Addressing livestock needs in Multiple Use water Services

Case studies of multiple use of water in Ethiopia (MUStRAIN case 5)

As part of the MUStRAIN project in Ethiopia, various approaches to water harvesting, multiple use of water and ecological sanitation have been studied. Here the impact of watershed management approaches on livestock is evaluated while identifying options for addressing broader livestock needs (especially drinking and feed) as part of an integrated approach to multiple use water services.

Watershed management and livestock in Ethiopia at a glance

Main features: Many rural water supply systems have a component for livestock watering, usually a cattle trough. While this may reduce the need of travelling long distances, herders still need to walk with their animals to grazing grounds. In many areas of Ethiopia, this is increasingly limited by watershed management measures where grazing areas are fenced off for to support the restoration of degraded lands.

Implementation: Based on successes in the northern and eastern parts of the country, the government has started implementing soil and water conservation campaigns throughout Ethiopia since 2012. These watershed protection measures can help reduce erosion and increase infiltration, potentially leading to higher discharges of downstream springs. The higher spring discharges reported could facilitate expansion of multiple use water services, as practised by HCS in the eastern part of the country.

Options for multiple use of water: Reduction of free grazing brings changes in livestock management, such as tethering animals at the homestead and feeding them by 'cut-and-carry' methods. Livestock then also need water nearby, e.g. from cattle troughs integrated into the domestic water supply system.

Challenges for uptake: Integrated watershed management in relation to multiple use water services is specifically suitable for spring systems in mountainous areas. Since land is usually rare in such areas, solid institutional arrangements must be made for the land that is required for the facilities. Users need training to maintain the protected areas and manage the various facilities.

Introduction

Ethiopia has the highest number of livestock in Africa, with around 50.9 million cattle, 22 million goats, 26 million sheep, and 2.3 million camels.[1] The livestock sector accounts for 12-16% of the total GDP and around a third of the agricultural GDP.[2] This excludes the value of draught power, transport and manure, or the value as social status and role as assets. Livestock make a contribution to the livelihoods of 60-70% of the Ethiopian population. Livestock are kept for multiple uses, including power (for ploughing and transport), nutrition and income (from meat, dairy, eggs, hides) and manure. In addition, livestock provide a buffer for meagre times.[2] Important factors in livestock production in Ethiopia are the increasing demand for dairy products in urban and peri-urban areas, the high and diverse livestock population, varied agroecological landscapes throughout the country, and a long-standing culture of animal production and consumption. Productivity of dairy animals in particular is limited, because of the feed sources, feeding systems and access to services and inputs. The dominant feeding system in rural animal farming system is grazing on private and communal pasture lands, while stall-feeding is predominant in urban areas.

Despite its importance, livestock are widely neglected in agricultural water planning and management, in particular the water requirements of fodder crops[3]. Livestock drinking is often provided for in rural domestic supply. The addition of livestock

troughs to community water facilities in rural areas is fairly standard and highly appreciated by the communities[4]. Still, in many areas, herds of animals have to travel long distances, particularly in the dry season, for watering at rivers or other sources as well as for grazing on communal land. This is time consuming for small holder farmers and reduces animal health and productivity. At the same time, high numbers of livestock in any location may negatively impact on water quality[5] and over-grazing may accelerate erosion of degraded land.

In the highlands, high population pressure and land degradation have not only affected the productivity of land for crop production and grazing, but also are widely considered to have negatively impacted the discharges of many springs. One of the constraints and challenges in promoting multiple uses of water is the limited discharge of the available water sources. Upstream watershed management interventions have the potential to alter infiltration into the ground and affect the discharge of downstream springs. This may potentially increase the availability of water for communities to use.

In Eastern Hararghe, where springs are the main sources of water, upstream land degradation is reported to have caused some springs to dry up. At the same time, watershed management measures under the Productive Safety Net Program, such as exclosures and other bio-physical interventions have apparently caused other springs to recover. Similar effects have been reported from the northern Tigray Region, where groundwater recharge has improved after a range of soil and water conservation measures were put into place[6]. The most likely explanation for this effect is thought to be that the soil and water conservation structures mean runoff is no longer eroding the soil, but recharging the groundwater instead.

