



## Research Article

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### Adopted Cropping Systems, Tillage Practices and Subsistence of Shire to May-Dimu Area Residing Farmers

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#### Abstract

Farming residents' local practices in cropping systems and the way of living in Shire and May-Dimu areas were viewed, in this paper through experiences devised from field excursions, practical demonstrations, field visits, interviews and personal communication in the last four years to the areas. This paper is developed to introduce adopted cropping systems and situations of lively hoods in the areas. There are occasional local practices in developing cropping systems by farmers basically for the sake of crop preference, weed control and scared farm land. Major crops grown in different cropping patterns include teff, maize, sorghum, finger millet, niger seed, chickpea and grass pea. Major irrigated vegetables included seldom to the cropping patterns are tomato, pepper, cabbage, lettuce and switchyard. There is a mixed farming system in which crop cultivation and animal rearing are practiced in its dry lands. Agricultural productivity is too low and the way of lively hood is so hard to fulfill a daily bread to households. Farmers and families are subjected to migrate to towns to labor at off farming seasons for a subsidiary income. Child education is also difficult since children might be required to finance their fees and schools are distant. There is an immediate need for intervention for the social resilience in these areas.

#### Keywords

Cropping system, Farming practices, Crop cultivation, Lively hood, Dry land agriculture

#### Adopted Cropping Systems, Tillage Practices and subsistence of Residents

Shire and May-Dimu are conjoint districts having farming residents on fragmented plots. The areas are attributed to an undulated landscapes and dry spell agriculture. A case study was developed from past trends through field excursions, personal observations, filed survey and personal contacts to the farming community and experiences of resident way of living and farming practices for the last four years. The paper presents general facts and residents day to day experiences, practices and challenges. It introduces existing local farming techniques, practices and habits of a farming community in shorter details.

Shire town in woreda Shire- indaselase and May-dimu kebele are located in Tahtay Koraro, Northwestern Zone Of Tigray Regional State, Ethiopia. The study sites are characterized by mean annual temperature of 18 to 28°C and average annual rainfall of 900-1200 mm despite the fact that 75% of the topography is high land. The soil type of the area includes 70% clay, 10% sandy loam and 20% loam with near neutral pH. Shire town and May-Dimu are located at 1877 and 1992 meters above sea level (Solomon Legesse and Fassil Assefa 2014).

According to the definition of Rana and Rana (2011), cropping system is arrangement of crop populations that transform solar energy, nutrients, water and other inputs into useful biomass that includes food, feed, fuel and fiber. Crop system comprised of soils, crop, weed, pathogen and insect subsystems. The crop can be of different species and variety, but they only constitute one crop system if they are managed as a single unit. The crop system is a subsystem of cropping system. For example, in the maize crop system, maize is the dominant crop which is grown in association with other crops. Cropping Systems: Cropping systems, an important component of a farming system, represents a cropping pattern used on a farm and their interaction with farm resources, other farm enterprises and available technology, which determine their makeup.

Tillage and cropping systems are vital for soil preparation for any crops production (Ademir *et al.* 2008). Developing certain cropping systems in an area has a significant agricultural and environmental importance. Aiming to increase productivity and production of a crop in an area deserves an apt system in which scarce growth resources be utilized equitable in sustainable bases. Commonly shared growth resources degrade through time that leads to an improper combination of major crop requirements. Targeting sustainability in the intention of maximum production should also have a concern to keep the environment safe.

Farmers of Shire are obligated to work hard on their plots of highly exploited land in order to produce crops for subsistence. Any farmer and his family labor generally spent more than twelve hours on work on their farmland including looking after their animals. The area is devoted for dry land agriculture where by the rain fed crop production is highly affected by moisture scarcity. The area is crop belt for teff, finger millet, sorghum and

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maize production from cereals and chickpea, grass peas, niger seed are also produced as pulses. Majority of their land is always covered by teff production for it is a major staple food grain and its palatable straw is a first choice for animal feed and local house construction in which farmers' gain high market exchange. However, the greatest challenge in teff production to the area is its very low productivity even from that of the national average yield which is 12 quintal per hectare (CSA 2015). A farmer can only produce 6 quintals of teff grains in a mono-cropping system in the area.

