

Engaging communities towards restoring hillslope seep wetlands in the Tsitsa River catchment of South Africa

Notiswa Libala, Oghenekaro Nelson Odume^{*}, Carolyn G. Palmer^{*}

Institute for Water Research, Rhodes, University, P.O. Box 94, Grahamstown 6140, South Africa

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ABSTRACT

Considering the increase of wetland degradation globally, a need exists for an integrated approach that involves communities to collectively protect and sustain wetlands. In the Tsitsa River catchment, South Africa, hillslope seep wetlands are among the vulnerable wetland ecosystems with potential to trigger erosion in the landscape. This study engaged with livestock owners in communities to elicit information regarding their knowledge of hillslope seep wetlands, and their understanding of the importance of these wetlands. Using purposive sampling, researchers interviewed 31 livestock owners and analysed the data using thematic analysis. Results revealed that communities largely perceived hillslope seep wetlands as important ecosystems for their livelihoods. They recognized that the importance stems from services provided by these wetlands. Although the communities viewed hillslope seep wetlands as important ecosystems for livelihoods, however, they also perceived them as highly eroded ecosystems. Community members indicated willingness to strengthen local natural resource governance systems, which could lead to better management or restoration of hillslope seep wetlands. Protective strategies for hillslope seep suggested included fencing, active herding and rotational grazing. This study provides one example from South Africa demonstrating the importance of active involvement of local communities toward successful management of natural resources.

1. Introduction

Wetlands are among the most productive and functionally important ecosystems globally (Hu et al., 2017; Libala et al., 2019; Wood et al., 2013). They provide numerous benefits to local people, such as water collection for domestic use, medicinal plant collection, fishing, sedge and reed collection, and dry-season livestock grazing (Obiero et al., 2012; Adekola et al., 2012). Despite their importance, wetlands remain one of the most threatened ecosystems globally (Gardner et al., 2015; Hu et al., 2017). About half of the world's currently available wetlands have been lost or degraded (Drayer and Richter, 2016). Wetland degradation is attributed mainly to overgrazing, forestry, and invasion by alien plant species (Drayer and Richter, 2016). Most communal lands in South Africa are open-access systems for grazing, with little or no active livestock management. As a result, a lack of active management practices gives livestock uncontrolled access to wetlands, leading to degradation. The degraded status of wetlands affects not only livestock production, but also the well-being of people who both value and depend on livestock.

The current study focuses on hillslope seep wetlands, which are

vulnerable because of their relatively small size and steep slopes with shallow soils prone to erosion (Libala et al., 2019). Although research has largely overlooked these wetlands (Adekola et al., 2012), they pose serious impacts on landscape erosion. In the Tsitsa River Catchment of South Africa, livestock farming and subsistence crop production are the main economic activities for the majority of residents (van Tol et al., 2014). The catchment has a high level of erosion, and the duplex soils are geologically prone to erosion (Gwapedza et al., 2021). The Tsitsa Project focuses on the threats of erosion for the potential construction of dams downstream, as well as in securing local livelihoods. Erosion is triggered on slopes, and livestock are mediators of erosion in such a way that livestock trampling and grazing on these small wetlands may aggravate the situation, and entire hillslope seep wetlands may vanish into erosion gullies and extend to the entire landscape. The erosion of hillslope seep wetlands may also lead to a reduction of the ecosystem services that they provide. A study conducted by Mkabile (2019) in the neighbouring sub-catchment on cattle distribution patterns using Global Positioning System (GPS) collars showed that cattle prefer to graze in the following landscape domains: more gentle slopes (12 %); areas near

^{*} Corresponding authors.

E-mail addresses: notty.libala@gmail.com (N. Libala), n.odume@ru.ac.za (O.N. Odume), tally.palmer@ru.ac.za (C.G. Palmer).

