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LIVELIHOOD ACTIVITIES, CHALLENGES AND STRATEGIES AT PARTICIPATORY FOREST MANAGEMENT SUB-CATCHMENT IN HARARGE HIGHLANDS, EASTERN ETHIOPIA

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ABSTRACT

The study is aimed at identifying major features of livelihood activities, challenges and strategies devised by the smallholding farmers in one of the forest priority areas in Hararge highlands, eastern Ethiopia. Two peasant associations are purposively selected in the study sub-catchment based on its accessibility, land use/cover dynamics, and socio-economic and environmental characteristics. Using stratified multistage cluster sampling techniques, 128 key informants are randomly selected. The study used in-depth semi-structured interview, focus-group and formal/informal discussions, direct field observations, etc and descriptively analysed the collected data. The study area is known for sorghum-hoe farming complex with mixture of crop and livestock production system. Major constraints of crop production identified were climatic uncertainties, shortage of labor, SW erosion, lack of irrigation water, high cost of agricultural inputs and lack of credit services. Smallholder farmers have devised numerous livelihood strategies including crop rotation and intercropping, early ploughing during dry season against pests and insect infestation, sowing early maturing crop varieties, participation in off-farm and non-farm activities, migration and volunteer resettlement, decreasing number of child birth, use of family planning, investment in education and participatory forest management approach. However, the ever increasing demand for volunteer settlement, low adoption of artificial agricultural inputs, workload on women and the initiatives of participatory forest management by the community are demanding proper intervention. Holistic, systematic and integrated roles of stakeholders are required for sustainable livelihood development and management of natural resources.

Keywords: Agriculture, Hararge Highlands, Livelihood Strategies, PFM, Quni-Sororo

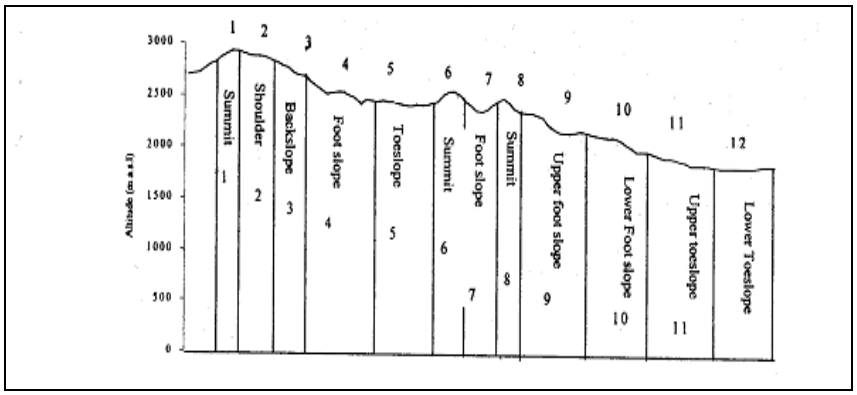
INTRODUCTION

Developing countries are directly dependent on environmental resources for their life and livelihood. Ethiopia Highlands cover about 44% of territory, more than 80% of human population, 86% of employment and 56% of total agricultural output (Ayalneh 2002). These highlands are known for their inherent soil fertility and sufficient rainfall, highest agricultural potentiality in Africa as well as accelerated land degradation (Shiferaw et al, 1997 cited in Ayalneh 2002). The Hararge highlands are among those highlands where cultivation of crops occurs in areas over 80% of slope gradient and with only 10cm of soil depth (Mohammed et al, 2005). With long history of human settlement in the area, resultant intensity of accelerated soil and water loss from these highlands made smallholding farmers at stake to sustain life and livelihood.

