

Research Article

Degraded land rehabilitation role of chomo grass (*Brachiaria humidicola*) and its socioeconomic importance; evidence from Western Ethiopia

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Abstract: In order to combat the problem of land degradation, a lot of efforts have been made since 1970s in Ethiopia. This study was conducted in Manasibu woreda of West Wollega zone to Degraded Land Rehabilitation role of chomo grass (*Brachiaria humidicola*) and its Socioeconomic Importance. Local farmers' perception, major causes and management practice were also assessed. About 139 sample respondents were selected randomly from four purposively selected kebeles in the woreda. Interview schedule, focus group discussion, key informant interview and participatory observation were used to collect data from sample respondents. The result of the study indicates that local peoples are using chomo grass for various purposes. Particularly they use for forage, for sale, more importantly for environmental rehabilitation, and making of some home utensils among the other. They are selling both seed and grass and earn a good income. Chomo grass was their first and last choice. Accordingly, chomo grass was well introduced in the area. Thus the study concludes as chomo grass has curative values for communities' number one problems; soil degradation. Accordingly, the efforts in expanding the grass in effective land management should be scaled up to other areas having a similar situation.

Keywords: *chomo grass, land rehabilitation, Western Ethiopia*

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Introduction

Over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period in human history resulting in a substantial and largely irreversible loss in the diversity of life on Earth (WCMC, 1992; Gaston et al., 1998; Wilson et al., 1988; MEA, 2005; Wandewesan, 2009). Although the changes that have been made to natural environment have contributed to substantial net gains in human well-being and economic development, there has always been a challenge in reducing the growing cost that considerably halts the benefits future generations obtain from ecosystems (MEA, 2005). The dispute of reversing the degradation of natural environments while meeting increasing demands

for the natural resources has been dominating the development agendas of most developing nations, and necessitate significant changes in policies, institutions and practices (UNEP, 1992). The problem becomes even more severe and interlinked in sub-Saharan-Africa (SSA), where the prevailing climate change accelerates the expansion of desertification (Uitto and Manshard, 1993), exacerbate land degradation which will consequently lead to loss of biodiversity.

In Ethiopia, where a rapidly growing human population exists, yet all livelihood and economic development are based on agriculture, and land resources, reversing land degradation through rehabilitation of the degraded ecosystems and viable land management are very crucial to bring about sustainable development. Hence, land

conservation and reclamation is not an option in Ethiopia, where agriculture still remains to be the sources of livelihood for majority of its citizens and more than 40% of its GDP (Alemayehu, 2009). The study area (Western Ethiopia) has experienced settled agriculture dominated by mixed farming and the large portion of its areas is highly degraded due to mismanagement of natural resources (overgrazing, deforestation, etc.), inappropriate agricultural practices and the heavy termite invasions that aggravated the situation (ICRA, 1998). Based on its findings, ICRA (1998) recommended an integrated approach to combat soil degradation and enhance productivity of the land. The GOs and NGOs (mainly Ethiopian Evangelical Church Mekane Yesus) have exerted efforts to combat land degradation in the district by undertaking land rehabilitation and management activities to enhance the productivity of the land. The Ethiopian Evangelical Church Mekane Yesus (EECMY) Western Synod launched a land rehabilitation project in May 1999 integrating termite control, soil and water conservation, crop and livestock management and other related practices with the objective of bringing the land to its previous productive state by applying the recommended strategies. Obviously, the integrated project activities have reduced soil erosion, improved vegetation cover, and productivity of the degraded land (Dawit, 2014).