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homesteads; in abandoned or seasonally cultivated lands; alongside the drainage lines in the so-called "meadows" adjacent to the very wet or regularly inundated riparian area; and in the lower slopes below seep lines. Although livestock did not spend much time on the slopes, [Mkabile \(2019\)](#) suggested that, when livestock are on the slopes, they spend more time on hillslope wetlands, and it is that small time that has a disproportional impact on hillslope seep integrity and triggers slope erosion. These hillslope seep wetlands provide ecosystem services such as fodder production during both the wet and dry seasons and are regarded as key resource areas. Degradation of hillslope seep wetlands is known to occur as a result of excessive erosion and subsequent invasion of *Acacia meamsii*.

Considering the value of livestock to people in the catchment and the recognition of hillslope seep wetlands as key seasonal resources, involving or mobilizing local people to protect or manage these particular vulnerable wetlands is important. Such an approach would maintain a focus on providing ecosystem services to people. The demand for using wetlands indicates that livestock and wetland issues have social, ecological, and economic consequences and thus addressing issues of the wetlands require a complex social-ecological systems approach ([Pollard et al., 2010](#); [Palmer and Munnik, 2018](#)). The complex social-ecological systems approach is crucial for tackling global challenges and acts as a foundation for sustainable development. It offers new opportunities to understand and manage critical feedback between people and nature, which could lead to better management of natural resources and human well-being ([Liu et al., 2007](#); [Ostrom, 2009](#); [Cockburn et al., 2018](#)). The social-ecological system approach in this study integrates four knowledge threads: a fundamental ecological understanding of (1) hillslope seep wetland ecological health; (2) the functional role of hillslope seep wetlands within a livestock grazing-grassland system; (3) a social-science based understanding of the ways livestock owners view the value of hillslope seep wetlands; and (4) ways of restoring degraded wetlands using local knowledge.

Over the past 50 years, debates have been active on the management of commons both locally and internationally. According to [Ostrom \(1990\)](#), communities can self-organize and develop rules that allow them to effectively manage common-pool resources while avoiding the "tragedy of the commons," as proposed by [Hardin in \(1968\)](#). [Slough et al. \(2021\)](#) suggest that effective governance institutions are essential to sustainably managing natural resources. Studies in South Africa ([Ainslie, 1999](#); [Bennett et al., 2010](#); [Vetter, 2013](#)) also argued that legitimate local institutions are needed to take ownership of resources and secure people's land rights in order to make management effective.

Emphasis has increased in recent years on the inclusion of multiple knowledge systems and perspectives globally, particularly local and indigenous knowledge systems of the marginalised, in biodiversity and landscape management and climate change adaptation ([Brand et al., 2021](#); [Schoon et al., 2021](#)). Issues still remain, however, of power dynamics, such as language barriers, scientific knowledge treated as superior ([Cockburn et al., 2020](#)), and trust ([Sillitoe, 2010](#)). [Williams et al. \(2020\)](#) also stressed that the value of indigenous and local knowledge in the management and governance of landscapes is often overlooked and undervalued. The current study uses transdisciplinary research by acknowledging the value of different forms of knowledge and emphasizing co-learning and collaboration as a means of co-creating knowledge.

This study engaged with livestock owners in communities within the Tsitsa River Catchment. In South Africa, wetlands are amongst the most affected natural ecosystems, their erosion and vulnerability affects many people and livelihoods. Despite numerous research projects and/or development interventions, no clearly successful process is available for restoring natural resources while ensuring thriving communities. One frequent omission in interventions is the involvement of the local community in the sustainability of the process. This study therefore elicited information regarding knowledge of the communities pertaining to hillslope seep wetlands and the importance of these wetlands as

systems for protection. As a further step, the study also collected data regarding the kinds of protection and restoration interventions that would be acceptable and supported by local residents, such as active livestock herding.

This paper therefore reports findings of the following main question addressed:

- What do people in the community feel can lead to better management and restoration of hillslope wetlands?

2. Study area description

The study was conducted in the Tsitsa river catchment, a tributary of the Umzimvubu River in the Eastern Cape, South Africa ([Fig. 1](#)). The catchment broadly comprises two distinct socio-cultural domains: the western areas, which are dominated by freehold title tenure; and the communal areas in the eastern sections ([Sigwela et al., 2017](#)). Combined land uses of commercial agriculture and plantation forestry characterizes the freehold title areas, whereas subsistence farming dominates the communal areas, including both livestock and crop production ([van Tol et al., 2014](#)). Commercial and subsistence farming, agriculture, and livestock grazing are the predominant anthropogenic land uses in the catchment, making up to 15% of the land cover. Plantations, forests, water bodies, and towns comprise 13% of the land use in the catchment.

