

Gendered evaluation of impacts of landscape degradation and restoration on ecosystem services: perspectives from paired husbands and wives in Ethiopia.

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Abstract

Globally, land degradation disproportionately affects women more than men and, to close the gender gap, several landscape restoration projects promote gender inclusiveness. However, empirical evidence based on gender-disaggregated data is a major research gap. Using a gender-inclusive restoration case of Amhara and SNNP (Southern Nations, Nationalities and Peoples) regions in Ethiopia in the last 6-10 years, we collected data from 59 wife-husband paired households and six gender-disaggregated focus groups. The study revealed large gender differences in perceptions of landscape scenic beauty and habitat quality in terms of wildlife, pollinators, beneficial plants, weeds, and pests and diseases as indicators of ecological health. Despite that, the paired husbands and wives live together and share resources, their perceptions and valuation of degradation and restoration were divergent. Men largely attributed degradation to external and natural forces while women considered the lack of appropriate restoration strategies as a precursor for accelerated land degradation. Women noted that in areas that receive heavy rainfall and have steep slopes, cultivation without management measures exacerbates degradation. Gendered experiences on impacts of degradation were captured: women indicated to be greatly impacted in terms of water scarcity for livestock whilst men were impacted on the water for irrigation. On restoration impacts, women display increased concern and knowledge of regulatory services while men are knowledgeable of provision services. Women attribute a moderate impact of land degradation on habitat quality than men and attribute restoration to the enhancement of biodiversity and pollinators. These results are key in understanding the divergence between men's and women's valuation of impacts of degradation and restoration that underpins their involvement in ecosystem restoration and can be a basis for gender equity discourse and policy.

Introduction

Despite the widely reported notion that population pressure accelerated degradation in Ethiopia (Gashaw et al., 2014; Gebreselassie et al., 2016; Taddese, 2001), historical evidence from the northern region shows that, in some land parcels, restoration efforts have enhanced ecosystem services including soil retention, crop yield, biomass production, groundwater recharge (Nyssen et al., 2009). Emerging from the succession of drought years in the 1970s to 1980s that exacerbated degradation, the rural communities striving in harsh conditions have forged strong social cohesion and collective action to revegetate landscapes and improve soil protection (Nyssen et al., 2009). The main restoration activities include physical structures such as soil bunds to control soil erosion on steep slopes as well as allowing natural regeneration through natural enclosing degraded areas from grazing, cultivation, and indiscriminate tree grass extraction (Descheemaeker et al., 2006; Tamene,

2005). The recovery invalidated notions of irreversible degradation (Dregne, 1991) and captivated the global call for collective restoration action that culminated into the UN General Assembly declaring 2021-2030 a decade of ecosystem restoration (UN, 2019; UNEP and FAO, 2020). In this regard, Ethiopia has taken a bold step by committing to restore 15 million hectares of degraded and deforested areas into productivity by 2025 (afri100, 2016; IUCN, 2020). Despite the demonstrated potential for success, women’s low engagement in restoration activities has been cited as the key concern (Bayu, 2020; Kumasi and Asenso-Okyere, 2011). The links between gender inequalities, degraded ecosystems, and land and water management interventions are increasingly visible (Broeckhoven and Cliquet, 2015; Collantes et al., 2018). Yet, despite potential synergies between restoration initiatives and gender inequality outcomes, gender remains poorly addressed (Basnett et al., 2017). Addressing such deep-seated socio-economic and ideological causes requires context- and culture-specific understandings and approaches (Zgang et al., 2019). A review by Zhang et al. (2019) identified the lack of empirical data disaggregating gender at the household level and the household division of labour concerning land management as major research gaps. In an intrahousehold gender dynamics study in eastern Kenya, it was found that employing an intrahousehold approach to land restoration increases both the uptake of restoration practices and the success and equity of restoration efforts (Crossland et al., 2021).

Several programs have been rolled out to ensure women’s rights, their engagement in decision making and equity in benefit sharing. Enhanced tenure security has been found to correlate positively with women’s likelihood of engaging with restoration (Basnett et al., 2017). For example, according to Collantes et al. (2018), the gender-responsive land certification and registration process undertaken in Ethiopia in the early 2000s increased landowners’ likelihood to invest in soil and water conservation measures by 20 to 30 per cent. However, enhancing the value of land through restoration can affect the desirability of the (land) resource, and thus may pose the risk of land dispossession to those with insecure land rights. Because asset-poor groups and individuals are highly dependent on “common pool” resources, such as forests, water bodies and ecosystems, restoration initiatives that affect these areas significantly impact their livelihoods and wellbeing.

Corresponding to the Government of Ethiopia’s foundational goal that sustainability and equity are inter-linked (UN-Women, 2014), the study’s objective is to explore gendered dynamics within rural community restoration initiatives by capturing intrahousehold ecosystem benefits among husbands and wives with shared restoration experiences. We work on the assumption that women and men often have differential access to resources and their perception and knowledge of ecosystem services also differ (Yang et al., 2018). Hence, understanding these differences is critical to ensuring that policies aimed at enhancing access to and use of ecosystem services can provide benefits to all genders.