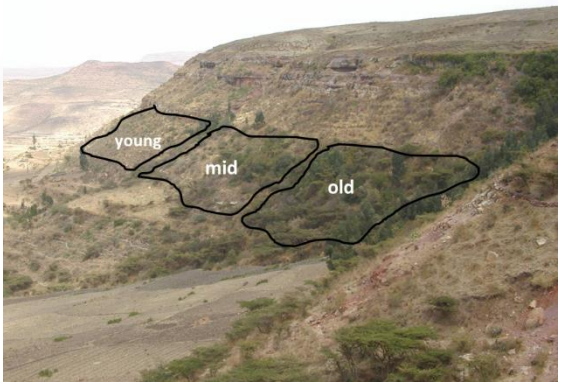

Figure 1. Exclosure areas of various ages, established five (young), 14 (mid) and 21 (old) years ago, in Kunale, Tigray Region.[7]

These watershed management practices have consequences for livestock keeping as both feeding and watering of animals are affected. Both have to be taken into account for multiple use water services to become more sustainable and more productive.

Implementation

The Ethiopian government is conducting a nationwide campaign on soil and water conservation, for the second time since 2012, based on lessons learned from food insecure areas where watershed management works through food or cash for work programs have been successfully implemented[8]. The campaign is an action at scale that involves all farmers within their wards (kebeles) for a minimum of one month, without any additional incentives, to undertake soil and water conservation works to rehabilitate their degraded land.

In the Eastern part of Ethiopia, the NGO Hararghe Catholic Secretariat (HCS), supported by the international NGO Catholic Relief Services (CRS) implements multiple use water services in partnership with

government line agencies at district (woreda) level, such as the district office of water, mines and energy (WOWME). This is supported by a decentralized budget at the district levels. HCS has included watershed management components in its water projects in Eastern Hararghe since 1995[a] as part of their first Development Activity Programme (DAP1), followed by a follow up, DAP2. These measures are said to have been successful in restoring degraded lands and increasing groundwater recharge and improving springs. While hardly any quantitative data on changes in spring discharges are available, informal guesstimates are around a 15-30% increase after rehabilitation of the watershed[9].

One of the components of the watershed management approach is the implementation of area exclosures. These are upstream areas, often communal lands that are fenced off and closed. Different multipurpose trees and grasses are grown, protected from people and animals.

Watershed and livestock management in Eastern Hararghe

Eastern Hararghe in Oromia Region is one of the food insecure areas where watershed programs have been promoted to enable poor farmers to work on rehabilitating their degraded land through food for work. This has included soil and water conservation activities such as terracing, fencing off and afforestation of upstream areas. The aim is to stop the cycle of overgrazing, degradation and erosion, followed by farming and grazing on more vulnerable areas (e.g. on steeper slopes), that leads to faster degradation. Supported by new by-laws, free grazing is no longer allowed on these areas, and replaced by the 'cut-and-carry system'. This means that fodder is cut elsewhere, be it from cropland or other areas, and brought to the homestead.

Traditionally farmers in the area did tether oxen for fattening at the homestead while other animals were herded. Male household heads normally decided which animals would be fattened and on which feed, making sure that they got fat for sale within a short period of time. However, the actual supplementary feeding and watering at home was done by women. This practice has prepared men and women to some extent for the current new trend to tether all livestock, including small ruminants, at the household and feed them there under the cut-and-carry system.

Figure 2. Tethered oxen at Ganda Galan, fed with maize stalks near the homestead.

With the increased numbers of tethered animals, there is a shift in labour demands, from children and young boys herding the animals to grazing areas and rivers for drinking, to men, women and children being responsible for bringing home feed and water. In Eastern Hararghe men and boys collect feed such as crop residues, a share of grasses from the enclosures and grasses from other places, which is stored in small storage huts. Women and girls have to collect the additional water for the animals and feed them.

[a] All dates are noted using the international (Gregorian) calendar.

Revenues from fattened oxen and cows are usually controlled by men, while women derive income from dairy cows, and small ruminants and chicken.

Figure 3. Tethered calf and sheep Gende-Abdule, fed with teff straw near the homestead.

Gende-Abdule spring in Ido Jalela, Goro-gutu

The Gende-Abdule spring system in the ward of Ido Jalela in the district of Goro-gutu was established in 2005 by the district office, with a watershed component being supported by HCS through DAP1. The system was upgraded to cater better for multiple uses rather than just domestic supply in 2012, with complementary measures to protect the upstream watershed through the national campaign for soil and water conservation.

