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Socio-economic importance of forest resources and their conservation measures in Ethiopia: the case of area closure in South Gonder of Ethiopia

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Abstract Area closures that set aside to degraded lands for rehabilitation purposes are a popular forest conservation measure in various parts of the world. However, their use can be controversial because, if poorly designed, they can accelerate the degradation of neighboring unprotected lands and deny local residents' access to important ecosystem services. This paper reports the results of a study on the area closure approach used in south Gonder within the Lake Tana watershed of Ethiopia to stem the rapid decline of vegetation cover that has occurred there over the last four decades. We used a mixed-methods approach that combined data from a household survey, focus group discussions, key informant interviews, and official documents. We found that support for the area closures was high. We also found that area closures have had a mixed effect on access to key ecosystem services while a number of important concerns about the negative impacts to surrounding unprotected forests were also expressed. We conclude that area closures have garnered broad public support within our study region but this support appears to be mostly contingent on management successes within protected forests and does not necessarily capture the unintended negative consequences to surrounding unprotected forests.

Keywords Conservation · Community · Perception · Area closure · Lake Tana

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Introduction

The livelihoods and traditional practices of rural residents of the developing world depend heavily on access to and availability of natural resources (Garedew et al. 2012; Kindu et al. 2015). For instance, local forests are often a vital source of firewood, medicinal herbs, and foodstuffs necessary to satisfy the energy, health, and nutritional needs of the communities that surround them. Human activity also greatly impacts environmental processes in these regions and, in turn, requires a delicate balance to avoid unintended negative consequences (Price 1996). Communities that are both geographically close to forests and economically dependent on them tend to be particularly vulnerable to environmental and social problems that undermine forest sustainability (Flint and Luloff 2007; Qin and Flint 2010; Kindu et al. 2016; Kindu et al. 2018), which is why rapid forest cover losses in these areas can be extremely detrimental (Rashid et al. 2013; Tom-Dery et al. 2014). To stem these losses, governments of the developing world often use area closures that set aside specified forestlands for rehabilitation purposes but it is becoming increasingly apparent that the conservation gains of this approach are often achieved at the expense of losses to surrounding forests and the communities that rely on them.

The use of area closures to rehabilitate degraded forestlands is grounded in classical biological conservation principles (Walpole and Goodwin 2001). Area closures simply restrict clearing activities within a prespecified range to make it possible for forests to recover natural vegetation without the need for human or animal intervention (Rahmato 2001). The advantage of this approach is that it is possible to maintain or achieve forest conservation goals with minimal resources, which explains its popularity in resource-constrained countries of the developing world. The major disadvantage of this approach is that it can simply displace negative population pressures to surrounding areas, further accelerating forest cover losses in these regions (Struhsaker et al. 2005). Furthermore, area closures also require some form of restricted access to the forests that they govern, which can block surrounding communities from accessing critical ecosystem services necessary for their livelihoods and traditional practices (Pratt et al. 2004; Yosef 2015). It is for these reasons that conservationists argue that the area closure approach must pay greater attention to local understandings of resource use to avoid causing unintentional harm (Kumssa and Bekele 2014). A growing body of empirical evidence further supports this claim and shows that conservation efforts that lack such community support often produce unintended costs that are much greater than their intended forest conservation gains (Rashid et al. 2013).