Methods

Study area

The study was conducted in two landscape restoration sites of Gudoberet (in Basona-worena district, North Shewa zone of Amhara region) and Lemisuticho (in Doyogena districts, Kembata Tembaro zone of SNNP–Southern Nations, Nationalities and Peoples (Fig. 1). Landscape restoration practices were upped in these sites for the last 6-10 years. The local Bureaus of Agriculture and communities play an important role in the implementation and management of restoration practices in the Gudoberet site while an NGO called Inter Aide France and local communities lead those practices in the Lemisuticho sites (Doyogena). In these two sites, the Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT) provide research support ranging from planning, implementation to evidence generation.

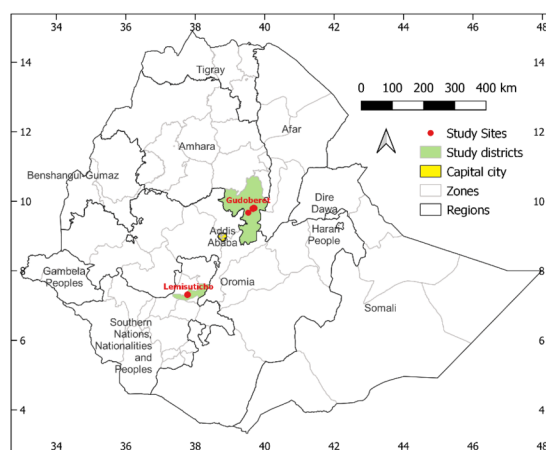


Figure 1. Map of the study area

The cool sub-humid moist climate (bimodal rainfall of $1449 \text{ mm} \pm 16\%$ variability) of Gudoberet supports higher agricultural potential with 66%, 25% and 6% of land used for cultivation, grazing and woodlot, respectively. Low nutrient content (especially available phosphorus), gully erosion in some places and rainfall variability greatly affect productivity. Integrated soil and water conservation measures (enclosures, terraces, soil bunds, stone bund trenches, percolation pits, check-dams, gully rehabilitation have been implemented by 1164 households (580 male and 584 female) covering over 1700 ha in the Gudoberet restoration area to reduce runoff and enhance infiltration. An impressive effort was also made to rehabilitate gully erosion through gabion terraces and re-shaping in the Adisghe Kebele.

Receiving bimodal rainfall of 1000-1400mm/annum, the sub-humid highland (2280-2640 m.a.s.l) cool ($12-20^\circ\text{C}$) climate of Doyogena supports diverse livelihood strategies including cereal-livestock integration and agroforestry. Despite the favourable climatic conditions, high population pressure (highest in rural Africa of up to 600 inhabitants/km²), soil erosion and nutrient depletion affect productivity. Restoration interventions being implemented include physical structures (soil bunds and fanya juu terraces) integrated with biological measures (desho grass). Agroforestry around homesteads is a common land use and restoration practice in the Doyogena and surrounding sites.

Data collection and analysis

The household survey was conducted with paired samples of couples. The pairing provided robust intrahousehold gender dynamics including the preferences, roles, benefits and challenges for women (wives) and men (husbands). We used stratified random sampling to pick 59 husbands and 59 wives. Before data collection, the household survey questions were pre-tested by enumerators. We used Open Data Kit (ODK) to conduct household surveys. The survey tool was framed based on gender design and evaluation framework by Basnett et al. (2017) capturing the degradation-restoration themes. We captured gender differentiated data on drivers of land degradation, and perceived benefits and challenges faced by women and men.

The focus group discussions (FGDs) were organised to complement the household interviews and the open-ended questions enabled gathering of more in-depth evaluations of the degradation and restoration impacts on women and men. The FGD members selected to represent men and women groups participating in

community level restoration interventions. All the FGD members also represent the three-landscape positions (the upper, middle, and bottom), to capture households' feedback on different restoration interventions across the landscape position.

From the household survey, a comparative analysis was done on gender-disaggregated ratings by paired husbands and wives representing men and women voices, respectively. The results are presented using radar diagrams and bar graphs and supported by participant narratives from FDG. Further correlational and concordance analyses were done. Spearmans's rank correlation coefficient was used to measure ordinal association between the pairs of sets of ratings (see note on Table 2) of impact of restoration activities. Since there were no experimental evaluations against which the raters would rank the attributes, the ratings by men and women had no reference criterion. Hence, the perceptions were founded on their respective lived experiences and the rank correlation is the measure of agreement between men and women.

We run Kendall's concordance, W_t , analysis using the *irr* package in R to measure the degree of agreement or disagreements among m sets of men and/or women for n ranks of restoration outcomes. It is an index that measures the ratio of observed variance of the sum of the ranks to the maximum possible variance of a sum of ranks and ranges from 0 to 1. The least rank score shows that men and/or women have divergent experiences of degradation impacts and restoration outcomes and hence use a different standard when rating. On the other hand, a higher score shows that men's and/or women's experiences are similar. Like the correlation, W_t is a measure of opinions and value judgements useful to establish the gender dynamics in restoration activities. W_t is estimated as (Edwards, 1964; Martey et al., 2014):

$$W_t = \frac{12 \left[\sum T^2 - (\sum T)^2 / n \right]}{nm^2(n^2 - 1)}$$

Where;

