



Hillside Conservation and Income Creation as Adaptation to Climatic Change: the Case of Landless Cattle Owners in Tigray, Ethiopia

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Abstract

The increasing threats posed by the adverse effects of climate change coupled with the growing number of landless people has pressured the local administrators of the Tigray Regional State to rethink current long-term solutions. Distributing communal mountainous hillside areas to the landless people was regarded as one of the pathways to address the problem. This study evaluated distributed mountainous areas to identify whether hillside conservation and income creation activities done by the landless cattle owners could increase their adaptive capacity while responding to climate change. The study revealed that repeated droughts caused by climate change left the landless cattle owners with herd decimation because of a lack of animal feed. A majority of them were sensitized the effects of climate change in terms of rainfall variability, change in temperature, lack of animal fodder, untimely raining and flooding, and shortage of food for human use. To respond to these effects, landless cattle owners applied various conservation measures such as stone bunding, trenching, planting trees and cacti, guarding, and terracing using alo. Having implemented various conservation measures, the landless cattle owners generated income from beekeeping, sales of vegetables, timbering, sales of fuel-wood, fodder and livestock rearing. 🐄

Linking hillside conservation and income creation to address the effects of climate change



Effects of drought on cattle and maize crop in Ofla Wereda district. (Photo credit: Melaku Berhe)

In the face of multiple pressing factors like climate change, population growth, and competing demands for land, the majority of the livelihoods of rural populations in Tigray, northern Ethiopia is dependent on scarce natural resources. Because of people's excessive use of these resources, most hillside areas which were covered with forests during the 1970s became devoid of vegetation. This has put strains on the existing food security status of the rural poor and continual ecological degradation that further expose farmers to the effects of climate change. Distributing communal hillside areas to the landless people was regarded as one of the pathways to address persistent challenges posed due to the negative effects of climate change and looking for long-term solutions. Particularly, keen attention was paid to climate change adaptation by creating sustainable income benefits via improving the economic values of the hillside environment through stewardship and conservation. Accordingly, local leaders distributed previously degraded hillsides and gully areas to landless people to bring about environmental rehabilitation as well as income generation. Using the distributed hillside land grants, landless cattle owners implemented various conservation measures, from which they complemented their subsistence income sources. The intention of this study was to verify whether income generation through hillside conservation can assist in adaptation to the adverse effects of climatic change.



Landless Cattle Owners Sensitized the Effects of Climate change

Out of the 450 interviewed respondents, 96% of them noticed repeated frequencies of the occurrence of droughts. As indicated by responding farmers, recurring drought was one of the major challenges that left them with crop failure due to lack of rain and herd decimation due to lack of animal feed. They faced severe drought twice or more times within a four year period. In their reports, a majority of them sensitized the effects of climate change in terms of rainfall variability (77%) and temperature change (70%). Respondents clearly indicated that because of animal herd loss caused by frequent droughts, they failed to supplement their means of living, which further led them to poverty crisis.

Moreover, nearly 97% of the landless cattle owners felt the effects of climate change in terms of water scarcity. They expressed that during the times of water shortage caused by climatic effects, many livestock owners were altogether obliged to use the same water sources (rivers, ponds, wells and streams) to water their animals. Consequently, cattle herds that commonly compete for similar water sources were more likely to be exposed to numerous communicable diseases. As a result, problems related to disease outbreaks occurred across many villages due to the influx of a large number of livestock herds to drink from a single water source.

Conservation measures to adapt to the adverse effects of climate change



Fruits and vegetables grown by landless cattle owners in Hintalo-Wejerat, Tabia Metkel. (Photo credit: Melaku Berbe)

In the study area, the landless cattle owners implemented on average about 106 meters of soil/stone bund. While the average number of trees they planted was about 28, the mean of fodder trees planted was about 10. Additional efforts done by the respondents to implement conservation practices using trench accounted for 2.4m³ during the year 2013/2014. On average, more than 24 cactus trees were planted on previously degraded areas; mainly in rocky hillsides. In the Ofra district, the mean hillside terraces implemented by the landless cattle

owners using aloe trees were about 46 meters.