One of the land rehabilitation techniques performed by Ethiopian Evangelical Church Mekane Yesus Western Synod Mena-sibu environmental rehabilitation project (EECMY-MERP) was establishment and expansion of chomo grass (*Brachiaria humidicola*). Chomo grass is a genus of plants in the grass family native to tropical and subtropical regions of Asia, Africa, Australia, southern Europe, the Americas, and various islands (Singh, 2009). *Brachiaria* is the single most important genus of forage grass for pastures in the tropics (Singh, 2009). The same author contended as *Brachiaria* cultivars can grow in infertile and acidic soils. Chomo grass (*Brachiaria humidicola*) is a genus of plants in the grass family native to tropical and subtropical regions of Asia, Africa, Australia, southern Europe, the Americas, and various islands (Singh, 2009). There are over 100 species. Some species are cultivated as forage. Some species of *Brachiaria* were probably first introduced unintentionally to the Americas in the colonial period, from slave ships. *Brachiaria* is the most widely used tropical grass in Central and South America, with about 40 million hectares planted in Brazil alone (Kumble, 1996). As noted from Manasibu Woreda office of Agriculture and Natural Resource office (2017), farmers are victims severe

soil erosion resulted in the formation of gullies, landslides, and the shrinking of farm and grazing lands more importantly affected by termite related problems. The situation of the vegetation, forest in particular, also demonstrates similar trends in the study area. As a result, more and more land is becoming unproductive and abandoned, and the farmers are migrating to the nearby low lands. According to Alemayehu (2009) in Mena-Sibu District alone, 66,000 hectares of productive land was taken out of production and 33,367 farmers have abandoned their lands. Consequently, smallholder farmers in the area were exposed to food insecurity, the main causes of which are low productivity of crop and livestock, limited income, and inability to develop skill and knowledge. As a result, a significant number of farmers migrated to the neighboring low lands in search of fertile farm land for growing crops and feeding their livestock. A similar problem is being observed in newly settled lowlands and this is becoming a source of conflict over land resources.

In mitigating this challenge various stakeholders have been expanding and popularizing chomo grass and are implementing various land rehabilitation related activities like area closure. So far, the effectiveness of project interventions and socioeconomic importance of chomo grass were not assessed. In replicating the experience to other areas having the same problem, it's very crucial to test, very and confirm socioeconomic importance of chomo grass and other land rehabilitation activities in the area. Thus this paper was initiated to investigate the socioeconomic importance of chomo grass and its environmental rehabilitation roles activities in selected kebeles of Manasibu Woreda, West Wollega Zone, Oromia Regional State.

Methodologies

The study employed a household survey, key informant interview, focus group discussion and personal observation. Data were collected from both sampled household and village based aspects. Semi-structured questionnaire, focus group discussion aided by check list, interview, and participatory observation were employed so as to meet stated research objectives, wide range of data were collected from both primary and secondary sources. Accordingly, primary data were obtained through the aforementioned data collection tools, and secondary data were collected through reviewing documents, like books, journals, websites, reports, annual bulletins, research papers among the other. Five kebele were selected purposively from manasibu district based on the

extents of chomo grass plantation practices. Simple random sampling method was used to select sampled respondents. The sample size was determined by Cochran's sample size determination formula (Cochran, 1977).

$$n_o = \frac{Z^2 * pq}{d^2} \longrightarrow n_1 = \frac{n_o}{1 + \frac{n_o}{N}}$$

$$= \frac{0.1 * 0.9 * 1.96^2}{0.05^2} \approx 139$$

where:

- n_o = Desired sample size Cochran's (1977) when population is less than 10000
- n_1 = Finite population correction factors Cochran's (1977) when population is greater than 10000
- Z = Standard normal deviation (1.96 for 95% confidence level)
- P = population proportion to be included in sample (10%) $q = 1 - p$ i.e 0.9
- N = Total number of populations which is 1338
- D = degree of accuracy desired (0.05)

Household survey was made by local language, *Afanoromo*. Questionnaire was administered by trained data collectors. Minimum of four data collectors were assigned for each kebeles. Selection of data collectors were made based on their educational background and their exposure to each kebeles. Enumerators were given half day training on the objectives of the study, how to approach respondents, how to record responses and on detailed contents of the questionnaire.