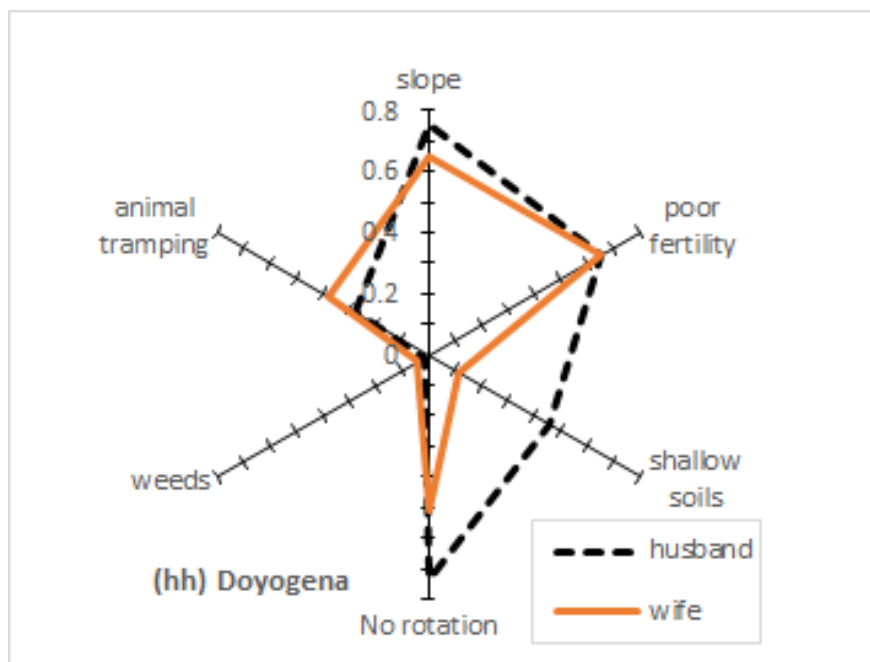
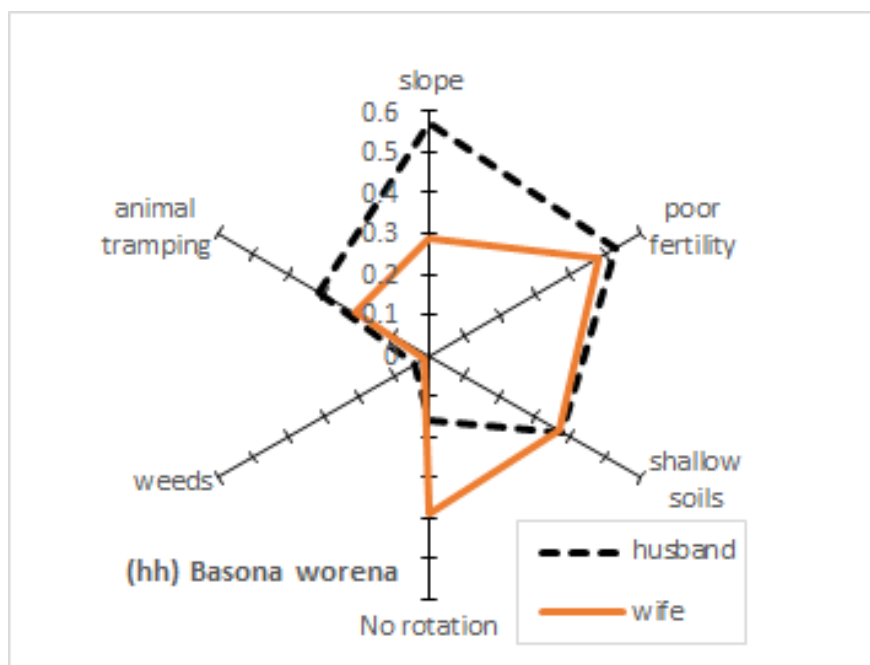
T = sum of ranks for each degradation cause or restoration outcome being ranked. m = number of rankings (husbands and/or wives) and n = number of restoration outcomes being ranked. The following hypothesis was tested: $H_0: K = 0$; there is no agreement among experiences of men and/or women regarding land restoration benefits. $H_1: K \neq 0$ There is agreement among experiences of men and/or women regarding land restoration benefits.

Results and discussion

Drivers of land degradation

At the level of a managed plot, in both SNNP and Amhara, poor soil fertility was regarded by both men and women as one of the major root causes of land degradation whilst at the landscape level, heavy rainfall was perceived to be the root cause (Fig. 2). In Amhara, men think slop drivers land degradation (soil erosion) while women think absence of crop rotation drives land degradation at plot level. Both households also perceived weeds to be causes of land degradation at plot level. This might be because of its impact on productivity. In Amhara, there were gender differences as more men indicated biophysical root causes (e.g., erosion on cultivated slopes) whilst women considered land management (e.g., lack of crop rotation/continuous cultivation) as the key drivers of land degradation at landscape level. In the SNNP, men attribute shallow soils to be prone to land degradation at plot level. Women of Amhara during the FGD indicated that the lack of strategies to control erosion led to degradation, which is less in areas with conservation measures. They narrated that some areas prone to erosion due to overgrazing, lack of cover crops and removal of crop residues. The area receives heavy rainfall and strong winds that wipe away the top fertile soils, depleting the nutrients. Apparently erosion is the most common form of degradation with reports indicating annual soil loss of between 42 to 300 t/ha/year (Gebreselassie et al., 2016). To arresting erosion, the interventions

focused on installing physical and biological measures neglecting social and institutional dimensions including gender inclusivity (Gebreselassie et al., 2016), which our study has found to have a strong bearing on management.