Livestock production is the leading agricultural activity in catchment. Severe deterioration of ecosystems and wetlands might negatively affect livestock production, if not managed. (Most rural communities in the catchment rely on natural ecosystems, such as hillslope seep wetlands, for livelihoods and socio-cultural activities. The convergence of social ecological history – lack of natural resource management and highly erodible duplex soils—negatively reinforces feedback cycles to produce a particularly high degradation pressure on hillslope seep wetlands, however, and will pose serious consequences for livelihood and landscape ([Cockburn et al., 2018](#)). Traditional councils, comprising chiefs, headmen, and sub-headmen, govern the communal areas in the municipality. Councils co-operate with municipalities and democratically elected ward councillors ([Cockburn et al., 2018](#)).

3. Methodology

3.1. Research approach

3.1.1. Qualitative research approach

Qualitative research methods were developed in the social sciences to enable researchers to study social and cultural phenomena by observing feelings, thoughts, behaviours, and the beliefs of individuals and groups of people ([Babu, 2008](#)). Qualitative methods enable the exploration of phenomena using more flexible and semi-structured instruments, such as workshops, in-depth interviews, focus groups, and participant observations ([Mack et al., 2005](#)). [Creswell \(2007, p. 40\)](#) described qualitative research as a means to "empower individuals to share their stories, hear their voices, and minimise the power relationships that often exist between a researcher and the participants in a study." Qualitative methods, such as interviews, are provide a deeper understanding of social phenomena than would be obtained from purely quantitative methods ([Gill et al., 2008](#)).

This study employed a qualitative research design to explore the understanding and knowledge of rural people about the importance of hillslope seep wetlands, the contributions of hillslope seep wetlands to their livelihoods, and the need for their restoration. Because ecosystem services are the key components of the study, part of the questionnaire was about ecosystem services provided by hillslope seep wetlands. The questions included: provisioning, e.g., grass for livestock and water for domestic use; and cultural, e.g., recreational and spiritual. Although the main focus of the research design was qualitative, we also used quantitative analysis where necessary.

