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Intensification of crop-livestock farming systems through market-orientation in Ethiopia

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Introduction

Crop-livestock mixing farming is commonly practice to diversify household income sources in the rural Ethiopia. With shifts in climate changes and associated risks, animal production appears to be resilient to rainfall induced stresses and thus contributes widely to the livelihood of the rural farmers. Livestock resources are commonly consider as capital assets for the rural household and are easily converted to cash (ASSEFA ABEGAZ, 2005). Livestock are mainly fed on natural pasture, crop residues, stubble grazing and in the valley bottomlands and steeply slopes. With increasing human population, however, large proportion of the traditional grazing lands shifted to croplands. Consequently, overgrazing intensified, vegetation cover reduced and runoff and removal of fertile topsoil due to erosion accelerated and infiltration rate reduced. Furthermore, the primary productivity of the bottomlands has been decreasing due to the burial by infertile soils eroded from the upper catchments. Aggregately, the landscape changed into bare lands where forages availability and quality cannot support the existing livestock resources. Rehabilitation of degraded landscapes using physical and biological soil and water conservation measures has been going on for many years. Vegetation cover of the rehabilitated landscapes considerably improved with further step up in groundwater enrichment and spring developments particularly in rehabilitated catchments. However, shortage of animal feed has still remained as one of the limiting factors for market oriented livestock development in the country. Since 2005, the Improving Productivity and Market Success (IPMS) project, operating in four Regional States and 10 Woredas (districts), has put collaborative efforts into action to intensify the crop-livestock production systems and introduce innovative skills along crop and livestock commodity value chains. The purpose of this paper therefore is to share lessons learnt in forage development approaches, scaling up strategies, opportunities and challenges in the process of innovative interventions in the value-chain of market oriented livestock development in relation to sustainable use of natural resources in selected Woredas in Ethiopia.

Materials and Methods

This study is based on the experiences of IPMS project in Atsbi (Tigray Region) and Fogera (Amhara Region) Woredas both in northern Ethiopia. Atsbi, located about 870 km north of Addis Ababa, is a highland with an average rainfall and temperature of 668 mm and 18^{o}C. Altitude peaks at 3,069 m and about 75% of the landmass is in the upper highlands. Total area of the Woreda is 1223 Km^{2}, and about 13,050 ha of the district is arable land, 16,301 ha non

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cultivable sloppy lands, 8,802 ha grazing lands and the rest 120,000 ha are forest lands (IPMS, 2005). The district has a total human population of 112,639. The ruminant livestock resource is composed of 48,870 cattle, 72,471 sheep and 10,427 goats. Fogera, located 625 km from Addis Ababa, has a total land area of 117,414 ha and human population of 236,553. Flat land accounts for 76% of the total land area bordering Lake Tanna. Altitude ranges from 1774 to 2410 masl. Average annual rainfall and temperatures are 1216 mm and 19^{o}C. Gumara and Reb rivers cross the woreda and are mainly used for irrigation. There are 157,128 cattle, 27,867 goats and 7,607 sheep. Production systems are broadly classified into rice/fish/livestock and the cereal/horticulture/apiculture systems. This system is dominated by cereals, horticultural and oil crops. There is a long tradition of honey production and some farmers own up to 250 beehives (IPMS, 2005).

In Atsbi forage development was undertaken in bottom and degraded sloppy lands, irrigated and farmlands and back yards sites. In the bottomlands where moisture and soil fertility is relatively better, the intervention was excluding animals from the natural pasture to allow re-vegetation. In sloppy degraded lands, perennial grasses such as *Phalaris aquatica*, Rhodes, tree Lucerne and *Sesbania sesban* were planted around and between terraced lands. Napier grass was introduced into irrigated sites. Cut and carry feeding system was introduced in all the intervened sites. The community set bylaws to protect forage development sites and was responsible for land preparation and planting. In Fogera, extensive communal grazing area which was invaded by a noxious weed, *Hygrophilla auriculata* L. (locally known as Amekila) has been cleared through community mobilization and rehabilitated into a cut and carry production system.

Capacity of farmers and extension services providers was strengthened through short-and long-term training, exposure visit, sharing of ideas and experiences in the form of technology exhibitions or farmers festivals on livestock production management and marketing in all the Woredas. Experience sharing visits to successful forage development sites were implemented. Actors also visited livestock fattening and rearing farmers and export abattoirs. Market information on livestock was posted biweekly in all PAs and major public gatherings. Linkages with traders and abattoirs were established. Farmers had access to credit and saving services.

Results and Discussion

In Atsbi, natural forage grasses and legumes established very well in the bottomlands with average biomass yield of about10 ton (DM) ha^{-1} while in degraded sloppy lands, yield was about 3.0-5.0 ton (DM) ha^{-1}. Substantial amount of green feeds was also collected from perennial grasses and legumes grown around backyards and irrigated sites. After the introduction of cut and carry feeding system, herbage composition sharply increased. In the bottomlands, legumes cover about 25-30% of the standing herbage biomass. The bottomlands stayed moist throughout the year and farmers harvest green forage three times per year. Forage from the sloppy lands also has similar composition but forage harvest is once per year. In the bottomlands, about 45 different grass and legume species were recorded in the improved forage sites within the past 2-3 years. Particularly the cover abundance of palatable legume species such as *Trifolium* spp., *Medicago* spp., and *Lolium* spp improved significantly.