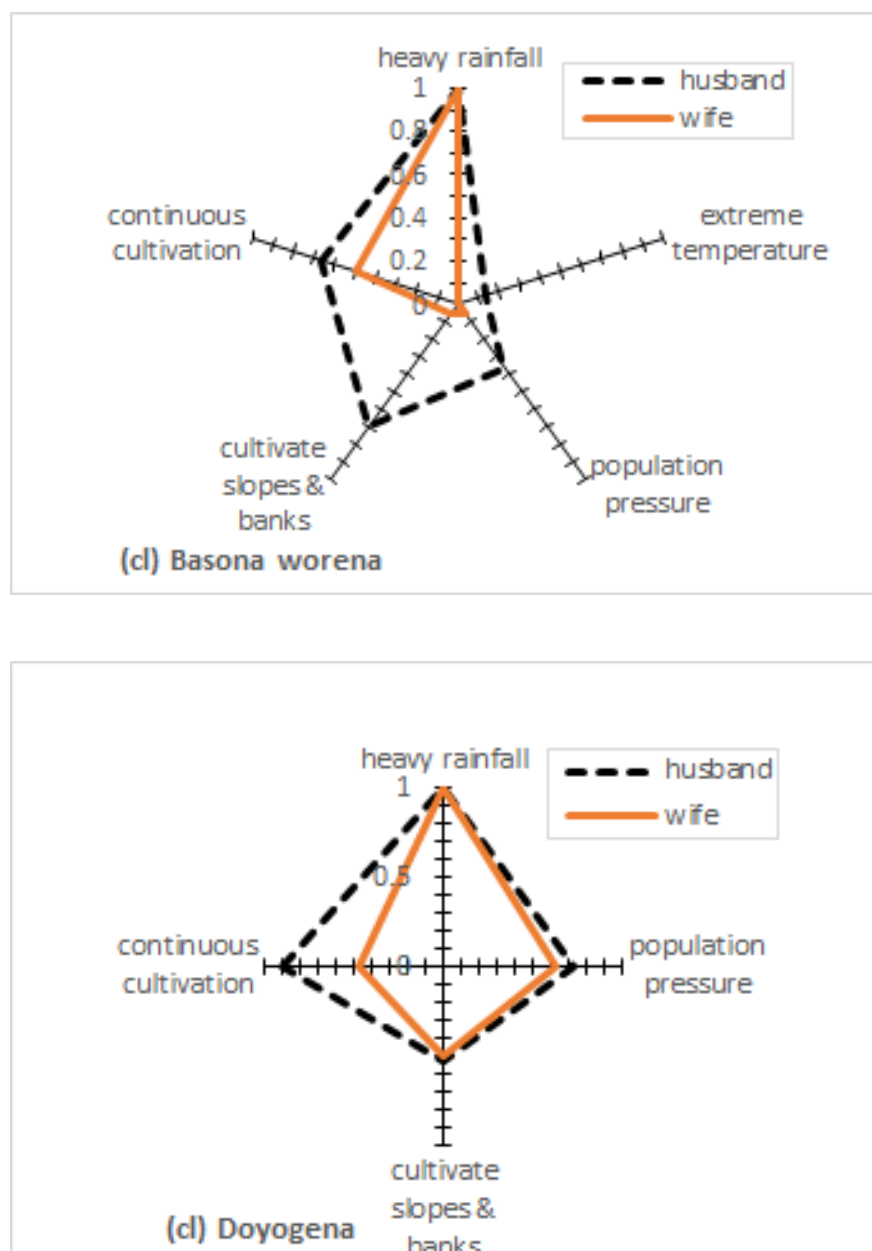


Figure 2. Gendered perceptions on main causes of land degradation on household's plots (hh) and community-landscape level (cl)

Impacts of land degradation and restoration on ecosystem services

Of the 15 ecosystem services (ES) under consideration, the concordance analysis shows disagreements ($W_t < 0.5$) in perceptions among the 59 men and 59 women (All raters in Table 1). The most disagreement was on economic ES and tenure. Worth noting, women largely have convergent views ($W_t = 0.63$) on regulatory and cultural ES. Men on the other hand, have convergent views mostly on provisioning ES. Women have been found in several studies to have increased concern and knowledge of regulatory services while men are knowledgeable of provision services (Fortnam et al., 2019). A systematic review established that women

have a stronger perception of soil formation, habitat conservation and sustaining biodiversity while men have strong knowledge of fuel and timber (Yang et al., 2018). Our results also show that men have higher agreement on rating of provisioning services than on regulatory and socio-economic.

Table 1 Kendall's coefficient of concordance (W_t) for gendered agreements in restoration impacts

		All raters (118)	Women raters (wives)	Male raters (husbands)
Ecosystem services (15)	W_t	0.38	0.48	0.32
	p-value	0.000	0.000	0.000
Provisioning (5)	W_t	0.36	0.37	0.38
	p-value	0.000	0.000	0.000
Regulatory & cultural (4)	W_t	0.47	0.63	0.33
	p-value	0.000	0.000	0.000
Economic & tenure (6)	W_t	0.27	0.38	0.21
	p-value	0.000	0.000	0.000

Provisioning (crop production, irrigation water, household/livestock water, fodder or grazing grass, fuelwood or poles or timber; Regulatory (landscape beauty, wildlife and pollinator habitat, reduction in weeds); cultural (religious and cultural sites); economic (income, costs, time and energy from or on farm and availability of jobs and businesses); tenure (access to communal land).