The relationship between dynamics in livelihood and status of environment varies within a country, across agro-ecological zones and even across households (Hunter 2000 cited in Tesfaye 2003). Livelihood strategies have potential for effective maintenance of food security and sustainable NRM at household level, which may include agricultural extensification/intensification, change in demographic decision in favor of minimizing number of children against the so-called 'rigid' mental outlook of demanding for more children by rural community (Tesfaye 2003). Mountain communities also opted for out-migration to reduce their dependence of on natural resources and to make important connections through financial and social remittances leading towards development of mountain areas. The current survey is to disclose crop production activities, major challenges and livelihood strategies in one of the sub-catchments of Jelo-Muktar forest priority areas (FPAs) of Hararge Highlands, Eastern Ethiopia.

DATA METHODOLOGY

Description of the Study Area: Quni-Sororo sub-watershed is situated within Jelo-Muktar FPA, at $8^0$55'N-$9^0$05'N latitude and $40^0$50'E-$40^0$51'E longitude, about 342kms southeast of Addis Ababa. Its altitude ranges from 1900 to over 3310masl, having subtropical climatic condition with mean annual temperature of 10^0C and mean rainfall of 1220mm. Its length of growing period ranges from 210-270days (MOA/FAO/UNDP 1983). The crystalline basement rocks form the geological formation overlain by Mesozoic and Cenozoic tertiary volcanic rocks to mantle the surface of most parts of the study area (Mohr 1971 in Mohammed 2003). Limestone and sandstone were also deposited upon the Precambrian basement rocks (Eyelachew 1999). It is part of the Chercher highlands in Hararge with extensive mountain range separating the Rift system from the Eastern plateau and lowlands, having numerous micro-catchments with diversified bio-physical and socio-economic environments (Eyelachew 1999; Murphy 1968). The landform feature of this sub-watershed is almost similar to Jelo micro-catchment positioned on its rear side and also suited to the classification of toposequences: summit, shoulder, back slope, foot slope and toe slope that do not necessarily follow sequential arrangements in descending slope position & form complex landform associations (Park et al, 2001 cited in Mohammed et al, 2005; Fig. 1).



Source: Mohammed et al, 2005

Fig.1. Topographic profile at north-south cross section of the west aspect of Jelo micro-catchment

The micro level variability in environmental factors has resulted in spatial variation of soil types. Based on geologic, climatic, topographic, biotic and pattern of land use/cover (LUC) dynamics, there are variations in soil types as one ascends from toe slope into the shoulder and within each of these segments of the toposequences as they are unevenly distributed and situated throughout the highlands. Leptosols, Cambisols, Vertisols, Phaeozems, Regosols, Fluvisols and Gleysols are the major soils in the area (Table 1). Anthropogenic processes due to shifting cultivation and forest clearing has led to continuous removal of soil materials that strongly affected the micro-climate and soil development of the area (Eyelachew 1999).

The study area is dissected by streams due to their erosive processes for prolonged period of time. The sub-watershed is within Wabi-shebele and Rift Valley drainage systems, drained by Chiro Qela and Jelo perennial streams towards the Rift system while perennial streams like Welenso and Ula Quni and seasonal streams like Rukele Arba Feno and Dingete draining towards Wabi Shebelle drainage system (EMA 1999).

Table 1. Relative Position of Major Soils Groups in the Jelo Catchment

Major soil	Relative position	Slope (%)	c. altitude (masl)	LULC
Vertisols	Toe slopes/valley bottoms	1-8	1800-2350	Most cultivated
Cambisols	Gently & strongly slope forms	2-15	1825- 2200	Largely cultivated
Regosols	Foot slopes and terrace positions	1-20	1845-2300	Largely cultivated
Leptosols	Steep and convex slope forms	4-100,c. >30	Varied, c. >2200	Vegetated/ degraded
Fluvisols	Along stream channels	1-5	1800-2075	Most cultivated
Phaeozems	Gentle to very steep slope forms	2-45	2300-2900	Natural vegetation