As reported by the landless cattle owners, production of animal fodder on hillside areas and crop production via share-cropping and renting system were used as their major adaptation methods to respond to adverse effects of climate change. Using these land resources, they produced hay and straw to feed their animals, with grains from farm plots used only for human consumption at home. In the Tigray region, village-based community mobilization aiming to restore the denuded environment has been the main strategy widely practiced in the past several decades. Similarly, in the study area, landless cattle owners implemented various types of conservation structures such as soil/stone bunds and tree plantations including fruits and animal fodder. Additional conservation measures applied by the landless cattle owners were: hillside area enclosures, guarding, applications of natural fertilizers like manure, and planting of cacti on degraded and rocky hillsides.

In contrast, some landless cattle owners reported keeping their animals at home and restricting their movement. Hence, they have started adopting zero-grazing, meaning that animals are kept in limited places and fed by cutting and carrying grasses, hay, or straw. The landless cattle owners pursuing zero-grazing have improved cattle management as zero-grazing avoids contacts among livestock herds which enabled them to protect disease prevalence. In addition, feeding cattle using zero-grazing reduced walking hours for reaching animal feed and shelter. Especially during drought time, zero-grazing enabled supplying of clean water instead of walking long distance in search of water for animals. Due to adoption of zero-grazing, cattle medication health centers and nearby veterinary services became easily accessible resulting in effective livestock disease control. Hence, zero-grazing is regarded as a means to manage cattle herds in a specific area provided that food and shelter are supplied sufficiently. The adoption of zero-grazing contributed to hillside protection, pasture land saving, reduction of time to search for feed, and finance savings that could otherwise be spent on hiring labour to maintain cattle herds.

In order to determine whether the conserved hillside areas were persistently protected or not, landless cattle owners were asked how they dealt with difficulties such as animal and human encroachments that could damage the terraces and checkdams constructed in the hillsides and gullies. It was found that local bylaws and regulations were established in each village to protect the conserved areas. For example, forest access was restricted to allow regeneration of natural vegetation. Depending on the context of each village, the community members developed their own minimum criteria to get each community member adhered to the rules and regulations. This had important bearing on the communal hillside conservation by establishing local standards.

Based on the agreed bylaws, village-based development group committees comprised of five members were elected to ensure the implementation of hillside protection in each village. Although the agreements among each village differed from place to place depending on the nature of the hillside areas, the landless cattle owners along with the community members agreed on the following rules and bylaws if anyone encroaches:



Recently conserved hillsides in Wereda Alaje. (Photo credit: Melaku Berhe)

1. If any community member in a village encroaches the village bylaws by sending goats, sheep or calves to hillside areas, he/she will be fined Birr 10 per each animal.
2. If any community member in a village lets their cattle, camel, horse, mule, or donkey into the enclosed hillside areas, Birr 50 per head shall be penalized.
3. If anyone living in a village violates the community bylaws for the second time, his/her case will be sent to legal court for a higher financial punishment including imprisonment.
4. Apart from privately owned land areas, any community member who lives in a village has to implement stone or soil bund, tree plantation, deep trench and checkdams on communal areas per the recommended conservation types by agricultural experts.

Prior to implementation, the drafts of such bylaws were designed by village leaders elected by the entire community. Community discussions were then held concerning each issue to reach a consensus. The bylaws agreed by the majority of the village members were used to protect the conserved hillside areas on condition that they were approved by the entire community in all villages. Finally, farmers were elected to guard the conserved areas for some specified periods, usually for one month, with guarding continuing turn by turn in this way for the whole year.

Income creation induces hillside conservation in the face of climate adaptation

Once the landless cattle owners implemented various hillside conservation measures, they pursued production of various supplementary income sources in the hillside areas for their families. The landless people were able to produce timber trees (eucalyptus trees) and fruits such as banana, mangoes, guava, and avocado, and vegetables. Timber from eucalyptus trees grown in the hillside areas was one of the major income sources for the landless cattle owners. In the study districts of Ofra and Alaje, for example, the eucalyptus tree is also called “commercial tree” due to its high demand from the local people and nearby particle board factory. Eucalyptus timbers are supplied to the factory as input material. Such a huge potential market for eucalyptus trees grown in the hillside areas has induced the landless people to implement conservation by planting more and more trees every year. Beyond its income contribution, in steep sloping gully areas where running water washes away soil and remnant bushes, plantation of

eucalyptus trees is found to remedy curb flooding and land damage.