Traditionally, the spring was used by the community for domestic and productive purposes. Water flowed from the spring into a pond that was used for livestock watering and domestic purposes, while overflow from the pond was used for small scale irrigation by farmers who had farmland nearby. Women and children went to the traditional pond very early in the morning to fetch clean water for domestic use before it would be disturbed by livestock and washing. The quality of the water was poor because of these activities and children suffered from waterborne diseases. This was a driver for the community to get organized and request the district water office for support to improve water quality for drinking.

The district water office accepted the request but had limited capacity in terms of budget and staff (three people with low qualifications), so the water point was developed with minimum budget and limited engineering input into the design of the water supply system. A total of ETB 15,000 (around € 1,400 at the time) was allocated from the food security program to develop Gende-Abdule's spring into a domestic water supply system. The community contributed labour and local materials, as well as hospitality costs for the water office staff.

Because of the limited budget the water system was developed with a single water point connected to the spring box and no reservoir (the spring flow continuously with an average discharge of 0.011 l/s). Below the domestic water point, the overflow continued to feed the traditional pond used for livestock watering and as night storage for small scale irrigation.

Figure 4. Gende-Abdule domestic water point.

In 2005, the new water supply system served 47 households residing in the downstream Gende-Abdule village. After the new system was built, the upstream community demanded the right to access the service for

free without paying the user fee of € 0.2/month/household that the Gende-Abdule community members were paying. The district water office had no budget at the time to develop other springs in the upstream area. As a result, the water system now had to serve an additional 45 households from neighbouring villages, which was beyond the capacity of the Gende-Abdule system. This created pressure on the water point, with long waiting times, especially during the dry season.

In 2012, the district water office upgraded the system by reconstructing the spring box, which apparently doubled the discharge to 0.025 l/s. A cattle trough was then constructed downstream of the water supply point, as well as an irrigation reservoir.

The water supply system is in service during specified hours in the morning and evening and then closed to fill the irrigation reservoir. Currently, 92 households benefit from the domestic water supply, while 47 households use the irrigation facilities.

Figure 5. Gende-Abdule cattle trough.

The irrigation reservoir was constructed with contributions in labour, local materials and hospitality costs by the 47 household heads over a period of 70 days. In addition the households each contributed around € 4.50 in cash for the reservoir. It was constructed on private farm land that was given for free, though the farmer was given priority rights by the community to use the irrigation water for his *qat* and cash crop production.

Figure 6. The irrigation reservoir at Gende-Abdule with the owner of the land.

As the users see the need for more water from the same spring, they are interested and prepared to strengthen the current government initiatives with their own community-based integrated upstream watershed management activities. The community members have seen how watershed management practices have improved the discharge of springs nearby and have now joined the national campaign, developing soil and water conservation structures upstream of the spring.

Ganda-Galan spring system in Gorobiyo, Meta

The Ganda-Galan spring system in the ward of Goroboiyo in the district of Meta was established in 2004/2005 with support from HCS and local government offices. It has three water points, two of which were not functional during the field visit in 2013. There is also a laundry basin, an irrigation system with concrete lined canal and reservoir filled directly from the spring, as well as a cattle trough (not in use). Currently, 115 households benefit from the domestic water supply, while

62 households together irrigate seven hectares of cash crops such as *qat*.

The cattle trough is situated on private land, but as the owner did not receive his ETB 500 (€ 48 at the time) compensation, he does not let the community use it. Instead, a traditional livestock pond is used, fed by the overflow from the domestic water point. This pond has created a muddy area on the road to the domestic water point, hindering access.

Between 1995 and 2005, the degraded upper catchment of the spring, 220 hectares of former communal grazing and farming land, was rehabilitated as part of DAP1 and later the Productive Safety Net Program. Farmers who were identified as food insecure participated in the watershed management activities through cash or food for work. Various soil and water conservation structures were developed in the large area upstream of the spring, such as terraces, half-moon ponds and other water harvesting and soil retention structures. These bio-physical measures were started, maintained and extended over the years under the different programs to rehabilitate the degraded land and improve the discharge of the spring. In addition, different multi-purpose trees were planted and exclosures established.

Figure 7. Terracing at Ganda-Galan watershed.

Biological measures included the planting of various multipurpose trees including two endemic timber tree species *Juniperus procera* (African pencil cedar, local name *tidh*) and *Podocarpus gracilia* (fern pine, local name *zigba*), fruit trees and fodder grasses (natural grass and alfalfa) in the protected area above the spring. *Eucalyptus* was discouraged because of its high water consumption, though it may bring income through the sale of firewood.