Farmers use manual farming tools in order to stir up their soil to make it ready for crop emergence, water retention, weed and pest control. However, there are aggressive weed species in the area including the parasitic striga. For this reason farmers sometimes tried to use an alternate cropping system particularly crop rotation. The primary concern of these people for crop rotation is to control weeds. Labor for weeding is expensive and less available in which the farmers could not able to try. Family labor is also limited because of the youth migration to cities and towns for seeking job and school. Hence their less productive farm lands are used to be managed traditionally by including less inputs aiming to produce only for subsistence.

Soils of Shire and Maydimu areas are cultivated for long period of time and thus are very poor to support plant growth. It is highly affected by degradation to lose its properties and less application of fertilizer inputs led very low productivity of each crop. The maize and sorghum crops emerge well other than teff and finger millet. Farmers used to sow high biomass producing maize and sorghum varieties aiming to use the residual for animal feed, construction material, fuel and sale to dairy farms to Shire town. Farmers are obligated to off farm activities to support their life. It is very difficult to get daily bread in the area through their mixed agricultural systems. Poor crop production and animal rearing practices in a degraded area led the farmers for food insecurity.

A farmer with a hectare of land may get a yield of 15 quintal maize or 6 quintal teff or 10 quintal sorghum and finger-millet to the average. If the same person could have a milked dairy cow he would receive an average 1 liter of milk a day. A family contains more than six members in average, four of which are self helping students. This is below their daily meal requirement while it could be divided to their number. Almost every child will work half a day in a farm or as daily labor to

support the family before going school or after school. Farmers' children of the area face shortage of school fee and are food insecure and less effective in their educational life. They could not compete with other students in the town whose educational environments are relatively better. In addition to these difficulties, children should go up to 20 km to attend school.

Distribution of primary, secondary and high schools to the area and the farmers' settlement in undulated terrain make it difficult for children to attend school easily. Hence, every members of the family are in a daily base farming experience to find a way for sustaining life. Even though, good cropping systems are not investigated to the area, farmers by their own experience are practicing in response to yield decline, seasonality, crop failure, shortage of land, weed problem and crop preference.

Farmers' settlement near growing towns and cities always face land scarcity time to time because of expansions for buildings, factories and investments (Kavitha *et al.* 2015). Farmers interviewed in the area indicated that there is shortage of cultivable land which is very less to the regional average landholding. Individuals of the area received only half a hectare of land to produce crops and for rearing animals. They used to uncontrolled grazing on a communal land which failed to support livestock husbandry sustainably. Crop chaffs and every plant remnant are used to be consumed by animals.

Tillage practices are majorly accomplished by using an oxen drawn plough which requires two oxen per a family. Farmers employed different season tillage but frequent in its type to cultivate various crops basically to reduce the effect of weeds and to conserve the scarce moisture. They used to plough the land frequently leaving so many bushes unclear within it aiming to use it for fuel, animal feed particularly for goats, fencing, shade and house construction. For this reason, they are not controlled perennial weeds intentionally. It looks like an arbitrary agro-forestry practice on every farmer's land to see crops cultivated underneath different thorny bushes majorly cranberries.

A four to six frequent tillage is commonly practiced for teff production to reduce weed infestation and for an intention to break aggregates which might harm emergence of the weak teff seedlings. Farmers are also intended to plough repeatedly to enable land leveling easy at teff sowing. Both repeated ploughing and land leveling practices of farmers are majorly intended to control weed infestations. In any plough a farmer is

seriously tried to remove a whole part of a weed from a farm land at any possible cost. To do this, they practice a repeated tilling particularly following any erratic drop of rain which results in emergence of many weeds. A final plough is then made at sowing to bury the left emerged seeds, propagates and soil aggregate at land leveling. Land leveling is practiced to prepare a land flat and free of colloids, stones and weeds from the bed by compacting using animal feet followed by family labors' intentional walk on a bed to fill pits, remove stones and weed materials. Leveling through compaction has been practiced so long for a purpose of drainage, weed control, bed clearance and to facilitate shallower sowing depth for a small seeded tef crop.

