Land productive farm lands at lower slope areas

Business, Management

Land degradation is aworldwide problem that has revived the issue of resources sustainability whichis mainly caused by improper land use (Hurni, 1997). Due to its variousnegative impacts on environmental degradation, agricultural productivity and itseffects on food security, land degradation has been a major global issue sincethe last century (Eswaran et al.

, 2001). The agricultural land is most vulnerableand affected by degradation. De Graaff et al., (2009) indicated that outof the total agricultural land in the world 40 percent is degraded severely. Onebasic process that threatens the land resource is soil erosion by water(erosive rainfall). Among the sever degradation of the world’s agriculturalland 80 % of it is caused by soil erosion (De Graaff et al.

, 2009). Soil erosion by water is the critical problems and processes of land degradation(Woldeamlak and Sterk, 2002; Wagayehu, 2003). Soil erosion has onsite and offsiteeffects. The onsite effects of soil erosion is washing out of important soilnutrients, reduction of soil depth, decreasingwater holding capacity of the soil and finally leads to lower agriculturalproductivity (Aklilu, 2006; Gebreegziabher et al.

, 2006). On the otherhand, soil erosion causes off site effects like siltation in dams and reservoirs, degradation of wetlands and loss ofproductive farm lands at lower slope areas (Gete et al., 2005).

The problem of soilerosion existed all over the world nevertheless the severity level is high in developingcountries, as their economy mainly dependent on agriculture. In Sub-SaharanAfrica countries, soil erosion

problem is worst in which the rate of soilerosion on averages is nearly 10 times greater than the rate of soilregeneration (Holden et al., 2005).

Lossof top fertile soil by water erosion creates severe limitations to sustainableagricultural land use, which leads to reduction in productivity of the soil andfood insecurity (Tadesse, 2001 and Bewket, 2007). In Ethiopia, since morethan 80% of the livelihood of the country’s population is dependent on agriculturalactivities (Aklilu, 2006) land is a crucial resource. Population pressure increases the food requirement and intensivesubsistence cultivation exacerbated the cultivation of grazing and forest land(Taddese, 2001; Lu et al., 2007). As aresult, 26% of the total area of the country is degraded and 20. 6 millionpopulation are affected by the cost of sever and continuous land degradation(Bai et al., 2008). Thus population pressure, past political crisis, policiesand there implementations contributes a lot for land resource degradation inEthiopia (Holden et al, 2005).

Population pressure andits related effect and interaction with poverty is the major factor for sever landdegradation in the highland parts of Ethiopia (Sonneveld and Keyzer, 2003). Consequentlythe land holding size decreased and resulted continuous intensive cultivationwithout possible land management measures. Such conditions aggravate the landresource degradation and lowering agricultural productivity (Shiferaw andHolden, 2001). IMF (2005) reported that the amount of crop yield increased by0. 4% and cultivated land increased by 5. 7% from 1991 to 2003 per year onaverage.

FAOestimated that 25% of the highlands of Ethiopia have been seriously affected bysoil erosion (FAO, 2004). Most of theEthiopian highlands experience high amount of annual rainfall and it has highspatial and temporal variability with long dry months of the year (Bewket andSterk, 2005). The heavy rainfall during the rainy season causes overland runoffand erosion on the already disturbed agricultural and other degraded lands. Rainfall based soil erosion is severe (Bewket and Sterk, 2003) and soil losses reachup to 7 ton/ha annually (Garzanti et al, 2006). The report by Environment for Development alsoindicated that, in 1995 the net amount of soil loss in Ethiopia was 130 millionmetric tons and shifted to 182 million metric tons in 2005 (EfD, 2010).

USAID (2000) also estimated that the averageannual soil loss rate in Ethiopia ranges from 12 tons ha-1 yr-1 to greater than300 tons ha-1 yr-1 in which the area is steep slopes and limited vegetationcover. There is also greater local spatial variability of soil erosion rates whichranges from less than 1 – greater than 400 t/ha/year (Mitiku et al., 2006; Tebebuet al., 2010). It is true that soil erosion rate in Ethiopia is far greater (onaverage 10 times) than soil formation rate (Holden et al.

, 2005). As a result of this extensive soil erosion, theproductivity of the soil has been decreased and agricultural production has notbeen able to feed the growing population. Therefore, to reducesuch problems soil and water conservation was initiated in Ethiopia during1960s (Kcclcy and Scoones, 2000). Extensive and remarkable works have been observedsince 1970s and 1980s in most highland areas of the country (Nyssen et al., 2008; Tefera and

Sterk, 2010). With respect to this, different researches havebeen done to see the impacts of soil and water conservation.

However, thereexists contradicting results in studies on its impacts. Some of the researchersfound that soil and water conservation contributes for reduction in runoff andsediment loss (Zenebe, 2009; Kirubel and Gebreyesus, 2011), soil moisture conservation(Haregeweyn et al., 2012, 2015; Nyssen et al., 2010) andincreases seedling survival (Gebreyesus, 2011; Mekuria etal., 2007). Some other findings also identifiedthat soil and water conservation practices increased agricultural productionsignificantly where drought, erosion prone and moisture stressed arid and semiarid areas (Gebrekidan, 2003). Temesgenet al.

, (2012) also found that soil and water conservation efforts are notresulted in decreasing sediment concentrations. Though, the understandingof conservation measures and its implementation increased in the past fewdecades, the problem of soil erosion remains prevalent and the adoption of conservation measures are limited (Yeraswork, 2000; Berhanu and Swinton, 2003; Mitku et al., 2006). Hence, in large parts of Ethiopia soil erosionproblem remains significant and it could get worse for the future due to thepredicted population increase and extreme rainfall events in the 21stcentury (Niang et al., 2014), which also threatens agricultural sustainability (Anleyet al., 200).

Therefore, investigating the dynamics of soil erosion in differentslope conditions and crop covers in an agricultural land would be important foridentification of the vulnerability of the land and suggest some

conservationmeasures. Moreover, the evaluation of the effectiveness of soil and waterconservation measures done since 1995 would be significant to learn lessons andfurther improvement.