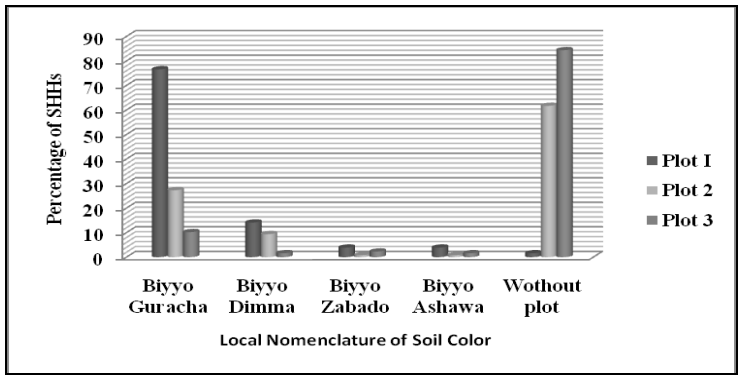
Source: Extracted from Mohammed (2003)

Date and Methods: Purposive sampling was employed in the selection of the study peasant associations (Quni Sagariya and Sororo) based on their accessibility, LUC dynamics, and socio-economic and environmental characteristics. In-depth semi-structured interviews, focus-group discussions (FGDs), direct field observations, etc were also important sources of the primary data after having stratified multistage cluster sampling techniques to identify 128 sample households (SHHs). The collected data are analyzed using descriptive techniques. Secondary data from statistical reports, published/unpublished documents and archives from different institutions are used as secondary data sources in the study occurred from September 2011 to June 2012.

RESULTS AND DISCUSSION

Crop Production Activities: Ethiopian highlands are centers of diversity of numerous globally important crops (Samberg et al, 2010). The sorghum/hoe complex is mainly known agricultural system in the Hararge Highlands (Westpal 1975). The major food crops cultivated within this system is sorghum (Sorghum bicolor L.) mixed with maize (Zea mays, L.), and/or haricot bean (Phaseolus vulgaris) while barley (Hordeum vulgare) is cultivated in relatively cooler high altitudes of the micro-catchment. Potato (Solanum tuberosum) and sweet potato (Ipomoea arabica, L.) are also cultivated to supplement cereals and onion as cash crop (Mohammed et al, 2005; Tesfaye 2003; Westphal 1975).

About 2/3rd of respondents hold cropland less than 0.5ha and about 30.3% of them have 0.5 to 1.0ha of land. Deliberate decision of selection of crops cultivated by smallholder farmers is based on fitness of crops to their elevation, soil type and specific agro-ecological zone as well as high productivity (Samberg et al, 2010). In the study area, nearly 3/4th of SHHs cultivated from 2 to 4 types of crops. In Ethiopia in general smallholder farmers manage numerous small plots of land with considerable variation in soil type, fertility status, slope gradient and distance from home, use of soil fertility management and access to irrigation, etc (Chilo & Hassan 2008). Farmers have different plot numbers: about 98.4% own plot 1, 21% that of plot 2 and only 15.6% hold plot 3. Throughout these three plots, largest share of SHHs cultivated on Biyyo Guracha (locally equivalent to black soils) (Fig.2).

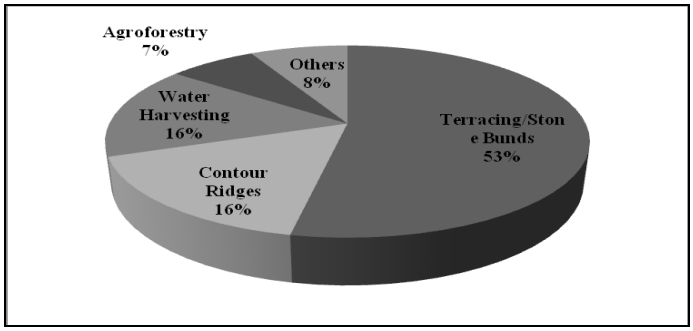


Note: Plot 1= on plains and valley bottoms, Plot 2= on gentle slopes and Plot 3= on moderate to steep slopes upon FPAs.

Source: Own survey, March 2012.