During the survey, information's like issues of land degradation, soil and water conservation, chomo grass establishment, socioeconomic values of the grass; the forage value, its effectiveness for rehabilitation of degraded land, farmer's future plan on the adoption and expansion of chomo grass were collected. After detailed household survey, FGD were conducted with 10 purposively selected farmers from different age groups. Selection of discussant was made based on their awareness on soil and water conservation practices in general and chomo grass establishment in particular. Key informant interview were also made with important stakeholders like district office of agriculture and Local NGOs, district land administration and environmental rehabilitation office experts and Development agents among the other.

Table 1. Distribution of sample respondents across Kebeles.

Kebeles	Household Heads			Sampled Households		
	Male	Female	Total	Male	Female	Total
Buke Henna	177	31	208	19	3	22
DargeTobora	560	31	591	58	3	61
Hombosha	221	15	236	24	1	25
WanashaDabus	266	37	303	27	4	31
Total	1224	114	1338	128	11	139

Source: Manasibu Woreda Office of Agriculture; 2017.

Results and Discussion

This section discusses the results and key findings of the investigation. Accordingly, local people's, perceptions about trends of soil fertility and land productivity in the study area, major causes of decreased land productivity, Socioeconomic Importance's of Chomo grass and degraded land rehabilitation role of chomo grass were discussed.

Perceived trends of soil fertility and land productivity in the study area

As depicted in table 2, more than half (54%) of sampled respondents confirmed as trends of fertility of their soil are decreasing. Only 15.8 percent of them opted for increasing. Meanwhile, nearly half (48.9%) of sampled respondents

witnessed decreased trends of their productivity. About 40% of them opted for increased trends of their land productivity. As noted in FGD and key informant interview, the area were highly degraded before the introduction and expansion of chomo grass and even planning to migrate to other areas. It's noticed that after long term intervention and land rehabilitation activities, communities in the study area are able to reverse the adverse situation and now in a position to increase their productivity over time.

Major causes for decreased land productivity in the area

As noted in Table 3, about 76%, of farmers opted for the effect of termite as the major causes of land productivity in the area. Meanwhile, nearly half

(54% and 52%) identified the absence of fallowing and soil erosion, respectively as the major reason for decreased land productivity in the area. The remaining opted for over cultivation and fertilizer cost for decreased land productivity. Qualitative data collected through FGD and key informant

interview also confirm the aforementioned discussions and woreda office of agriculture also witnessed as termite is number one causes of land degradation in the area. This clearly indicates the severity of environmental degradation and termite infestation in the area.

Table 2. Perceived trends of soil fertility and land productivity.

Variables	Trends	Frequency	Percent
Trends of soil fertility over time	Increasing	42	30.2
	Constant	22	15.8
	Decreasing	75	54.0
Trends of Land Productivity Over time	Increasing	56	40.3
	Decreasing	68	48.9
	Constant	15	10.8

Source: Field Survey (2017).

Table 3. Perceived causes of decreased land productivity in the area.

Variable	Category	Responses		Percent of Cases
		N	Percent	
Major Causes for Decreasing land Productivity in the area ^a	Erosion	39	17.2%	52.0%
	Fertilizer cost	36	15.9%	48.0%
	Rainfall	18	7.9%	24.0%
	Absence of fallowing	41	18.1%	54.7%
	Over cultivation	36	15.9%	48.0%
	Termite effect	57	25.1%	76.0%

a. Dichotomy group tabulated at value 1. i.e. Multiple Response Item.