Our study examines community support for area closures in Libokemkem District, South Gonder, Ethiopia, and the socioeconomic impact of this forest conservation practice. Over 80% of the rural population of Ethiopia relies on agricultural practices to sustain its livelihood and the spread of these practices combined with rapid population growth has led to devastating forest cover losses throughout the country (Tegene 2002; Garedew et al. 2012; Kindu et al. 2013; Temesgen et al. 2013; Desalegn et al. 2014). This practice has sparked concern among government officials about the potential for political disruption due to the irreversible economic, ecological, and socio-cultural losses that tend to accompany such problems when left unaddressed (Taddese 2001). It is for these reasons that forest rehabilitation rose to national prominence in Ethiopia starting in the late 1970s (Tefera et al. 2005). Since this time, government officials and non-governmental organizations pursued a variety of natural resource management efforts in Libokemkem District while area closures have typically been the standard tool of choice used to achieve broad forest conservation goals (Nedessa et al. 2005). However, government officials are now becoming aware of the adverse socio-economic impacts that this strict nature protection policy can introduce (Naughton-Treves et al. 2006; Cardozo 2011), which has led to a recent push for greater use of community-based Participatory Forest Management (PFM) approaches (Amente 2005).

Our study seeks to contribute to the growing body of scholarship on area closures and protected forests in the developing world. We used a systematic general population survey to explore the perceived socioeconomic impacts of the area closure approach from the perspective of households living within the communities surrounding well-established area closure forests in Libokemkem District, Ethiopia. Prior studies have already investigated this issue in various parts of South America and South Asia, including studies conducted in Bangladesh (Rashid et al. 2013, Mukul et al. 2010), Ecuador (Naughton-Treves et al. 2006), Peru (Cardozo 2011), Guatemala (Radachowsky et al. 2012), India (Macura et al. 2011, Heinen and Shrivastava 2009), Laos (Sirivongs and Tsuchiya 2012), Myanmar

(Allendorf et al. 2006), Nepal (Meatha and Heinen 2001, Allendorf 2007), and the Philippines (Amanor 2003). A number of existing studies have also explored this topic in the context of Africa, including studies conducted in Benin (Vodouh et al. 2010), Kenya (Shibia 2010), Madagascar (Ormsby and Kaplin 2005), South Africa (Infield 1988), Tanzania (Kideghesho et al. 2006), and Uganda (Infield and Namara 2001). Finally, a few existing studies have even focused on the impacts of area closure forests specifically in the context of Ethiopia (Bishaw 2001; Amente 2005; Nedessa et al. 2005; Tefera et al. 2005; Wassie 2007; Kumssa and Bekele 2014; Yosef 2015; Demissie et al. 2017).

Materials and methods

Study area

Libokemkem District forms part of the Lake Tana watershed and is located in the South Gondar Administrative Zone of the Amhara National Regional State. The District lies within 11° 58′ 1.5″–12° 22′ 6.7″ N latitude and 37° 33′ 25.4″–37° 58′ 16.5″ E longitude with an area of 1082 Km^2 (Fig. 1). The district comprises a total of 32 Kebeles (the smallest administrative unit of Ethiopia) and the latest census figures from 2007 claim that the total population of this district is 198,435.

Our study focused on 8 specific Kebeles in Libokemkem District that span roughly 265 Km^2. Area closures and/or forest conservation activities have been practiced in these 8 Kebeles since the late 1970s because the vegetative cover provided by the forests in these Kebeles plays a critical role in regulating biodiversity and provisioning key ecosystem services necessary to support the livelihoods and traditional cultural practices of the communities located within the Lake Tana watershed. Nevertheless, agricultural expansion and excessive exploitation of wood products for ever increasing human settlements in this area has led to recent large-scale forest cover losses. This rapid loss of vegetative cover has left the region with only small remnant patches of forests, bushlands, and scrublands (Yitaferu 2007; IFAD 2007; Zegeye et al. 2011; Demissie et al. 2017). Nearly all of the patchy remnants of old-aged Afromontane forests are found almost exclusively in the areas surrounding Ethiopian Orthodox Tewahido Churches because locals are reluctant to damage such forests since they are regarded as holy places in a religious, social, and institutional sense (Wassie 2007).