Intra-gender comparison for each of the ES revealed divergence in perceptions between men and women on access to land and availability of water for household and livestock, an indication of differences in lived experiences, aspirations and opinions of land degradation, restoration, and their valuation of these ES (Table 2). However, there is convergence in their rating of availability of water for irrigation and fodder or grazing grass, condition of religious and cultural sites and availability of jobs and business opportunities, an indication of shared experiences among these ES. We see that on average, restoration activities tend to lower women's access to communal land, especially in Amhara. Women of SNNP, compared to their husbands, perceive increased water availability for household and livestock use and increased income from farming but relatively lower rating of costs and expenditures on the farm following restoration.

Table 2 Mean ratings and correlations of perceptions of restoration impacts among paired husband and wife ES raters

	Basona-worena	Basona-worena	Basona-worena	Doyogena	Doyogena	Doyogena
Ecosystem service	H	W	corr	H	W	corr
1. Access communal land	0.33	-0.20	-0.25	0.07	0.14	-0.09
2. Crop productivity	0.83	1.47	-0.01	0.86	1.21	0.02
3. Irrigation water	0.43	0.50	0.14	0.00	0.00	.
4. Household and livestock water	1.23	1.17	-0.004	0.72	1.14	-0.53
5. Fodder or grazing grass	1.27	1.27	0.16	1.76	1.76	0.06
6. Fuelwood, poles or timber	1.33	1.27	-0.07	1.14	1.10	-0.12
7. Income from farming	0.90	1.47	0.05	1.21	1.34	-0.37
8. Costs/expenditure on farming [¥]	0.27	-2.7	-0.04	0.93	0.97	-0.07
9. Time spent on farm [¥]	-0.67	0.8	0.02	0.62	0.69	0.32*
10. Energy required to manage land [¥]	-0.40	0.93	-0.07	0.79	0.59	-0.12
11. Availability of jobs and businesses	1.07	0.67	0.03	0.21	0.03	0.37*
12. Beauty of landscape	1.33	1.77	-0.19	1.97	1.93	-0.05
13. Wildlife and pollinators	1.03	1.30	-0.34*	0.79	0.76	0.19
14. Occurrence of weeds [¥]	-0.33	-0.03	-0.14*	0.00	0.00	.
15. Religious and cultural sites	1.17	-0.23	-0.04	-1.38	-1.07	0.82*

*H=husbands, W=wives; *sig.<0.1; mean and correlations estimated from ratings: 2=more increased, 1=in-creased but not much 0=no change, -1=reduced but not much, -2=reduced a lot; ¥reversed rating*

Provisioning ecosystem services: land productivity

From the survey, it is evident that men and women have different perspectives on the contribution of restoration measures to land productivity (Fig. 4). Although both gave positive ratings, men gave a much higher rating of increase in production while women rated a lower productivity increase. We also observe that 10% of women in Basona-worena indicated that productivity was reduced. During the FDG, men of Amhara indicated that after the restoration intervention, there are higher satisfaction levels regarding soil erosion decline and fuelwood availability restoration benefits. Despite the human and livestock population growth that creates pressure on the land resources, men indicated that degradation in the area is decreasing. They attributed the decline to farmer awareness that land is a scarce resource and a better understanding of the advantages of restoration structures in improving soil fertility and producing food from the existing plots. Most farmers construct the stone and soil bunds, and plant grass along the soil bund (Dehso and Phalaris).

Considering productivity reduction as a degradation syndrome, although the residual effects of deforestation and overgrazing still cause long-term productivity loss in Ethiopia (Gebreselassie et al., 2016; Kumasi and Asenso-Okyere, 2011), both men and women of Amhara and SNNP rated them as moderate or least contributors to the productivity loss (Fig. 3). Instead, around 50% of both women and men considered the ongoing nutrient mining or loss and topsoil loss due to erosion to greatly affect productivity (Fig. 4). The soil fertility decline degradation syndrome is perceived to greatly contribute to productivity decline by more women in Doyogena but more men in Basona-worena. In both sites, more men consider erosion to greatly impact land productivity than women. These narratives relate to their perception on causes of root causes and signals the orientation of men towards more physical erosion forces measures while women focus on man-made degradation pathways.