In the bottomlands, forage groundcover improved to about 70-100%. The improved forage groundcover exists during the dry season because farmers cut the forage at 10-20 cm height after

the intervention. In the sloppy lands, the forage groundcover was about 60-90%. Hence, the presence of year round forage groundcover protects the soil by canopy and contact cover and slows runoff, increases water infiltration. Groundcover reduces the speed of overland flow, roots bind the soil and some organisms feeding on dead forage produce gums that aggregate soil particles, making them less erodible. The presence of year round forage groundcover enriches groundwater and development of springs downstream.

Gullies in the study sites were stabilized and transformed into productive lands. The stabilization of gullies attributed to the soil and water conservation in the upper catchment and growing of *in situ* forages plants. Improved forage groundcover reduces runoff and evaporation, and increase infiltration. Excluding of livestock trampling improves soil compaction and thereby infiltration rate in the forage lands. Groundwater substantially enriched with the appearance of some swampy sites particularly during the rainy season. The water is now used for human and livestock consumption and for irrigated vegetables. Within the district, about 65% of the total grazing bottomlands (8802 ha) and most of the sloppy grazing lands adapted cut and carry system of animal feeding. In some areas, farmers introduced improved forage species and enriched the bottomlands and sloppy lands to increase biomass production. Assuming that a household sales two rams and slaughters two sheep/household/year (ASSEFA ABEGAZ, 2005), income from mutton and skin sales ranges from Birr 35-40 million/year.

In Fogera, 7,298 farmers (1,609 women; 22%) participated in Amikela weed clearance in six highly infested communal grazing lands in 2007 for the first time and a total of 269 ha was cleared. The incidence of Amikela was reduced and the performance of the pastureland improved due to the vigorous growth of the local grass and legume species. Through farmer field days, encouraging result has been achieved in expansion of weed clearance and livestock exclusion. Between 2008 and 2010, a total of 1,493 ha of land were cleared and the number of rural villages involved increased from 6 to 14. Area closure increased from zero in 2007 to 129 ha in 2010, and a total of 247 ha were closed in 9 rural villages.

The pasture is composed of 88.9% grass, 6.8% legume and 4.3% weed. The proportion of weed is lower because of two years successive weeding through active participation of the community. *Atraxon prionodies*, *Pennistum glourum*, *Cynodon dactylon*, *Phalaris arundinacea* and *Cassia mimosoides* are the dominant grass and legume species. Total dry matter yield (grass and legume) and the proportion of legumes on a privately owned pasture land was 8 ton/ha and 16.7%. In a forage enclosure site, total dry matter yield (grass, legume and weed) and (grass and legume) was 8.12 ton/ha 6.99 ton/ha, respectively in 2009. The proportion of grass, legume and weed was 73.1%, 12.3% and 14.6%, respectively.

According to ASHAGRE ABATE (2008) annual DM yield of privately owned natural pasturelands ranged from 3.9 to 5.5 ton/ha and indicated that yield is affected by the amount and distribution of rainfall. The communal grazing land productivity is less than privately owned pasture land. Enclosure avoided the reduction of forage yield by 30% as a result of trampling effect of free grazing Amikela clearance coupled with pasture land enclosure improved the carrying capacity of grazing land. From the total area of enclosure, 123.7 and 705 ton dry matter was harvested that supported 16,493 and 94,005 TLU in 2008 and 2009, respectively.

Conclusion and Outlook

In order to transform the livestock sector from subsistence to market-oriented production system, sustainable management of the natural resources base is crucial to ensure the supply of adequate quantity and good quality feed. Market oriented livestock production helps to promote the expansion of fodder development technologies. Forage development improves feed availability for livestock, increases groundcover and protects soil from rainwater run-off and encourages water infiltration. With improved forage development, livestock production and fattening emerged as key business oriented commodities with significant changes in the income of farmers in both districts. In Atsbi, sheep fattening also emerged as business for landless youth considering the high and attractive sheep market in the nearby towns. Comparatively, female headed households and households whose livelihood is largely dependent on sheep breeding and fattening benefited. In Fogera, reclamation of extensive communal pasture land that was invaded with weed provided excellent opportunity for market oriented livestock production. In some cases, farmers who do not own livestock marketed the feed to other farmers and generated income. With cut and carry feeding system, livestock production, and productivity increased and mortality due to disease decreased. In conclusion market oriented livestock development helps the sustainable conservation of natural resources because communities can secures income and improve their livelihoods.

References

ASHAGRE ABATE. 2008. Effect of nitrogen fertilizer and harvesting stage on yield and quality of natural pasture in Fogera district, Northwestern Ethiopia. MSc Thesis, Haramaya University, Ethiopia.

ASSEFA ABEGAZ. 2005. Farm management in mixed crop-livestock systems in the northern highlands of Ethiopia. Tropical Resources Management Papers No. 70. Wageningen University and Research Center, The Netherlands.

IPMS (Improving Productivity and Market Success). 2004. Atsbi Wemberta Pilot Learning Woreda Diagnosis and Programme Design. ILRI, Addis Ababa, Ethiopia (www.ipms-ethiopia.org).

IPMS (Improving Productivity and Market Success). 2004. Fogera Pilot Learning Woreda Diagnosis and Programme Design. ILRI, Addis Ababa, Ethiopia (www.ipms-ethiopia.org).

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