Data collection and analyses

Our research team used both primary and secondary data to obtain data for this study. We used a household survey as the primary means of data collection. We obtained responses from 386 of the 10,039 households available in the 8 Kebeles of Libokemkem District, Ethiopia. An area-based stratified sampling method was used to ensure proportional representation of households in each Kebele. A systematic sampling method was then employed to select potential interviewees from the list of available households in each Kebele. Once a potential interviewee was identified, the chosen household was approached for a face-to-face interview using a questionnaire with both close-ended and open-ended questions. A total of eight interviewers participated in the data collection process of this study and all interviewers were trained to field respondent inquiries as consistently as possible. Our questionnaire was focusing on three major themes: (1) area closure knowledge, (2) area closure attitude, and (3) ecosystem service use and perceptions. In addition, key informant interviews and focus group discussions were conducted. Detail about arrangement key informant interview and focus group discussion can be found at Demissie et al. (2017). Finally, additional demographic and socio-economic information were also gathered from each respondent (gender, education level, age, household size, main livelihood).

Data analyses of forest resource importance, local people perception, and attitude on the management of area closure have been done using percentage and mean. Result from FGD and key informants were used to discuss the analyzed result and triangulated with secondary data. Triangulation was made among analyzed result, FGD, key informant interview, secondary data, and literature obtained.

Results

Household characteristics of the respondents

In our survey, 87.6% of our respondents were male and only 12.4% were female. This gender bias was expected and is consistent with longstanding social

