chickpeas and lentils where the difference in productivity shifts slightly to non-participant farm households.

Table 7: Land productivity among participant and non-participant farm households (Br./ha)

Crop	Participants	Non-participants	t-value
Old, largely cash crops			
Teff	16,833 (16,607)	10,781 (3,018)	5.45***
Wheat	11,220 (6,509)	7,581 (3,124)	4.87***
Chickpeas	13,483 (4,774)	14,028 (5,713)	0.61
Lentils	14,041 (5,314)	17,528 (9,213)	1.87*
New cash crops			
Onion	49,729 (16,084)	-	-
Tomato	31,043 (25,742)	-	-
Green pepper	32,384 (17,696)	-	-
Other crops (largely staples)	9,802 (6,101)	6,901 (4,687)	1.92*

***, ** and * indicates statistical significance at 1%, 5% and 10% respectively.

Figures in parenthesis indicate standard deviations.

Source: computed from household survey (2009).

Intensification of food crop production seems to contribute for this observed better performance. As shown in Table 7, farmers growing new cash crops invest better in their food production. They applied more fertilizers, improved seeds and hired labor on a hectare of cropland than their counterparts who didn't take part in the program. The use of purchased seeds and fertilizer rose by over 50% and reached 138 kg and 421 kg, respectively, per household; while pesticides application doubled after they took part in the commercialization scheme. Most importantly, the change in the number of users and expenditure for rented farm equipments and water pumps is more notable as it is

increased significantly by over three times. In general, the evidence shows that commercialisation on the input side also proceeds in tandem with the degree of participation in output markets, and this might attribute for improved productivity.

Table 8: The commercialization process and changes in the use of purchased inputs

	Before-After comparison			Comparison of participants versus non-participants		
	Before	After	t-value	Participants	Non-participants	t-value
Improved seeds						
- Users (%)	53	54	0.19	54	53	0.15
- Application rate - all crops (kg/farm)	89	138	2.42**	138	101	1.11
Fertilizer						
- Users (%)	99	100	--	100	97	--
- Application rate (kg/farm)	277	421	8.79***	421	340	2.19**
Pesticide						
- Users (%)	91	98	2.53**	98	89	2.49**
- Application rate (liter/farm)	2.07	4.16	6.69***	4.16	1.86	3.91***
Expenditure for farm equipments/pumps etc.						
- Users (%)	18	55	4.18***	55	11	4.48***
- Expenditure (Br/farm)	680	1016	2.97**	1016	730	1.05
N	76	80		80	80	

Survey data also shows that the new cash crops contributed a lot for the observed changes in the use of purchased farm inputs. The new cash crops, for example, accounted for 39%, 37%, 87% and 23% in the use of improved seeds, fertilizers, pesticides and rented equipments, respectively, while they occupied only about 15% of cultivated land. Though under certain circumstances the direction of the causality might run the other way, the study shows the positive household-level synergies between commercialization and use of productivity-augmenting inputs.

5.9 Factor markets and commercialization

As in the case of input markets, similar effect is observed in smallholders' participation in factor markets. Compared to their pre-intervention period, participant farm households, for instance, were hired about 60% more labor, though the size of farm cultivated also increased by equal proportion. However, the fact that about 60% of hired labour employed on the new cash crops which are cultivated only on 15% of farm land proves the role of these crops in stimulating local labour market.

The effect of the commercialization program on local labour markets might go beyond agriculture to non-agricultural activities. Survey data also indicates that employment in non-farm activities indeed increased but slightly after the intervention. What emerged noticeably is, however, the wide in non-farm employment between participant and non-participant farm households (23% versus 46%, respectively) in favour of the later

group. In general, the commercialization scheme might help in stimulating non-farm employments especially for non-participant farm households²⁹.

Table 9: Impact of commercialization on participation in factor markets

	Participant farmers			Comparison of participants versus non-participants		
	Before	After	t-value	Participants	Non-participants	t-value
Labor market						
- Farm labor						
- Participation (%)	53	54	--	54	53	--
- Labor hired (man-days/farm)	89	139	2.42**	139	98	1.11
- Share of new crop (%)	--	58%	--	58%	--	--
- Non-farm labor						
- Participation (%)	16	23	1.51	23	46	3.01**
Land rental market						
- Participation as - tenant (%)	-- ³⁰	--	--	86	43	3.68***
- landlord (%)	--	--	--	0	15	3.20**
- Size rented-in (ha/household)	--	--	--	0.84	0.61	1.82*
- Share of new crops (%)	--	--	--	29%	--	--
Credit market						
- Participation (%)	80	85	0.84	85	78	0.06
- Average loan (Br/household)	700	1000	3.74***	1000	1080	0.84
- Average interest rate (%)	8.61	9.94	5.75***	9.94	8.47	0.95
- Major lender						
- Cooperatives (%)	52	45	-	45	62	
- Micro-credit/NGO	36	42	-	42	32	
- Government	2	0	-	0	3	
- Local money lenders	10	13	-	13	3	

Demand for credit measured as the incidence of borrowing changes only slightly, the average loan size, however, increased significantly by over 40% during post-intervention period. Similarly, the average interest rate increased significantly albeit by low rate (by just 1.3 percent)³¹. Survey data also shows slight change in the structure of credit suppliers. Over 60% of non-participant farm households got their credit from cooperatives. After a fall by over 14% from the pre-intervention period; the share of cooperatives as supplier of credit was only 45% among participant farmers.