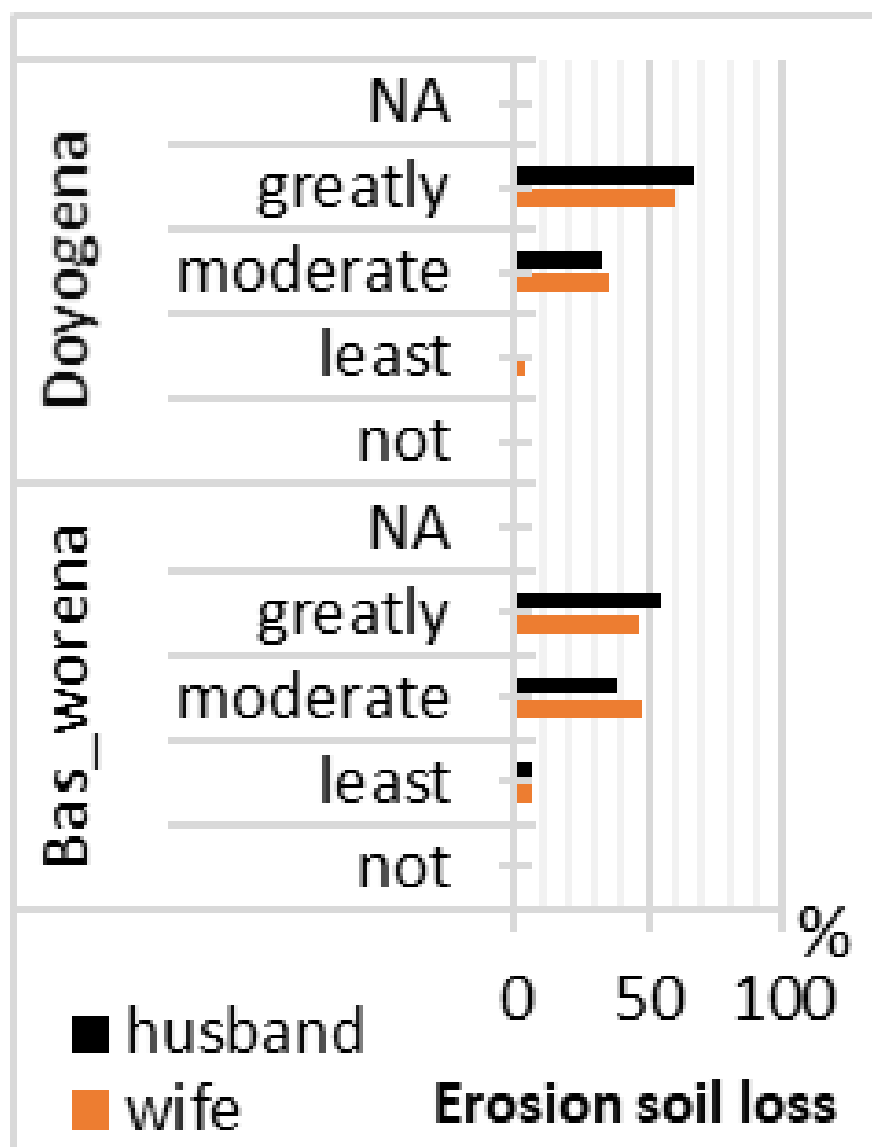


Figure 3. Pre-restoration gendered-perceptions of impacts of degradation on ecosystem services.

NB: erosion, fertility loss, grazing and deforestation impacts land productivity. Degradation impact on water availability for home (household and livestock) and irrigation, on landscape scenic beauty, habitat for wildlife, pollinators, and beneficial plants. Degradation impacts on weed incidence and pest and disease infestation. Pre-restoration costs and labour use to source firewood, poles and timber and forage or grazing grass.