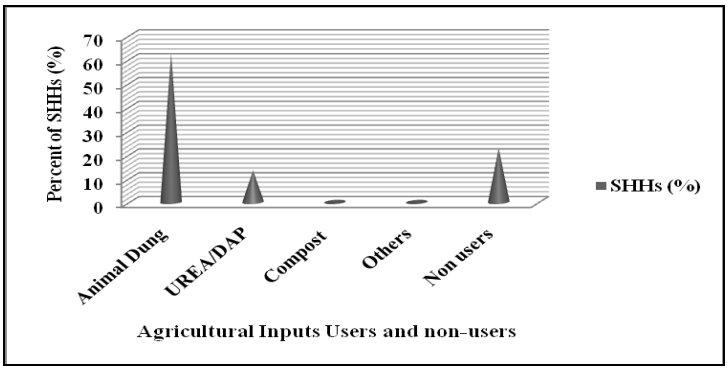
Fig.2. Soil Types and Plots Owned by SHHs

With an increase in the number of plot holding, there is a decrease in the number of smallholding farmers due to numerous demographic, environmental, socio-economic, institutional and political factors. Occurrence of intensive and continuous crop production over moderate to steep sloped and marginal forest areas have accelerated soil and water erosion, and degraded forest resources (Tesfaye 2003). Despite this fact, farmers in these areas have aspects of traditional knowledge and wisdom regarding terracing and soil bunding along steep slope where shallow soil depth prevail (Mesfine 1998). Likewise, >50% of SHHs used terracing/soil bunding as SWC methods while contour ridges and micro-basins/ponds for water harvesting are employed by about 16.4% and 15.6% of SHHS, respectively (Fig.3).



Source: Own Survey, March 2012.

Fig.3. Soil and Water Conservation (SWC) Methods Used by SHHs

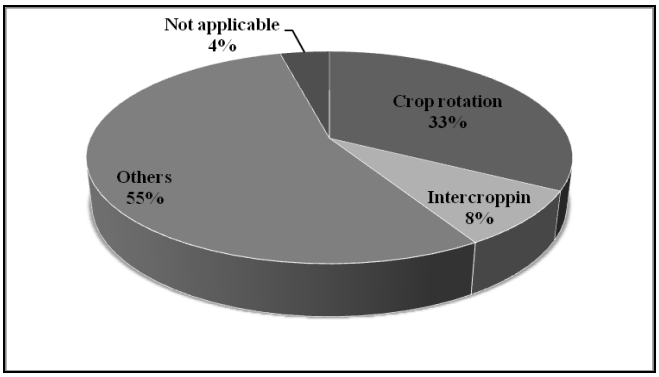


Source: Own survey, March 2012.

Fig.4. Percentage Distribution of Agricultural Inputs Users and non-users

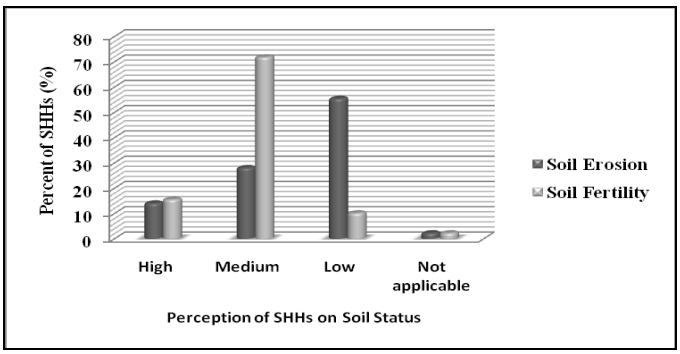
Capital-deficient/or labor based/agricultural intensification is common in the area including crop succession or rotation, intercropping cash with food crops and abandonment of traditional fallowing systems (Tesfaye 2003). Among the SHHs who were interviewed, about 62.5% used animal dung (locally called *dike*) and only 13.3% used UREA/DAP as agricultural inputs on their agricultural lands (Fig.4). About 1/3rd and half of them used crop rotation and intercropping per se or in combination as SFM methods for their farming plots (Fig.5). There is application of animal dung on farm plots without which soil productivity is almost nil. The study area is situated in the upper highlands, where adoption of traditional SFM practices is more likely than otherwise (Chilo & Hassan 2008). The use of such

methods might have affected the perception of respondents whereby about 56% and 28% mentioned the status of soil erosion as moderate and low, respectively (Fig. 6).