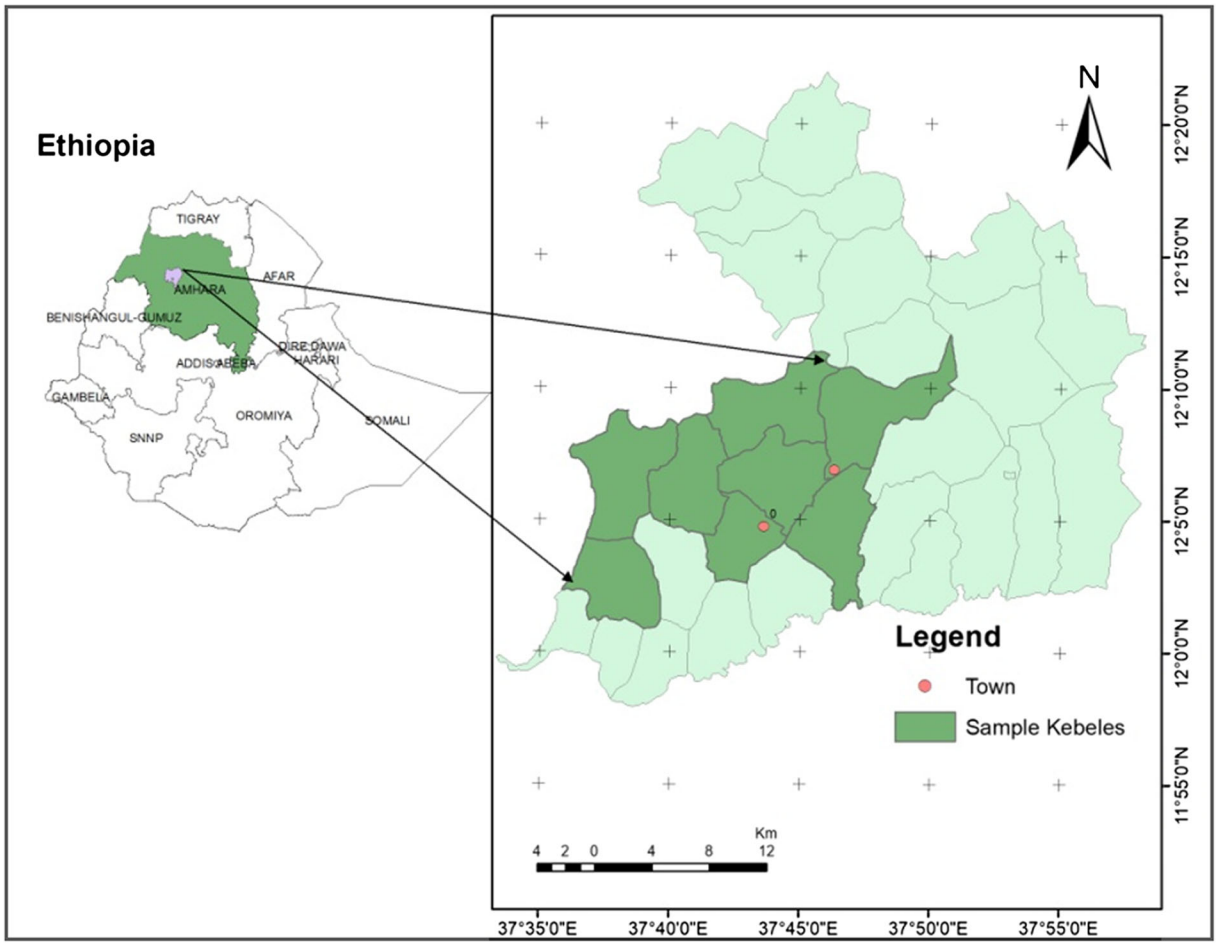

Fig. 1 Map of the study area (source: CSA 2007)

and cultural practices in Ethiopia that assume male heads of household are responsible for interactions with outsiders, such as responding to survey questionnaires, and that their views represent broader household and family interests. The age profile of our respondents was also in line with our expectations as the majority of respondents were somewhat evenly divided between the 35–44 age category (39.4%) and the 45–55 age category (29.5%) with slightly fewer respondents falling into the lower (14.5% were aged 25–34) and upper age brackets (16.6% were older than 55). Finally, as expected given our focus on households, nearly all of our respondents reported that they were married (89.9%) with only a few reporting that they were either single (4.4%), divorced (3.1%), or widowed (2.6%).

The socioeconomic profile of our respondents was also consistent with expectations for our study region. For example, every respondent who participated in our survey claimed that agriculture or pastoralism was their main source of livelihood while 11.9% claimed to also have a supplementary source, such as small-goods trade, carpentry, and fishing. As is common in rural Ethiopia, most respondents (61.2%) reported no formal education (32.4% of which claimed they could at least read and write) with a decreasing number of respondents claiming to have a primary (19.9%), junior secondary (17.6%), or high school education (1.3%). The average household size was 5.8 members with 52.6% of our respondents reporting between 4 and 6 household members, 35.7% reported more than 6 household members, and 11.7% reported less than 4 household members. Finally, 93% of our respondents claimed to have been

born and raised in the Libokemkem District with only 7% claiming to have migrated from elsewhere.

Social impacts of area closure/forest resources

Overall, we found that attitudes toward area closures in our study region were quite positive. For instance, 72.8% of our respondents claimed that they strongly supported the establishment of their area closure, an additional 23.6% reported moderate support, and only 3.6% opposed. (1.8%) strongly opposed (1.8%) establishment of the area closure in their community. We also found roughly similar percentages when respondents were asked to assess the overall effectiveness of the area closure with 71.8% claiming the area closure in their community was very effective, 26.2% claiming it was somewhat effective, and only 2.1% claiming it was not at all effective. 82.1% of our respondents also believed that their community thought the establishment of the area closure was a good idea while only 12.2% believed that their community thought this was a bad idea with 5.7% of our respondents believing their community was indifferent. For 92.0% of respondents, area closure was increasing vegetative cover, 4.1% believed it was decreasing cover, and 3.9% believed that there was no change in cover due to the area closure. 53.6% of respondents who experienced landslides in their community and 91.2% who experienced floods claimed that the area closure was decreasing these natural hazards as well. Finally, 73.8% of our respondents claimed that the area closure had increased wild game numbers while 76.6% of our respondent reported very severe or severe soil erosion problems prior to the establishment of their area closure which flipped to 69.9% reporting low soil erosion problems after its establishment with only 8.5% continuing to believe soil erosion was a very severe or severe problem.