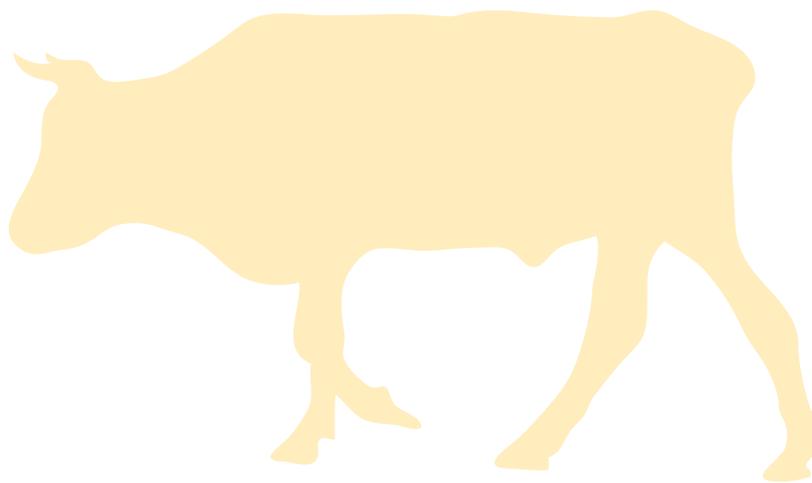
Income generation is highly associated to hillside conservation. Conserved hillside areas retain moisture and enrich ground water sources, enabling the landless cattle owners to grow fodder trees, fruits, vegetables, timber and produce honey. Income from these activities motivated the landless cattle owners to apply hillside conservation persistently. In conserved areas where landless people invested their money and labor, they protected hillside areas from any damages such as grazing, tree cutting, firing, and bush clearing. As a result, coppice of trees and seedling are allowed to grow and beehives are protected from any damage. Such interrelated actions between conservation and income creation in the hillside areas offer landless cattle owners with improved benefits. For instance, planting nectar bearing flowers and grasses grown in conserved hillside areas increased honey production per colony. This also enhanced the availability of animal fodder that in turn provided suitable options to rear cattle in the area. The pursuance of honey production and other benefits by landless cattle owners helped contribute to conservation of the hillside areas.

Entire village communities have benefited from hillside conservation

Apart from the income benefits gained by landless cattle owners, hillside conservation greatly improves the ecology of nearby communities and the environment at large. As the natural process of accelerated erosion occurs in a top-down fashion, hillside conservation and tree plantation done on the steep hills and mountains of upland areas greatly reduces possible damage to cultivated farm plots in downstream villagers. With conserved hillside areas, water sources flow steadily towards the flat farm areas below and soil erosion due to water run-off is well managed. From surveyed farmer reports, clear differences were observed in areas where the hill mountains in the upper reaches are not covered by hillside conservation and tree plantation, where the rivers burst their banks resulting in floods that ruined crops and lives, and washed yet more soil away, resulting in water wastages and crop damage. Thus, hillside conservation by landless people has contributed to saving farm soil fertility and water-stream quantity through making hillside terracing and tree planting. In turn, we see that hillside conservation serves as an effective method to not only help landless farmers adapt to climate change, but also to improve their and the surrounding communities’ livelihoods. 🐄



Fruits and vegetables grown by landless cattle owners in Hintalo-Wejerat, Tabia Metkel. (Photo credit: Melaku Berhe)



TIRI, Targeted Investment for Research Impact, identifies early-career researchers who are interested in tackling livestock production problems through innovative approaches and fresh perspectives. This small-grant program is open to early-career researchers (five or fewer years into research career) in any discipline, from student to professor, and from any organization that is engaged in applied research on livestock production in South Asia and East Africa — colleges and universities, government research centers or laboratories, or non-profit organizations.

Proposals are selected based on their potential to make livestock production systems more resilient to increasing climate variability and severity. At the end of one year, TIRI scholars are expected to demonstrate concrete outcomes and real potential for future impact. The 10 selected East Africa TIRI scholars and the 18 selected Nepal TIRI scholars are addressing research problems on various livestock and climate research themes.



Feed the Future Innovation Lab for Collaborative Research on Adapting Livestock Systems to Climate Change is dedicated to catalyzing and coordinating research that improves the livelihoods of livestock producers affected by climate change by reducing vulnerability and increasing adaptive capacity.

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