Source: Own survey, March 2012.

Fig.5. Soil Fertility Management (SFM) Methods



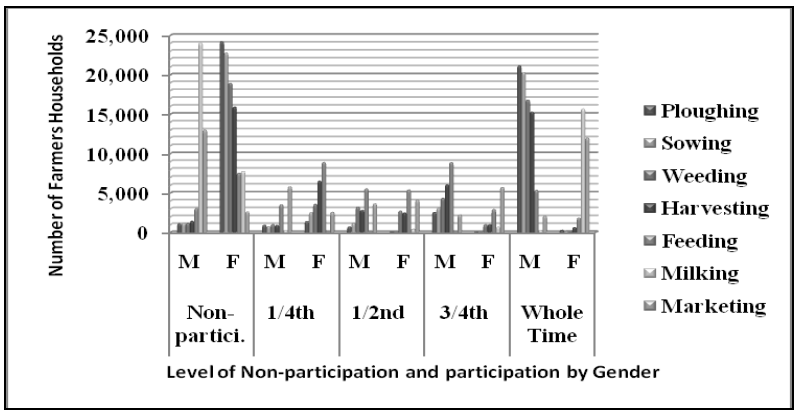
Source: Own survey, May 2012.

Fig.6. Farmers' Perceptions on Status of Soil Erosion and Soil Fertility

Crop production activities include land preparation, ploughing, irrigation, sowing/planting, weeding, application of fertilizers and pesticides, harvesting, threshing, transporting, storing, feeding/treating, milking, marketing of agricultural products, etc (Mahlet 2005; CSA 2004). Labor allocations for farming activities are obtained from family, hired/kulli, and guzaa (mutual/reciprocal labor group system equivalent to debo in other parts of Ethiopia) and maqanajo (shared of oxen and human) labor. The lion share of family labor of women aged 10 and over was not participated in ploughing, sowing, weeding and harvest while those of men participated in milking and marketing of agricultural outputs. Men aged 10 and over spent much higher full-time than those of women in ploughing, sowing, weeding, harvesting and feeding and treating. Whereas, women spent much of their full-time higher than men in milking and marketing of agricultural out puts (Fig. 7).

Ox-less farmers either exchange labor for oxen or make use of family labor. Hired labor (kulli) also migrates out of Quni-Sororo to neighboring districts like Boke and Homecho by leaving their family. Guzaa is common for almost all members of the community especially during high labor demanding activities: ploughing, sowing, weeding, harvesting and

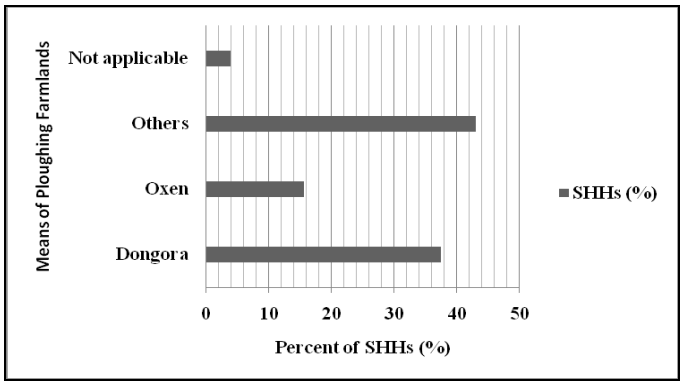
threshing. Usually guzaa is run by group members ranging from 2 to 20, but mean of 5 to 7, depending on farming activities and economic capacity to host the occasion by expenses of feeding/entertainment.



Source: Extracted from CSA (2004); **NB:** Gender groups include those aged 10 and above in farming household; n.a. =not available;*=Marketing of agricultural produce.