Socioeconomic importance's of chomo grass in the area

As noticed from FGD among Woreda Agricultural Experts and Key informants of Local NGO workers, in the area chomo grass (*Brachiaria humidicola*) was believed to be introduced in 1957 (before 60 years) through animal dung who come from Metekel (Metekel one of Benishangul Gumuz, Western Ethiopia) area. The grass was there for more than 40 years and no one noticed as it has number of benefits. In May 1999 local NGOs supported by Ethiopian Mekane Yesus Church come up with a new idea for sustainable land management. There was no literature from which they refer about chomo, there is no laboratory to test the nutritive value of chomo, and they simply start from locally available indigenous Technical Knowledge (ITK) of local people to solve land degradation problems which are major causes of termite infestation in the area. They started from scratch and developed the experience about chomo grass. Then after, chomograss has got recognition and local communities have started to use for various purposes. Currently nearly all kebel in the

district plant chomo grass. As indicated in Table 4, about 91% of sampled respondents are planting chomo grass. Those farmers are mainly planting chomo grass for various purposes. Accordingly, survey results indicate as about 35.3 % of them are using for forage and rehabilitation purpose only. The other 32.4 % of sampled respondents confirmed as they are planting for the purpose of forage only. About 19.4% are still planting for the purpose of forage, sale and rehabilitation purposes. Only 1.4% and 2.9% of sampled respondents are planting chomo grass for the purpose of rehabilitation only and sale only. In the area, about 98.5% of sample respondents confirmed as they are producing chomo grass mainly for rehabilitation and other socioeconomic purposes. In line with the aforementioned ideas result from FGD and Key informant fully agree chomo grass has a number of socioeconomic benefits. Accordingly, they use as forage and carry out animal fattening which can increase their earning as off-farm livelihood sources. Local farmers in the area also confirmed as there were no alternative forage source and chomo grass is their first and last choices. About 77% of farmers who opted to feed livestock

confirmed as chomo grass are suitable for all livestock. The remaining 13% and 10% witnessed as chomo grass is good for cow and oxen, respectively (see Table 4). They also confirmed as chomograss can increase the quantity of milk yield

per cow and can fasten time taken for animal fattening. Chomo grass can also be used as the source of food for poultry. Moreover, it can also be used as raw materials for making some home utensils like sleeping mats (*Frash*).

Table 4. Purpose of planting Chomo grass in the area.

Variables	Response	Frequency	Percent
Do you plant chomo grass?	Yes	127	91
	No	12	9
	Total	139	100
For what purpose do you plant chomo Grass?	Forage	45	32.4
	Sale	4	2.9
	Rehabilitation	2	1.4
	For Forage + Rehabilitation	49	35.3
	For Forage + Sale + Rehabilitation	27	19.4
	Total	127	91.4
Which livestock do you feed chomo grass?	Cow Only	16	13.2
	Oxen Only	12	10.0
	All livestock	93	76.8
	Total	121	100%

Source: Field Survey (2017).

As noted from the aforementioned analysis, local farmers have tested the socioeconomic importance of chomo grass, and they confirmed as they will continue planting in the future. Farmers are also asked to rate the socioeconomic importance of chomo grass and majority of them (95.5%) opted as its very important and the remaining witnessed as important. This clearly indicates as the sustainability of chomo grass in the area is not under question, and they will continue expanding

the grass. Mean land size sampled respondents allocated for chomo grass are about 2.1 ha having the standard deviation of 2.5; this percentage accounts for 65% of total landholdings they have. As noted from field survey very poor farmers can earn up to 1000ETB from the sale of chomo grass and seed annually (see Figures 1 and 2). This has great implications in their life as it provides an additional source of income.



Figure 1. Chomo grass seed in the area.



Figure 2. Well stabilized chomo grass pasture in the area.

Environmental rehabilitation role of Chomo grass in the area

As noted from personal observation, FGD and key informant interview, chomo grass has curative value for land degradation. By its nature, what makes chomo grass unique is that it favors highly degraded areas and provides fast vegetation cover. It's possible to establish from seed, tolerates low fertility and requires minimal pest control inputs, and is persistent when defoliated. The available literature also contended as chomo grass species are popular among producers because of their rapid regrowth and good persistence under heavy or frequent defoliation (Rika et al., 1991). It tolerates waterlogged or intermittently flooded soils such as chromic Vertisols (Amaya-Hernandez and Carmona-Munoz, 1988). It can withstand dry periods. It is highly resistant to leaf cutting ants, and tolerates, but is not truly resistant to spittlebugs. Local farmers in the area witnessed as bare land covered with chomo grass can be used as