Conservation tillage is less likely practiced in the area. Farmers are resistant to conservation tillage and technologies. Only some farmers who have small scale fruit gardens practice conservation tillage after seedling establishment for the sake of saving labor and applied water. They used a circular tree bed ring for cultivation and water application of a fruit trees. There are few tree seedling preferences of the farmers in which mango, guava and avocado are dominantly established in Shire town small scale gardens in recent years. People in such gardens do not left fruit tree bed rings uncultivated till it bears fruits. They always practice cultivation of shallow rooted vegetables very commonly lettuce, onion, garlic and kale vegetables underneath. Most often they are highly concerned for the scarce water to be applied with no fulfillment of shortly harvested food items.

Sequential cropping has been practiced after residual moisture retained followed by any erratic rainfall at the begging of spring season in September and at the end of autumn in May in the area. In spring just after early planted maize and sorghum harvested, chickpea and grass pea are commonly sown as sequential cropping in the area. Farmers preferred this narrow sequential cropping for the crops perform well in residual moisture and a superficial addition of rain fed, condensations and/or humid air precipitations. Farmers also understood the effect of these legumes in improving their soils fertility. The chaffs of these legumes are palatable to their animals feed and is believed to be nutritious in protein contents to be fed as supplements for milking sheep, cows and goats in the area.

Chickpea and grass pea are commonly cultivated pulses for the area. They are crops to be cultivated in a reduced cost and out of a main farming season that is considerable for family labor distribution. The crops are

also major sources of protein for the people. People consume chickpea and grass peas as a pulse in a daily meal that is prominent sauce (the local shiro wot) which is a mix of spices with roasted and grinded grains the crops to a flour to make a potage. Chickpea is also eaten roasted, boiled and as a year round vegetable for sale in the area. Farmers grow chickpea as a vegetable in irrigated gardens and earn income for their subsidiary costs of a daily living. Another very common and year round grain vegetable to the area is maize. Almost everyone in the town and rural areas will have a maize crop in its small home garden in the rainy season. Farmers of the area has a potential to grow crops in a small scale irrigation majorly for vegetables but there is always inclusion of a maize crop for it is highly demanded as a common vegetable in towns. Hence farmers usually intend to earn money and relay on cultivating maize indifferent intercropping systems particularly intercropping, rotation and sequential cropping systems.

Rotational cropping system and fallowing are occasionally practiced in the area. Due to shortages of the farm lands and less crop preferences, farmers are very reluctant to adopt these cropping systems. However in some occasions there might be a need to leave a farm land for grazing land or for making hay. On such occasions fallowing will be allowed for a double portion importance. The crops grown in successive years in rotation might not be intentionally selected for resource utilization differences. Just for the sake of crop preferences farmers will rotate vegetable with cereals and cereals with cereals. The very common reason for farmers to rotate crops is to reduce aggression of weeds. For this reason maize and sorghum crops are rotated with the teff and finger millet crops for there is difference in crop management and cultivation days. Generally there is not well established tillage and cropping system devised for sustainable crop production basis in the study areas.

Major agricultural interventions are required to bring a social resilience in these farming communities for there is a high food self insecurity. The adopted agricultural practices are very low input intensive and less productive. The scarce resources are not optimized and combined since there is a poor technological extension and adoption in the areas. It will be possible to feed the community and bring a relief out of food aid if major agricultural resources could be optimized and combined for maximizing productivity in sustainable basis. Hence, any stakeholders engaged in farming community development to the areas should take

considerations of a support in technological advancements that could enhance agricultural productivity through resource optimization for sustainable production. Any change in a farming community will be fostered if a farming practice is changed and paved a way to a house hold food self security. Priority must be given to enable people to feed themselves which might result in a stable social resilience, community development and environmental protection. Adopted technologies will enhance the performance of the family labored on their farms and there could be a significant increment in productivity of crops grown. New technologies disseminated among the farming community might be adopted through time in a demonstrative training. There must be intervention towards developing agro-ecologically and socio-economically feasible cropping systems, tillage practices and agro-forestry systems. The areas are identified as potential belts for avocado fruit trees and there will be desirable production of mango, guava, papaya and banana fruits. Hence, adopting sustainable farming integrative systems to be diversified and intensified in a fragment of plots of land will be required in finding a way to increase productivity of the area.

On the other hand, farmers' mixed farming practice must be intensified to enable complementarities between plant residuals for animal feed and animal residue for organic fertilizer.

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