Fig.7. Statuses of Gender Participation and Non-participation in Farming Activities in Quni (now Gemechis) District in 2001/02

According to focus group discussion, maqanojo (labor sharing system of joining two oxen together by two ox owners, or sharing labor/land for oxen) is also used in Quni-Sororo sub-catchment. About 37.5% of SHHs used dongora (traditional farming equipment locally used to plough land) while 43% using both dongora and oxen (Fig.8). Smallholding farmers are unable to get merits from farm machineries due to topographic, economic & technological factors.



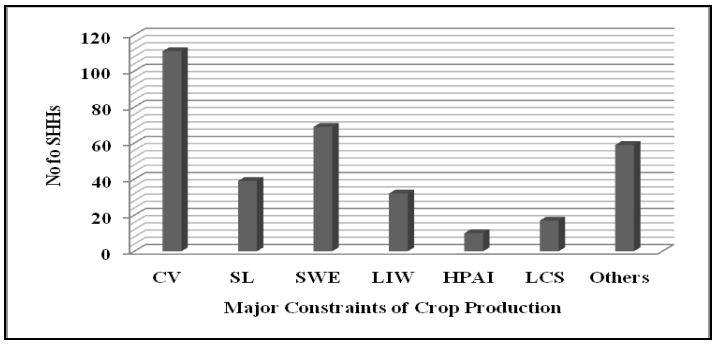
Note: Others= combination of *dongora* and oxen.

Source: Own survey, March 2012.

Fig.8. Means of ploughing land cultivated by SHHs at Quni-Sororo

Major Challenges: Sustainable agricultural development can be attained through fulfillment of appropriate resource management policies supported by farming communities at the grass root level, land tenure, farm holdings, access to agricultural inputs and credit services,

availability and effectiveness of extension services, farmers' awareness, abilities to afford and apply technologies, overall agricultural infrastructure, etc (Mushala & Peters 1998 in Ayalneh 2002). Diversity of subsistence agro-ecosystems in Ethiopian highlands have been created and maintained due to heterogeneous biophysical landscapes, traditional practices of agricultural production and inaccessibility (Samberg et al, 2010). Even though farmers have traditionally relied on highly predictable seasonal precipitation patterns, poor rural people are already puzzled by shifting seasonal climate patterns which weaken the value of their long base of experience and local knowledge that in turn exposed them to new risks of food insecurit. In the study area, about 87% and 54% of respondents identified climatic uncertainties and SW erosion as major constraints of crop production, respectively (Fig. 9).



Source: Own survey, March 2012; Acronyms: CV=Climatic variability, SL= Shortage of labour, SWE=Soil and water erosion, LIW=Lack of irrigation water, HPAI=High price of agricultural inputs, LCS= Lack of credit services.

Fig.9. Major Constraints of Crop Production stated by Respondents of Quni-Sororo area

Both of these constraints are highly determinant since lion's share (over 95%) of the country's cultivable land are utilized using rain-fed agriculture and the remaining less than 5% are through irrigation water (FDRE 1997 cited in Tesfaye 2003). during focus group discussion with the community representatives, the challenge due to climate uncertainties include "decreased rainfall, increased temperature and evaporation in dry areas, frequent drought spells leading to severe water shortage, change in planting dates of annual crops, increased fungal outbreaks and insect infestations due to changes in temperature and humidity, decrease in forest area and area under cultivation, decline in crop and gum yield (among others).

Major Livelihood Strategies: Agriculture is insufficient to secure survival of life in the Sub-Saharan African region (Ellis 2000). Climate risks and economic fluctuations make rural households vulnerable to serious shocks in Ethiopia (Dercon 1999). Food securities become very far and unattainable by many rural households in Ethiopia and therefore many vulnerable environments developed livelihood diversities of different ways (Ayalneh 2002).