The area is closed for free grazing and agriculture, which is institutionalized in communal by-laws to protect the area from human and animal interference. Livestock are kept tethered at the homestead and fed through the cut-and-carry system. For small animals, water is brought to the homestead from the domestic water point, which is of good quality. For larger animals this is inconvenient, so they are brought to the traditional pond for drinking, even though the water quality is perceived as poor.

Figure 8. Pond for livestock watering at Ganda-Galan.

The community participated in the construction of the facilities through contributing their labour and local materials in addition to the hospitality costs for the technical staff. After the construction, the multi-purpose water system was handed over to the community for management, operation and maintenance, according to the water

resource management policy of the country. HCS together with the district water office provided training for two committees, established for separately managing irrigation and domestic uses. Both committees have developed by-laws with the users to prevent and mediate the conflict of uses.

Figure 9. Irrigation canal used for laundry in Ganda-Galan.

The 125 households using the system for domestic uses have established a water committee that is also responsible for management of the cattle trough and laundry basin in addition to water points for drinking water. User fees of some four euro cents per month per household were collected in the first three years. However, the water committee turned out to be not strong enough to keep collecting the user fee and use it for operation and maintenance, which explains why two of the water points are currently not functional. The users stated that as soon as the remaining tap would fail, they would collect fees immediately to repair the water points.

The irrigators are able to produce a good quality *qat* crop twice a year that brings a relatively high income. These farmers have land situated downstream of the gravity irrigation system, though a few households use a motor pump to bring the water to their fields. The discharge of the spring is sufficient to irrigate more than seven hectares of land. The irrigation water users association manages the irrigation facilities, allocates water and collects the user fees for operation and maintenance. At the establishment of the water users association the 62 farmers contributed around € 2 with an intention of using this fund for building a potato storage warehouse. It was also planned to act as a cooperative for buying inputs at low cost and selling products at the best market price. This failed because the contractor did not deliver the warehouse as planned. Subsequently, the users stopped contributing the irrigation fees.

Figure 10. Irrigated fields at Ganda-Galan.

Costs and benefits

Communities have to contribute 5-15% of the total cost of rural water facilities constructed by the government and development partners. To the water office, these contributions are proof of commitment, and the community can sort out the respective contributions of cash and labour among themselves. Usually these contributions come in manual labour by men (e.g. to dig the irrigation reservoir and canals, and work on cement preparation, all under the locally hired contractors, or in this case, HCS), collection of local materials like stones, and

hospitality costs, often borne by women. For multi-purpose facilities, people in Eastern Hararghe are generally eager to contribute, even in cash, as the water will help them increase their income from crops, in particular *qat*. In some cases, people are asked to provide land for construction of the facilities.

After construction, the water facilities are handed over to the community for management, operation and maintenance, according to the water resource management policy of the country. This includes the collection of fees for cost recovery and usually training is provided to new water committees on how to do this. The committees are encouraged to open group accounts at the bank to deposit the fees and manage payments. In practice fee collection may cause problems as the water facilities are often used by people from other villages who do not pay regular fees.

Equity issues may arise, for example, when private land is used for construction of facilities, in exchange for irrigation favours, as happened at the Gende-Abdule spring. With the low discharge of the spring, the reservoir takes 7 days to get filled and when this water is always allocated first to the land owner, other irrigators may suffer from water scarcity, particularly during periods of high irrigation demand. This hampers the equal distribution of benefits to all users. Farmers have started addressing the serious shortage of irrigation water by digging their own shallow wells to access ground water and by harvesting water in private ponds.

The cattle troughs, functional at most systems (though not at Ganda-Galan), can be used by all the households who have livestock. Since the introduction of the cut-and-carry system linked to watershed management interventions, the communities appreciate even more the nearby cattle troughs with good quality water.

Challenges for up-scaling

The benefits of the integrated watershed management approach to tackle the inter-related problems of land degradation, low agricultural productivity and food insecurity, are well demonstrated by these success stories from the northern and eastern highlands of Ethiopia, and are widely recognized by the government and development partners. The impacts of these approaches on the yield of springs, and other water sources for multiple uses, has not been sufficiently quantified but looks promising. However, in a country with such high numbers of livestock, the impacts on livestock watering and grazing need to be integrated into these approaches. This complicates planning and management, but is necessary for long-term restoration and productivity of the watershed and may multiply the benefits.