On the other hand, about 13% of participant farm households borrowed from local money-lenders (which charges higher interest rate), compared to only 3% among non-participants. The decline in the role of cooperatives as source of credit among participant farmers, along the relative importance of the private sources (local money lenders) indicates a growing and healthy appetite for future borrowing.

6. Conclusion and recommendation

Participant farmers responded well to the commercialization scheme. Cashcrop area was expanded among all farmers, albeit at different degree. The new vegetables (onion, tomato and green pepper) become the major source of cash income while crops like Tef which were the major cash crop before the intervention turns to be more of subsistence crop.

The commercialization process didn't displace staple food crops and, consequently, helps for further diversification of agriculture in the study area. The result, therefore, implies that commercialization among smallholders doesn't necessarily mean specialization.

The fact that the level of commercialization consistently increased with the size of farm indicates the positive role of capital accumulation in the form of farm land, *ceteris paribus*, in fuelling the commercialization process. This, however, doesn't necessarily indicate that farmers generate more cash income as their farm land expands. On the contrary, smaller farmers generated more cash income per unit farm land as they allocated a larger proportion of their farm land to cash crop. These findings imply that targeting both small and relatively large farmers is correct but from different perspectives – among relatively land-poor farmers it is more meaningful in terms of its role in fighting poverty, whereas it is more of a commercialization tool among relatively land-rich households. Consequently, the intervention needs to have slight different packages for the two groups. Relatively large farmers seem to suit better for commercialization initiatives; with its implication on the need to look for ways to expand the proportion of land they allocated to cash crops. For land-poor farmers, the intervention might be more meaningful in terms of fighting poverty, though it is also helpful in raising the level of their commercialization.

Though the income and food effects of shifts from subsistence to commercial crop production are likely to be time and place specific, as a review of cash cropping schemes indicate (see Von Brown, 1994), that expansion of cash crops doesn't necessarily led for displacement of food crops and compromise food security status of small farmers. On the other hand, though the direction of the causality has not been examined adequately, the study found that the commercialization scheme helps in stimulating local factor markets with its positive effect on the use of purchased farm inputs,

In general, the study shows the success of this irrigation-led smallholder commercialization initiative, though its success might depends partly to the location of the study area: First, as located along major roads and close to major and growing urban markets, its location helps in creating sufficient demand for the new vegetables. Second, recent expansion in large private investment in the study area help for the expansion of local land markets as poor farmers gets opportunity to rent-out their land and work as wage-labourer in those nearby large farms and other establishments.

Any attempts to replicate the success of this scheme, should, therefore, not overlook these distinctive features of the study area. On the other hand, in view of rapid growth of supermarkets and changing consumers' demands and the associated stiff competition from other suppliers, any commercialization scheme among small farmers should go

beyond technical support to organizational support to improve their economies of scale and direct participation in value-chain that will facilitate conditions for future contract farming arrangements with nearby growing food groceries and supermarkets.

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Annex Table 1: Land productivity among participant farm households

	Degree of commercialization				F-value
	Very low	Low	Medium	High	
Tef	12,313 (14,620)	12,304 (12,114)	11,003 (5,165)	14,590 (3,875)	0.28
Wheat	8,981 (4,905)	9,120 (3,582)	10,549 (7,510)	13,769 (6,068)	1.17
chick peas	12,107 (4,976)	17,141 (1,737)	13,778 (5,202)	11,136 (4,584)	1.80
Lentils	12,453 (4,335)	18,620 (5,267)	13,449 (4,344)	14896	0.92
Onion	46,366 (17,197)	49,418 (25,464)	41,537 (22,259)	39,385 (46,279)	0.42
Tomato	53,311 (27,547)	49,225 (21,033)	54,302 (60,261)	35,917 (21,761)	0.22
Green pepper	21,981 (17,236)	30,546 (20,148)	24,511 (21,011)	--	0.41
N	16	22	36	7	

END NOTES

¹ see a recent study published jointly by the World Bank and FAO, titled *Awakening Africa's Sleeping Giant – Prospects for Commercial Agriculture in the Guinea Savannah Zone and Beyond* and the series of debate also entitled *Awakening Africa's Sleeping Agricultural Giant* and hosted by Reuter.