Traditional strategies are embedded in traditional social structures and resource management systems of the communities of Ethiopia. Depending on the impact of livelihood activities on household assets, a distinction can also be made between accumulative, adaptive, coping and survival activities. Accumulative and adaptive activities augment or transform the asset base, while coping and survival activities draw down the assets to maintain the level of

consumption (Ellis 2000). Livelihood copping strategies encompasses intensified sale of livestock, calling down informal claims, withdrawal of children from schools, requesting food loan, reduce of child birth, piece work and agricultural labor, temporary migration, and borrowing. About 55% of the respondents devised copping strategies.

During focus group discussion with elders, land shortage and degradation are reported severe in the area. According to them, children should go to school to pursue their life in education rather than waiting for uninhabitable small land. About 78% (100/128) of respondents identified non-farming activities as future fate for their children. About 75% of SHHs in Quni-Sororo sub-catchment reported lack of demand for more children due to shortage of land, economic reasons, age factor and lack of partner/supporter and others. About 73% (94/128%) of respondents' used family planning practices, and 70% (90/128%) being used injections for 3 months.

Volunteer migration of adults is the other common livelihood strategy in Quni-Sororo area. Initially it was invented by farmers themselves after obtaining unoccupied cultivable land in Bale region, south eastern Ethiopia. The first batch returned to home village after first crop season to take their relatives. This has motivated not only other farmers but also regional and federal governments to undertake volunteer resettlement program even to areas as far as Wollega and Illubabor in western Ethiopia. Success of volunteer resettlement may depend (among other factors) on participation of PA leaders and members and on decentralization of power to grass root level (Alemneh 1990). There are free exchange of information and people between Quni-Sororo residents and the migrants/resettlers in Bale, Wollega and Illubabor. About 70% (89/128) of respondents reported their interest and readiness to participate in volunteer resettlement program. Proper extension services need to reach and respond to marginal groups and to both women and men in such areas of high male migration where women have increasing responsibilities for agriculture, water management and related activities too.

Major features of adaptive strategies deals with asset protection and vulnerability reduction such as change in mix of assets, management of expenditure, precautionary saving of financial and other assets, reducing food consumption, agricultural intensification / extensification, invest in social capital, off-farm and non-farm diversification, and early management of oxen for ploughing, seeds for planting and labor for weeding, etc. About 45% of respondents reported for adaptive strategies. Because of their proximity to a zonal town of Chiro (Asebe Teferi), the importance of trading network has long durations (Mohammed 2009; Ayalneh 2002). In the study area, most women with/out donkey pass pedestrian route through inaccessible terrain of Jello-Muktar Forest Area for marketing food crops like *teff* and pepper from lowlands to highlands, and commercial goods back to the lowlands. They also participate in petty trades of milk through rotational milk saving group (*kaddi or milk-equb)* consisting of about 15 to 20 women who reciprocally collect and sell milk in nearby urban areas). Non-/off-farm activities like petty trading, brokering, renting out donkey to transport agricultural output and commercial materials, fattening of oxen sheep and goat, rope and basket making, etc are often practiced by rural households as their livelihood strategies.

The Jelo-Muktar Forest Area was once covered by tropical highland forests in southeastern Ethiopia. During the imperial regime, foreign private organization planted forest miller in the

sub-catchment for timbering. After timber plant failed to continue due to deforestation, smallholding farmers encroached to the mountain forest area for settlement, farming and livestock production. After severe deforestation, around early 1980s, it becomes state forest protection area where plantation of monoculture afforestation occurred. In the last four decades or so, 'common-resource' management approach was implemented where farmers freely encroached for farming, livestock rearing, domestic and commercial purposes. This aggravated by frequent changes of government and gap in administrative roles of central government, namely early 1970s and 1990s. It was one of the areas in the Hararghe Highlands of Ethiopia where Community Forestry Practices (CFP) projects are undertaken. According to the definition of FAO (1978 cited in Bishaw & Abdu 2003), CFP is perceived as encompassing all activities carried out by individual households and farmers, as well as community involvement through tree planting on farms and households, the use and management of natural resources, supply or provision of tree products from the surrounding vegetation, and promotion of self-help management and use of trees to sustainably improve livelihoods of the local people.