The provision of multiple use water services in general already puts higher demands on organizational and institutional arrangements[10]; integrating both watershed and livestock management requires even more coordination and communication between sectors. Failing to account for livestock needs in multiple use water services, the more so in areas with watershed management measures that include exclosures, may increase inequity and conflict while increasing competition over scarce water and land resources. When livestock needs for both drinking and feed are taken account of, much greater benefits for rural development could potentially be achieved.

In the Eastern Hararghe zone of Oromia Region land is scarce[11], and finding a suitable

place for the different water facilities is challenging. This area is characterized by high population pressure and fragmented small plots of land. Negotiation of land use issues is hardly considered at the starting phase of water schemes and this may lead to failure of parts of the system, such as the cattle trough in Ganda-Galan that cannot be accessed for watering livestock. Another example is found in Werji-Jalela in the Goro-Gutu district, where a domestic water supply point with livestock trough was developed on a farmer's own land. The farmer started collecting the user fee for himself, as compensation for his land, and now decides when the water can be accessed.

Conclusion

Livestock watering is one of the most widespread productive uses of water in multi-purpose water supply systems in Ethiopia. At the same time, livestock may increase degradation of grazing lands threatening water resources. The impacts of improved water supply on livestock productivity may be high, and combined with watershed management measures that restrict free grazing, livestock management practices may be strongly affected.

Watershed measures such as exclosures change livestock feeding practices from free grazing to cut-and-carry systems, keeping the animals tethered. In turn, this increases the need for livestock drinking water near the homestead. At the same time, the government of Ethiopia strives for increasing the access to potable water supply within 1.5 km radius from people's residences. As communal water systems are usually equipped with cattle troughs, this may more than satisfy the demand and become another driver towards tethering livestock at the homestead. As the animals no longer have to travel long distances for drinking, livestock productivity may increase. However, this needs to be supported with improved fodder that requires high inputs, in particular labour and water. Farmers thus need to minimize the number of livestock and focus on keeping more productive ones, such as milk cows, small ruminants and oxen for fattening. In peri-urban areas with good and competitive markets, people have started keeping exotic and cross-bred dairy cows to have higher milk production, but this requires vast quantities of fodder and may not be viable for remote rural areas yet.

Multiple use water services, as an integrated water delivery approach that takes people's multiple water needs as a starting point, is well placed to integrate livestock needs into its planning, finance, provision and management of sustainable water services for domestic and productive uses. Most of the functioning multi-purpose schemes have livestock troughs because of the high demand and relatively low costs of construction. Those in areas with watershed measures may need to consider additional arrangements to accommodate changing livestock management practices, such as providing water and land for feed production. This might be integrated with services for irrigation and other productive uses. The experiences from Eastern Hararghe zone show that there is potential for communal multiple use schemes to address livestock water needs and thus deliver more benefits.

The MUStRAIN project

The goal of the MUStRAIN project is "to address the critical water problems in water scarce rural areas of Ethiopia by collaboration, implementation of innovative and alternative solutions and exchange of knowledge and mutual learning". Scalable approaches to water harvesting (RWH) and shallow groundwater development (Self-supply) for multiple use services (MUS) has been the focus.

MUStRAIN brings together the strengths and builds partnerships of a consortium of Dutch-based organisations (IRC International Water and Sanitation Centre, RAIN Foundation, Quest and Water Health) and Ethiopian partners and experts with complementary interests in the sustainable development of approaches to MUS. MUStRAIN is led by IRC and funded by the Partners for Water (PvW) programme.

MUStRAIN aims to promote uptake of Multiple Use Services in different contexts within Ethiopia, by documenting replicable water access/MUS models. In eight case studies cost-benefit relations are analysed, as well as opportunities and challenges for implementation.

The MUStRAIN case studies are:

1. MUS from sand rivers
2. MUS and Self Supply
3. Mechanized pumping and MUS
4. MUS and wastewater reuse:
    a. Ecological sanitation
    b. Greywater reuse
5. MUS and livestock
6. MUS and the Community Managed Project (CMP) approach
7. MUS and the WASH business case
8. MUS and manual drilling

The methodology for the current case study (5) included a review of relevant guidelines, manuals and other documentation on livestock and watershed management in Ethiopia. This has been studied in more details for the East Hararghe sub-region in Oromia region. In March 2013, multipurpose water systems have been visited in two districts, where watershed management approaches have been applied. These cases were analysed in terms of their potential to upscale livestock water more systematically.

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In collaboration with:

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