To determine the impact area closures have had on the communities in our study region, we first asked respondents a series of questions about how they accessed and made use of resources in the area closure forests prior to the establishment of their protected status. We found that the majority of our respondents claimed that these forests were primarily held in communal hands (66.1%) before area closures were created, roughly a quarter were privately owned (23.1%), even less were government owned (8.5%), and even fewer were jointly owned (2.3%). Most of our respondents claimed to have used these forests primarily for grazing purposes (72.3%) prior to the establishment of the area closure while some also used these forests to collect fuelwood (43.3%) or for agriculture (15.0%) and very few claimed no use of the forests at all (1.3%). Additionally, we found that 76.4% of our respondents claimed that the area closure forests were used for beekeeping in their community, 32.9% said the same for collecting medicinal herbs, 19.2% for celebrating the "tsegie" fasting season, 15.3% for traditional hunting, and 15.0% for shade during traditional courts.

Economic impacts of area closure/forest resources

Next, we compared activity and resource-use levels before and after the establishment of the area closures to gain a sense of how these things changed as a consequence of restricted forest access. We began with an analysis of impacts to grazing activities and resources. We found that the total number of animals owned by our respondents increased for all animal types after the establishment of the area closures. For instance, the percentage of respondents who owned one or more oxen, cows, goats, donkeys, horses, mules, and hens rose by 10–15% for all categories after the area closure was established when compared to percentages before the area closure. However, we also found that the herd sizes of grazing animals (oxen, cows, and sheep) owned by our respondents actually decreased whereas there was a relatively proportional increase in the brood of hens owned by our respondents. In other words, the percentage of respondents who claimed to own four or more animals declined between 7% and 12% for grazing animals and increased roughly 4% for hens while the percentage of respondents who claimed to own between one and three animals increased roughly 10% for grazing animals and declined roughly 5% for hens.

After assessing the impacts of area closure on grazing, we then assessed changes in access to other critical ecosystem services, including fuelwood, construction materials, medicinal herbs, and beekeeping. We found that 46.4% of our respondents claimed that wood obtained from the area closure forests was their most important fuel source prior to the establishment of the area closure while this number dropped to just 2.8% after the area closure. Additionally, it was found that animal dung was the most important fuel source for 29.1% of our respondents (also the second most important for our respondents as a whole) prior to the establishment of the area closure while this number jumped to

54.2% after the area closure was established. We witnessed a similar trend for construction materials with 46.9% of our respondents claiming to have obtained these materials primarily from the area closure forests before their establishment and only 7.8% after whereas the percentage of respondents who purchased these materials increased almost 20% (from 30.3 to 49.2%) while those who obtained these materials from their own plots also increased roughly 10% between these two points in time.

Next, we examined the impact of the area closures on medicinal herbs and beekeeping. We found that 53.9% of our respondents claimed to use medicinal herbs prior to the establishment of the area closure and 51% of these respondents obtained these herbs from the area closure forests. We then found that 65.0% of our respondents believed that medicinal herb availability actually increased after the establishment of the area closure with only 13.0% claiming a decrease and 22.0% reporting no change. We also found that 38.3% of our respondents claimed to participate in beekeeping prior to the establishment of the area closure while this number rose to 42.5% after the area closure was established. Additionally, only 10.1% of the respondents who claimed to participate in beekeeping prior to the area closure actually hung their hives in the area closure forests while this number jumped to 26.9% after their establishment.