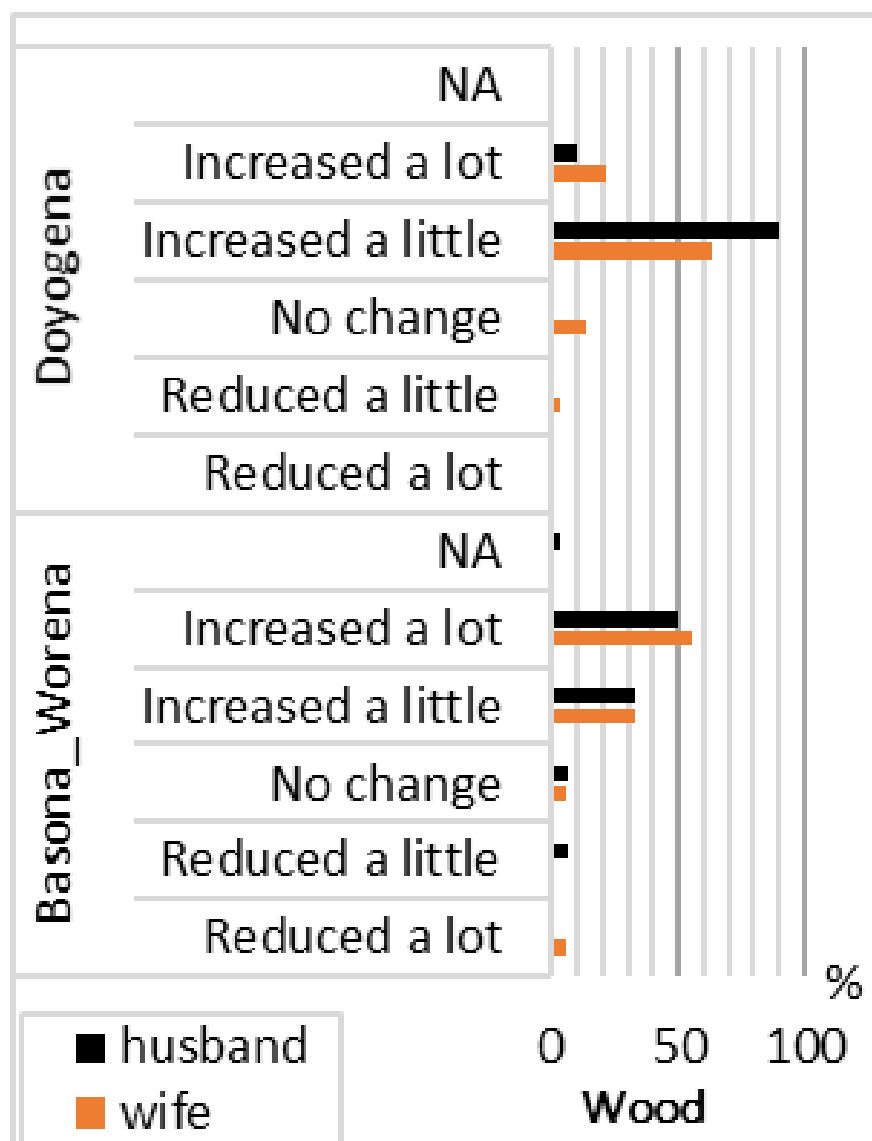


Figure 4. Post-restoration gendered-perceptions on impacts restoration on ecosystem services

NB: restoration impacts on: land productivity; availability of water for home (household and livestock) and for irrigation, of fodder or grazing grass and of firewood, poles and timber; landscape scenic beauty and habit quality for wildlife and pollinators; weed reduction; job and business opportunities; land tenure security; and on farm income, input costs and labour.

Provisioning ecosystem services: natural resource availability

We found that both men and women perceived land degradation and restoration to have profound impact on provisioning ecosystem services. In Amhara women rated that they were greatly impacted by degradation in terms of water scarcity for household and livestock use whilst men for irrigation. These reports are in line with domestic responsibility divisions among households in Ethiopia where over 80% of women are engaged in household chores and livestock enterprises while men are engaged in high value income generating irrigation enterprises (CSA, 2014). In SNNP, both genders reported experiencing a greater scarcity of water for their

livestock due to degradation (Fig. 3). With restoration in place, both men and women rated positive effects on water for livestock which significantly increased in both sites. On irrigation water, one third of men indicated that restoration had moderate to significant positive impact on water for irrigation.

During the FGD in Amhara, men reported that, due to degradation, the area experienced substantial shortage firewood. Post restoration, both men and women perceive significant improvement in fuelwood and pole availability. In SNNP, most respondents indicated that the change, though positive, is minimal. In both sites both men and women indicated that restoration significantly improved availability of fodder and grazing grass. During FDG, men indicated that women are worried a lot when there is livestock feed shortage. As men move to search for employment and income, women remain at home to take care of livestock. In SNNP, men narrated that communities are highly satisfied with the availability of grass for the cut and carry system. They noted that practice of planting improved grass variety on soil bunds helps farmers to integrate crop and livestock farming. Enclosures have been found to be effective at controlling grazing and restoring degraded grasslands and woodlands (Mekuria et al., 2019). In Amhara it was noted that marginal lands are converted to tree plantations which have higher economic value than if the land, with low soil fertility, is used for food crop production. In their pursuit of higher income from the smaller plots, farmers in the lower landscape positions tend to grow high value plants including the stimulant “*Chat*” shrub. Some left their fields as fallow and enclosures are used for controlled grazing for 3 to 5 years and recultivated once fertility is regained. Women’s valuation of provisioning ecosystem services in restoration activities is in sharp contrast to established notions that it is only men who value provisioning services and women value regulatory services (Fortnam et al., 2019; Kalaba et al., 2013).

Regulatory ecosystem services: landscape health and habitat quality

The study reveals gender differences in perceptions of landscape scenic beauty and habitat quality for wildlife, pollinators, beneficial plants, weeds and pests and diseases as regulatory indicators of ecological health (Fig. 3 and 4). The men of Amhara perceive that, pre-restoration, the scenic beauty, and wildlife habitat were greatly impacted while women rated the impact as moderate. In SNNP, both men and women gave a moderate rating of degradation’s impact on wildlife habitat, but both indicated that landscape beauty was greatly impacted. As presented in Fig. 4, men and women in both sites indicated that resource management restored landscape scenic beauty.

In SNNP, degradation was rated to have moderate impact on pollinators and beneficial plants but lead to proliferation of weeds and, pests and diseases while in Amhara, the ratings were inverse with higher impact rated for pollinators and beneficial plants. Most women of Amhara indicated that the impact on beneficial organisms was minimal but men observed that the increasing use of chemicals for weed control had a negative impact on bees and other pollinators. The respondents indicated that there have been habitat improvements leading to increase in wildlife and pollinators which has been substantial in Amhara but moderate in SNNP. A biodiversity study by Terefe et al. (2020) found increased abundance of pollinators and re-appearance of new species in restoration sites compared to neighbouring unrestored sites. In SNNP, respondents indicated that there has been significant reduction in weeds but in Amhara, majority of women reported that, post restoration, the areas have experienced increased occurrence of weeds and a third men perceived a slight increase in weed incidence. This rating reflects women’s central role in weeding and their ability to recognise the challenge better. Men and women of Amhara reported divergent experiences of incidence of pests and diseases. More women perceived least to moderate pest and disease occurrence in degraded landscapes while men rate the problem as least to none (Fig. 3). In SNNP, both genders reported higher occurrence of pests and diseases. The women’s knowledge and perception of these regulatory services is supported by similar findings by Yang et al. (2018) who found that women had stronger perception of habitat conservation and sustaining biodiversity.