² This is a key justification for major initiatives such as Alliance for a Green Revolution in Africa (AGRA).

³ See [Foreign Affairs of Nov/Dec 2008](#) and a recent online discussion by the IDS-hosted [Future Agricultures Consortium](#).

⁴ See findings from Heltberg and Tarp (2002) which suggests that differences in area-based characteristics (especially risk and technology) are more influential in the commercialization process than differences in how the poor and non-poor respond to incentives.

⁵ Though pre-interview scoping study indicates relatively small diversity in the population, the sample size was decided mainly based on resource availability.

⁶ Discussion with community members (during the scoping study) reveals that a family is considered poor in the community if it exhibits the following characteristics: landlessness, lack of oxen and seed and if household members earn their living by casual labour or hired on other peoples farm. On the other hand, a family having land and oxen and who tills its own or contracted land is considered to belong to the medium wealth group. A rich person is one who possesses significant assets other than land, is involved in trading and/or participates in other non-farm activities. Such people are also expected to have significant savings in bank and provide to their children the means to decent education.

⁷ As participation in the commercialization program is determined solely by random selection, pre-intervention differences between the two groups were assumed insignificant and hence, non-participant farm households were expected to serve as control group.

⁸ If the later is the case, it is important to redesign the program to provide equal opportunities for female-headed households.

⁹ This is far higher than the national average.

¹⁰ Low level of commercialization indicates marketing 40% or less than their output - measured in value term.

¹¹ This constitute farmers marketed 60% to 80% of the harvested output.

¹² Though there are various technical guidelines to classify farmers based on their farm sizes, the study adopts the classification of farms the government uses in its annual agricultural sample surveys so that a review of characteristics and policy implications drawn from this study will be comparable with other studies conducted based on the national statistical systems.

¹³ This is statistically significant difference ($t=1.91$ and significant at 10% level).

¹⁴ Intensity of commercialization is measured as cash income earned per hectare of cultivated land.

¹⁵ In proportion to the total landholding, small farmers also allocate more land to cash crop (small farmers allocate on average about 32% of their land to new cash crops while this figure is only 18% among relatively large farmers).

¹⁶ The positive effect could partly explained by the location of the study area where better access to nearby cities and major roads could help to minimize the risk of growing a particular cash crop (in this case perishable horticultural crops) which is relatively more important to smaller farmers.

¹⁷ The study limits itself to this two-way analysis, though small farmers decision to take part in the scheme or the extent their participation made in light of many different factors which needs a rigorous regression analysis.

¹⁸ As mentioned earlier, the classification of farms into three groups largely follows the classification used in the national agricultural sample surveys.

¹⁹ This is indicated, among others, by a high positive correlation coefficient (+0.66) between farm size and ownership of livestock.

²⁰ Though in proportion to the total landholding, small farmers allocate more land to cash crops.

²¹ This is to indicate that the marginal productivity of the technology behind the commercialization process declines as farm size rise beyond certain level.

²² The correlation coefficient which measures both the nature and extent of the relationship between two or more variables also indicates a negative association between the intensity of fertilizer ($r=-0.20$), improved seeds ($r=-0.19$) and hired labor ($r=-0.31$) uses and the degree of commercialization of farm households.

²³ Household food security status was defined as follow: A household consider food insecure if its own production of grain could not feed itself for a year. Similarly, if own production of food could feed the

household for 12 to 18 months, from 18 to 24 months and more than 24 months households were considered as food secure, better secure and highly secure, respectively.

²⁴ Lack of data on pre-intervention food security status of non-participant households impedes to carry out a dynamic comparison of the food security status of participant and non-participant farm households.

²⁵ Most of the land comes from renting from farmers abandon part or whole of their farm to work as labourer in large commercial farms (in animal fattening, high value crops, and flowers) and various small industries expanding in recent years in the study and nearby areas.

²⁶ The difference between 100 and this figures (percentage of cropland allocated to cash crops (new and traditional cash crops like Tef) gives the proportion of crop land allocated to production of largely stable food crops.

²⁷ This might be because of the new high-value cash crops which, unlike traditional cash crops, help to generate more cash income per unit farm area; hence reduce the incentive to expand cash crop area or shortage of irrigation water might constrain the expansion of cash crop area.

²⁸ It is also important to note the potential two-way effect in productivity and commercialization.

²⁹ Because of limitation in the design of the survey (lack of data on non-participants in pre-intervention period), it was not possible to conduct before-after comparison for non-participant farm households that will help to answer the question more explicitly.

³⁰ Data were not available.

³¹ Despite the small difference in the in the rate of interest in the two periods, the mean comparison test indicates a statistically significant difference and this might be because of low level of standard deviations (1.55 and 1.58).