Perception of respondents on the participation of area closure/forest resource management

Finally, we examined perceptions of community participation in the establishment and management of the area closures in our study region as well as perceived positive or negative side effects. We found that participation in the establishment of the area closure was high in that 58.5% of our respondents reported that most of the members of their community participated while only 15.5% claimed that everyone participated, 15.0% claimed that half of the community participated, 4.7% claimed less than half participated, and 6.2% reported that they did not know. Additionally, 39.4% claimed that all adult household members participated, 33.2% claimed their kebele leaders participated, 28.8% claimed that development agents participated, 19.4% claimed that social association representatives participated, 9.1% claimed that district representatives participated, and only 5.2% claimed that NGOs participated. About 76% of the respondents also claimed to participate in the current management of their area closure forests and 45.5% believed that the area closures had a positive effect on employment opportunities. Finally, 30.6% of the respondents raised concern about the removal of fuelwood or construction materials in unprotected forests after the establishment of their area closure, 27.5% raised concerns about grazing in unprotected forests, 15.8% raised concerns about farming in unprotected forests, and only 4.7% reported no concerns about unprotected forests as a consequence of the establishment of their area closure.

Discussion

The results outlined above indicate that the practice of area closure for forest conservation has broad public support among the surrounding communities of Libokemkem District despite some signs of potential interest conflicts at the household level. For example, nearly all measures used to assess support for area closures resulted in support levels of at least 70% or higher. Support levels were at their highest when respondents were asked to specifically assess the criteria that motivated the need to implement area closures upon their inception, such as the need to address soil erosion and vegetative cover problems. This is certainly a positive sign because it indicates that area closures are at least accomplishing their intended forest conservation goals from the perspective of nearly all households who experienced these problems directly within surrounding communities. This result is also in line with prior studies that tend to find relatively high support for area closures (Allendorf 2007; Allendorf et al. 2006; Birhane et al. 2006) and conforms to the expectations of past empirical studies that have found area closures to be quite successful in achieving such goals on the ground (Radachowsky et al. 2012; Birhane et al. 2006; Amente 2005; Bishaw 2001). However, support for area closures was not unanimous or unconditional in Libokemkem District. Support levels declined somewhat when respondents were asked more generally about the establishment and effectiveness of their area closure or when respondents were asked about potential unintended positive benefits, such as an increase in wild game. This suggests that either the broader benefits area closures provide to surrounding communities are unevenly shared or the costs necessary to achieve these

gains are unevenly distributed, resulting in the potential for interest conflict at the household level.

To explore the source of possible conflicts of interest area closures could introduce, we examined resource-access impacts before and after the establishment of area closures to determine how this change in conservation management altered the provisioning of key ecosystem services in Libokemkem District. We were particularly interested in impacts to owners of large grazing animals whom the literature suggests are likely to be blocked from accessing grazing land and fodder due to the establishment of the area closure and the need to avoid disturbances to rehabilitating forestlands (Mukul et al. 2010; Naughton-Treves et al. 2006; Nedessa et al. 2005; Nyssen 1998). We were also interested in households who depended on area closure forests for access to wood for fuel or construction materials as well as medicinal herbs who might be forced to find alternative sources for these resources due to existing area closure restrictions. Prior area closure literature has suggested that improper implementation of this approach can result in a loss of access to communally held resources that households must now supplement with products purchased in private markets (Cardozo 2011; Carnea 1985). Our findings showed that both of these problems were potentially happening in Libokemkem District but our evidence was also somewhat mixed. We found that the number of respondents who grazed their animals in the area closure forests prior to their establishment was much higher than those who collected fuelwood or medicinal herbs from these forests. This tells us that the impact on grazing should be more noticeable than the impact on access to wood or medicinal herbs because more households should experience this problem in response to the area closure establishment. What we found instead was that access to wood for fuel and construction materials experienced the greatest declines, the total number of grazing animals increased slightly while the average herd size declined, and access to medicinal herbs actually improved after the establishment of the area closure. We will now explain why we believe these results occurred.