Coordinated efforts between the government, private sector, civil society and the local community to encourage innovation, sharing of ideas, and maximum efficiency in planning and implementation are very important for success of a program. Since 2010, PFM approach initiated by the Oromiya Forestry and Wildlife Agency in collaboration with the German Technical Corporation (namely GTZ) with active participation of all stakeholders and the local community (personal communication, regional officer). There is eco-tourism due to wild animals like Mountain Nyala, Menelik Bush Buch, Leopard, Hyena, Rhinoceros, Black and White Monkeys, and numerous birds and others. Every two years, inventory of wild animals is conducted by experts from Federal Government and community representatives. Based on their quota, controlled-hunting of Mountain Nyala and Leopard is permitted for tourists.

According to the regional officer, continued awareness creation and experience sharing activities were made to convert strong opposition of farming community about PFM. Community closer to the forest land organized into Community Forest Association (CFAs) based on proximity, small landholding, poor economic status, volunteer to participate in the program. Activities of the CFAs include bee keeping, livestock fattening, following up zero-grazing, cut and carry system of grass and collection of income from eco-tourism. CISP-Ethiopia (International Committee for the Development of Peoples-Italian Based NGO) is acknowledged for support of the CFAs with initial capital on gift and on credit basis to be refunded after grace period of two and half years. It also provided necessary funds for materials and construction of livestock fattening shelters in the area. At the current time, agricultural extensification has been abandoned and rehabilitation of forest cover became apparent: number of wild animals increased and springs regenerated to give water to the surrounding downstream throughout a year. Yet, there are problems, interventions and illegal acts as disclosed during focus group discussion with members. These are:

1. Illegal wildfire by opponents of the program from the nearby community.
2. Signs of frequent conflicts with relatively distant residents of the community who could not get access to the watershed and unable to get material and financial merits.
3. Lack of access to veterinary services for their fattening cattle.

4. Signs of conflicts and disagreements especially between the beneficiaries of the PFM approach and the distant farmers through stealing forest products, etc.

The districts government bodies with the community are designing different conflict resolution and settlement devises at grass root level as much as possible. However, indicatives are likely to emerge before the program develops a systematic approach towards good governance and conflict resolution for sustainable livelihood diversifications and NRM.

CONCLUSION

Attempts made to reveal issues related with agricultural activities, major challenges and livelihood strategies practiced in the study area. Issues on crop production activities include crops grown, soil types and color, number of plots cultivated, labor allocation, means of ploughing land, status of soil erosion and soil fertility, SWC and SFM methods used in the area. Climatic uncertainties, shortage of labor, SW erosion, lack of irrigation water, high cost of agricultural inputs and lack of credit services were the list of major constraints of crop production identified by respondents. There are numerous livelihood copping and adaptive strategies that were devised by respondents. The major are crop rotation and intercropping, early ploughing during dry season against pests and insect infestation, using early maturing crop varieties, participation in off-farm and non-farm activities, volunteer resettlement and migration, decreasing number of child birth, use of family planning by females, increasing investment in social capital (mainly by sending children to school), etc.

The current PFM system implemented along steep sloped forest areas of Quni-Sororo has rehabilitated the watershed, through regeneration of forest plants and springs, raised participation and income of farmers from eco-tourism, fattening, apiculture and cut-and-carry of grasses from the catchment. Participation of the nearby farming community through planning and implementation of PFM approach in the area has great contribution for both the community and the environment. However, emergence of conflicts and disagreement among and between the community members require proper remedial actions and interventions for sustainability of the approach. The ever increasing flow of out-migrants together with high demand for volunteer resettlement schemes by farming community also should be heard and answered on time as awful push factors of migration continue unabated. Females in the study area require strong support as they are among the key role players in devising livelihood strategies and family planning measures throughout their domestic, reproductive, commercial and agricultural roles. There is also an urgent need for proper information and early warning systems on climate change and variability on agricultural system so as to undertake effective adaptation options.

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simplified the data collection and made the field survey more interactive and in favor of success of the study at hand. The authors extend words of thanks for all of them.

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