termite management strategies, largely influence the infiltration rate, followed by the permeability and structure of the underlying soil. Consequently, this creates soils which have good structure, absorb water quickly, and minimize surface runoff. Soil structure determines how easily the particles detach to start the erosion process. Steeper sites provide energy for the scouring action of surface water runoff. Maintaining good ground cover lessens the effect of all erosive forces. While vegetation cover absorbs the impact of raindrops, their litter and roots enhance infiltration and hold soil in place (Wild, 1993). Vegetations can also act to control landslides and other forms of mass movement of the land surface. Chomo grass provides restoration of soil organic matter. Restoration evolves returning native species to an area, stabilizing soil and reducing soil erosion. The influence of chomo grass in soil physical properties is also very important in augmenting the overall capacity of the land to be productive (see Figure 3).



Figure 3. Decomposed chomo grass in the study area.
Source: Field survey (2017).

Currently in the area, chomo grass is playing an important role in conserving the remaining vegetation and soil resources and improving soil fertility. They improved soil fertility by adding soil nutrients from decomposed plant remains. It also reduces nutrient loss from a site by controlling runoff (vegetation acting as a physical barrier to soil erosion). This eventually improves the capability of the land to support other vegetation types, including exotic plantations and/or support livestock (Tefera et al., 2005). Utilizing natural resources in more sustainable way can improve community livelihood. Various literature contended as soil erosion is the main cause of poverty in Ethiopia, protecting soil at the site by the restoration of vegetation cover in degraded land can effectively disconnect the coarse sediment transfer by encouraging deposition and preventing sediment supply. It also tends to reduce flood transmission so attenuating flood peaks through increased roughness. Farmers in the area were asked to rate the environmental rehabilitation role of chomo grass and about 90% of the rate as very important. This clearly indicates the paramount importance of chomo grass in land rehabilitation in the area. As noted in FGD chomo grass have curative value for land degradation and they are all planning to migrate to other areas before they get this grass. Now they got hope to stay in their community due to chomo grass.

Conclusions and Recommendations

Conclusions

Chomo grass (*Brachiaria humidicola*) was already there in the study area and widely used for various socioeconomic purposes and land rehabilitation roles for the last 60 years. Yet, these roles are not scientifically investigated and little is known about the grasses. This study showed clear insight about socioeconomic and environmental degradation rehabilitation roles of the grasses. Accordingly, chomo grass has been serving as a source of income through the sale of seeds and forage can be used as a source of forage for dairy and fattening. Moreover, the grass can be used in making home utensils like sleeping mats. Even if the grass has these functions, very few farmers are harvesting the expected benefits and chomo grass extension were not well emphasized in the area. Chomo grass was also having curative values for degraded lands. Land degradation factors like soil erosions, termite effects and removal of top soil cover can easily be treated through growing chomo grasses. It provides restoration of soil organic matter and control runoff (vegetation acting as a physical barrier to soil erosion). Even if chomo grass is known in the area

for having curative values majority of land covered in the districts are highly invaded by termite and becoming out of functions. This clearly showed weak extension on documenting and expanding the benefits of the grass for the benefits of larger community members.

Recommendations

Based on the findings of the study, the following recommendations were forwarded for better future in the area:

- Local frontline extension workers should capitalize on the socioeconomic importance identified and support farmers as engaging on chomo grass farming's have triple advantage (source of income, curative value for degraded land and sources of some home utensils)
- The good practices of using chomo grass for land rehabilitation roles should be expanded to areas with similar situations and agro-ecologies.
- Establishing rural social institutions or strengthening the already established cooperatives ensuring sustainable utilization available resource should be focused by the government.
- Work cultures in the community should be improved and they should be given skill based training on off-farm and non farm income generating activities so as to increase their income

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