The first thing to note about the reported decline in wood access among our respondents is that this decline was rather dramatic. In other words, nearly half of our respondents reported accessing wood for fuel from the area closure forests prior to their establishment but only 2.8% claimed to do the same after the area closures came into place. It appears that many households then shifted from wood-based fuel to animal dung as a way to compensate for this loss. The decline in access to wood for construction materials was similar in that nearly half of our respondents reported accessing these materials from the area closure forests prior to their establishment while this number dropped to just 7.8% after area closures were in place. This then forced many households to purchase their construction materials from private markets as a way to offset this loss. Both responses to the loss of wood access are likely to have more negative impacts on more impoverished members of Libokemkem District who are the least likely to be able to afford reasonable market alternatives (Onoja and Emodi 2012). Furthermore, the shift to animal dung as a fuel source is also likely to further exacerbate health problems known to be associated with the use of such fuel sources in the conventional heating and cooking equipment impoverished members of society are more likely to own and use (Mudway et al. 2005; Mohapatra et al. 2018; DeKoning et al. 1985).Thus, area closures appear to be introducing an unfair burden to the least capable members of society with respect to wood access.

The impact of area closures on grazing access, however, was not as noticeable as the impact on wood access and it also resulted in a somewhat unexpected outcome. For example, we found that respondents as a whole reported an increase in the total number of animals owned across all available categories after the area closure forests were established. However, most of these gains came from respondents with low herd sizes prior to the establishment of the area closure, increasing their herd size incrementally after the area closure was in place. These gains were also offset by declines in the total herd sizes of the largest owners of grazing animals prior to the establishment of the area closure forests. Furthermore, we showed that most households appeared to shift their ownership from large breeds to small breeds as an increase in the brood size of chickens tended to accompany the decline in the total herd sizes of large grazing animals for respondents as a whole. These results tell us that it would be difficult to blame the area closure forests for generally harming the interests of owners of large grazing animals but their introduction did seem to be encouraging smaller herd sizes, which resulted in a more equitable distribution of herd sizes overall. In that sense, it seems that more wealthy households who typically own larger herd sizes were

experiencing slightly negative impacts from the area closures while less wealthy households may actually be benefiting from this change. This result makes sense when considering the fact that area closures are one way to artificially limit grazing capacity, putting downward pressure on herd sizes, while gaining some control over who can access grazing lands and when, making it possible for the owners of smaller herd sizes to avoid over-competition for grazing land due to the pressures of owners of larger herd sizes grazing without limit on communal lands. Of course, this all depends on how the area closure forests control grazing access and there is nothing inevitable about this outcome.

While wood access experienced a negative effect and the effect on grazing animals was mixed, it appears that the area closures had an unquestionably positive impact on beekeeping and medicinal herb gathering. In other words, beekeeping and medicinal herb gathering both improved rather than declined in response to the establishment of area closures. For example, just over half of our respondents claimed to have gathered medicinal herbs in the area closure forests prior to their establishment while 65% of our respondents believed that medicinal herb availability actually increased after the area closure forests were in place. We also found that beekeeping activity increased slightly from 38.3% to 42.5% after the area closure establishment while the number of beekeepers who hung their hives in the area closure forests increased from 10.1% to 26.9% once the area closure was in place. This evidence gives us a reason to conclude that opportunities for beekeeping and herb gathering actually increased on the area closure lands. This also makes sense given that the area closure forests were intended to specifically improve land cover degradation, which should have a positive effect on the provisioning of the ecosystem services tied to medicinal herb gathering and beekeeping. Yet, it would not be possible for local community members to take advantage of these gains without permission to enter the area closure forests to conduct these activities. Given that beekeeping and medicinal herb gathering are unlikely to disturb land cover regrowth as intensely as herd-animal grazing, it is not surprising that the managers of local area closure forests are less sensitive to this potential for harm and are, therefore, permitting these activities to occur.