Land tenure and economic costs and benefits

Related to productivity, restoration activities are viewed to influence land-use rights. In Amhara, although a greater proportion of women think it has not altered the existing land tenure systems, one-third of men reported that the restoration activities have reduced their tenure rights while around 15% of men and 20% of women reported increased access to land. In SNNP, both men and women reported that restoration did not alter the tenure arrangements. Most women than men in Amhara indicated that restoration opened business and job opportunities while in SNNP, the respondents did not experience change.

The women's tenure security confirms earlier studies that found that enhanced tenure security increases their engagement and valuation of restoration initiatives (Basnett et al., 2017). Since women have minimal economic opportunities (CSA, 2014), they are highly dependent on natural resources and their increased tenure through restoration initiatives significantly impact their livelihoods and wellbeing. Women's tenure security has been supported by Ethiopia's gender-responsive land certification and registration policies since early 2000s which were found to increase investments in soil and water conservation measures by 20 to 30 per cent (Collantes et al., 2018). However, enhancing the value of land through restoration can affect the functionality of the (land) resource, and thus may pose the risk of land use and ownership dispossession. The study found that tenure rights for some men were reduced, which calls for gender-balanced approaches.

Degradation impacted both men and women in terms of labour and costs of sourcing fuelwood (Fig. 3 and 4). Women were greatly constrained by the lack of feed/forage availability and the shortage of time. To support livelihoods through livestock, women reported spending much of their time and income to acquire forage. Fuelwood collection is more of a woman's task in Ethiopia, and with scarcity of resources near homesteads, they travel for up to 2 hours per day (CSA, 2014) with large economic consequences (Gebbru and Bezu, 2014; Mosa et al., 2020). Studies in Kenya and Tanzania also found that fuelwood collection is affected by degradation thereby increasing women's burden to search cooking energy (Njenga et al., 2021) affecting other economic activities including care for the children (Levison et al., 2018). A recent study in Ethiopia found that enclosures supply close to 10% of households fuelwood demand, and women still travel 10 km/day to collect from degraded forests (Mekuria et al., 2019).

Ironically, in Amhara, husbands reported significant increase in income as well as in associated costs, majority of their wives indicated that the incomes and costs were slightly increased, while 20% of wives reported reduction in both income and costs. In SNNP, husbands reported observing a significant increase in income and a little reduction in costs while wives reported that they think incomes increased a little. In Amhara, women experienced significant increase in time and labour demand on farm while most men reported experiencing a decrease in both time and labour requirements while in SNNP, wives and husbands indicated that restoration slightly reduced the time and labour demands on farm. A restoration workload study in Kenya found that the structural restoration measures increased the cost and time for land preparation but the labour investment was paid off by increased productivity and income from sales of vegetative measures (Crossland et al., 2021). An increase in household income has been recorded for restoration programs in sloping landscapes (Lin and Yao, 2014).

Conclusion

The study has established gender-differentiated experiences and perspectives on land degradation and impacts in Ethiopia. The experiences and perspective on degradation causes reveal how men and women perceive root causes of land degradation and form a basis of their effort towards land restoration and valuation of associated challenges and benefits. In northern Ethiopia, Crossland et al., (2018) found that the cultivation of sloping land was considered by farmers to be the major cause of degradation. Although Crossland et al. (2018) found gender differences in the mapping of degradation, our study reveals more salient issues as to how women and men perceive to be the root causes of degradation and thus could have a different understanding of land degradation and the respective restoration strategies. In Crossland *et al.*'s research,

women mapped more areas as degraded and some larger parcels under restoration compared to men. Our study identifies that women are particular on what they consider to be root causes, whilst men attribute degradation to more factors. Women attribute a moderate impact of land degradation on habitat quality than men who attribute restoration to the enhancement of biodiversity and pollinators.

Landscape restoration reduce the negative impact of land degradation and enhanced land productivity, resource availability and environmental health. The restoration interventions brought many advantages in terms of declining of soil erosion, enhancing fertility of land, and improving soil moisture, availability of livestock feed, fuelwood and trees/agroforestry. Restoration contributes a lot of farmers to change practice, the free grazing to cut and carry system and the complete harvesting of crop residue to partial and full retaining. Even though land degradation was very challenging in the past, nowadays the land degradation is decreasing. This is major because of the continuous awareness creation efforts by the NGOs and GO, the increase in farmers' awareness as land is a scarce resource and understanding better on the advantage of restoration measures to improve the soil fertility and produce food from the existing plots. Constructing different SWC structures and integrating with grass and tree planting, maintaining natural trees and practising area closure and reducing free grazing contribute a lot to the decrease of land degradation.

Land, water and ecosystem degradation disproportionately affect marginalised communities and women. Consequently, it is essential to ensure that restoration initiatives do not further exacerbate marginalisation and inequalities. Land rights critically shape restoration opportunities and benefits that accrue primarily to those who hold land. Lack of secure land tenure can therefore exclude marginalised communities and women. Getting women's experiences and views on restoration is key to proper land management. In the study although husbands did not perceive the occurrence of new weeds in restored landscapes, wives owing to their major involvement in weeding were able to detect and report incidence of new weed species. Capturing and considering women's perspectives in policy goal formulation, planning of activities and evaluation is essential to improve the uptake of restoration practices and ensure the success and equity of restoration efforts.

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Ethical considerations

An ethical clearance (reference number: 2021-IRB39) was approved by the Institutional Review Board (IRB) on Research Ethics of the Alliance for Bioversity and CIAT.

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