One final note about the governance of the area closure forests can help us to shed more light on the interest conflict situation we just identified above. The assumption in the literature is that greater community participation in the process governing the establishment and management of area closure forests should minimize interest conflicts within the surrounding local communities who rely on these forests for key ecosystem services (Rashid et al. 2013; Porter-Bolland et al. 2012; Sirivongs and Tsuchiya 2012; Macura et al. 2011; Amanor 2003; Nyssen 1998; Infield 1988). In this regard, we found that local perceptions on the governance of area closure forests reflected a mostly inclusive process that incorporated as many community interests as possible. For example, over half of our respondents reported that "most of the members of their community" participated in the governance process establishing the area closure forests with many fewer claiming that "only half" or "less than half of their community" participated. An even higher number (76.2%) claimed to participate in the current management of their area closure forests. On the other hand, only about a third of our participants claimed that "all household members" participated in the governance process and about the same said that their kebele leaders participated. Reported rates of participation for development agents, social association representatives, District representatives, and NGOs were much lower (listed in decreasing levels of participation). These results seem to suggest that an attempt was made to ensure the governance process was inclusive of multiple local interests but it is also clear that certain interests, such as those of adult female household members or other underrepresented adult household members as well as groups representing specific local or global interests were possibly excluded from this process despite our mostly male head of household respondents claiming that community participation rates were quite high from their perspective. This seems to suggest a disconnect between perceived reality among those who participated in the governance process versus those who actually participated, which highlights a possible barrier to adequately representing the interests of traditionally underrepresented community members. This problem is even more concerning when considering the fact that 66.1% of the area closure forests were established on what were once communal lands as opposed to government or private property because it eliminates the non-market alternatives more vulnerable members of society, who are also likely to be underrepresented, can turn to for supplemental resources in times of need.

Conclusion

Our study found that the impact of area closure in Libokemkem District was mixed despite efforts to ensure a fully participatory governance process. For example, we found that the establishment of the area closure forests in Libokemkem District had a positive impact on minimally invasive ecosystem service activities such as medicinal herb gathering and beekeeping. We found that the area closure forests were also placing downward pressure on the herd sizes of grazing animals at the household level while encouraging an ownership shift to less invasive or forest-dependent animals such as chickens. We argued that this effect is decreasing herd-size inequalities and, therefore, potentially having a positive impact on wealth inequality at the expense of herd size declines to owners with large numbers of grazing animals. We also found a negative effect on wood access both in terms of access to construction materials and access to fuelwood. We argued that this was likely to place an undue burden on the least financially capable members of Libokemkem District who are now forced to turn to less healthy fuel sources, such as animal dung, or more expensive market alternatives to compensate. This is a result that current area closure studies have yet to identify but one that deserves much greater attention in future research.

Finally, we have shown that efforts to expand the inclusiveness of the process governing the establishment and management of the area closure forests in Libokemkem District have not entirely eliminated the potential for interest conflict within the surrounding area forest communities. For example, there is evidence to believe that the voices of traditionally underrepresented household members are continuing to be directly excluded from the governance process but this result also requires further exploration to determine impacts within households on power and resource distribution issues. What is clear, however, is that certain interest conflicts are difficult to avoid whenever the area closure approach is used despite inclusive governance efforts. For example, it is difficult to avoid conflicts of interest between preservation goals and more invasive ecosystem service activities, such as wood gathering and grazing. Our study shows that these activities are experiencing negative effects from the establishment of area closure forests in Libokemkem District and that the continuance of these activities in the area closure forests after their establishment are the two highest concerns shared among our respondents as a whole. Therefore, more work could be done to redress these issues but the path to a solution won't be easy considering that these activities directly conflict with the management goals of the area closure forest themselves. More attention must be paid to offset the need for local community members to encroach upon the area closure forests for wood or grazing access and it is very likely that this cannot be achieved without some form of aid or government support that subsidize losses to local community members stemming directly from the restricted use-requirements of the area closure forests. Our study shows why a more nuanced understanding of these issues is warranted despite the obvious successes area closure forests have been able to achieve in helping degraded lands recover for the mutual benefit of surrounding communities.

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