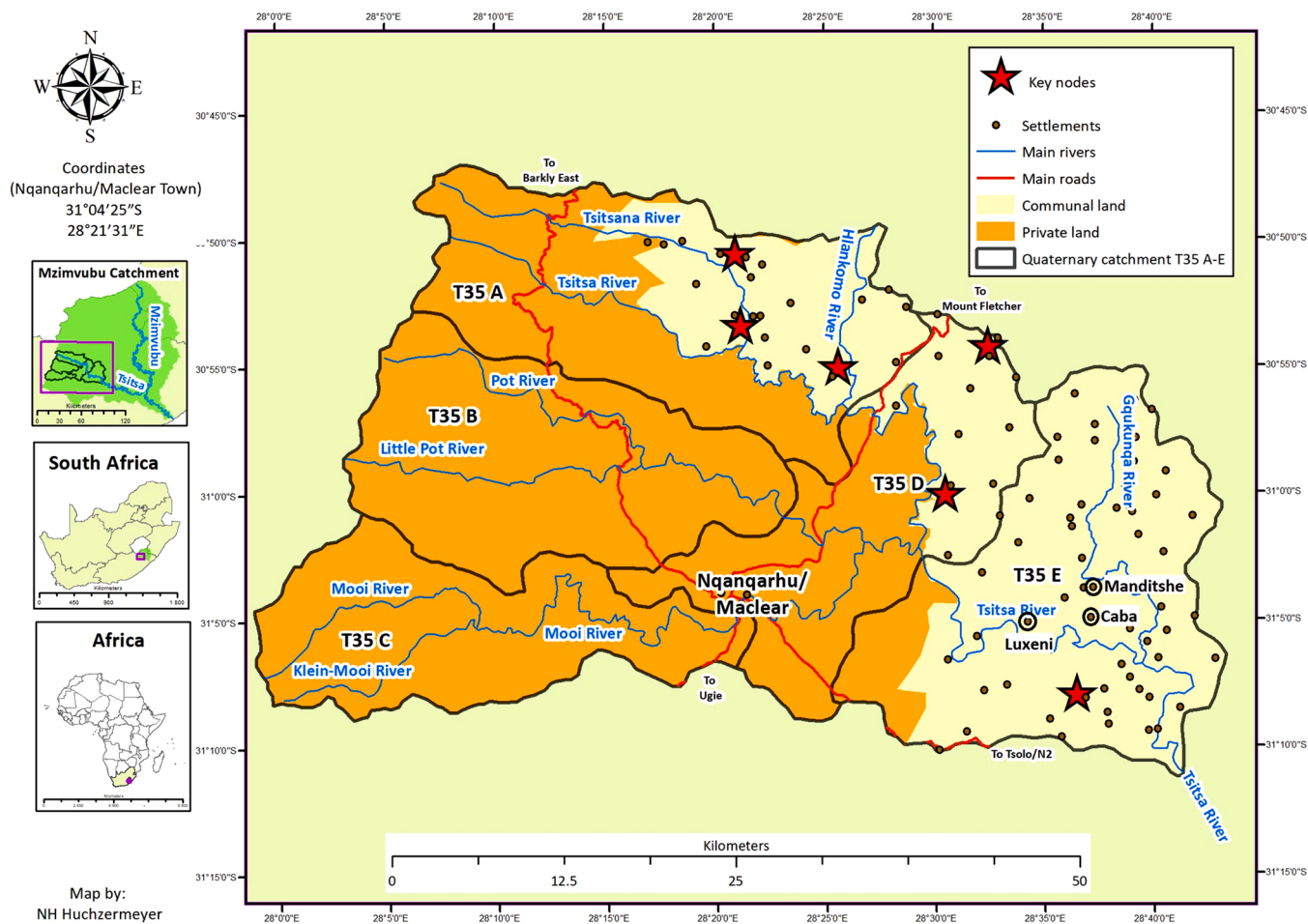


Fig. 1. The Tsitsa River catchment, Eastern Cape, South Africa.

3.2. Sampling method

3.2.1. Sampling strategy

All participants were purposively sampled from Caba, Luxeni, and Manditshe villages. Singleton et al. (1988) defined purposive sampling as an approach that comprises aspects that contain the most characteristic, representative, or typical attributes of the population. Purposive sampling is a non-probability strategy in which the investigator intentionally selects certain people in a study based on defined characteristics, who may be exposed to a particular phenomenon. In the context of this study, the participants were engaged because they were livestock owners, herders, or family members in households that own livestock.

3.3. Data collection

3.3.1. Participant selection

Of the 63 villages in the T35E quaternary catchment (Fig. 1), respondents were chosen from three purposively selected villages. They were the upper Caba, Manditshe, and Luxeni villages. The villages were chosen based on their proximity to hillslope seep wetlands. After a pre-selection in Google Earth of 49 households that fit the requirement of having a livestock kraal, 31 were finally included in the study following the owners' agreement.

Thirty-one "participants" were interviewed. A participant in the context of this study is one or more people who were in the household and participated in the interview (for example, a resident woman may have been assisted by a herder in answering some questions). Household

interviews were conducted to gather information on hillslope seep wetland benefits, their degradation status, livestock grazing, the importance of raising cattle and grazing practices.

3.3.2. Household interviews

Structured and semi-structured interviews comprised the methods for gathering data. In the study area, isiXhosa is the first language, so interviews were translated into isiXhosa. Semi-structured interviews were organized around a set of pre-determined open-ended questions, with other questions emerging from the dialogue between the interviewer and the respondent (Dicicco-Bloom and Crabtree, 2006).

3.3.3. Ethical considerations

Before data collection, traditional leaders were contacted to discuss and give clarity about the survey and make appointments for the interviews. Ethical clearance was obtained from the Rhodes University Ethics Committee, and the ethics clearance number is SCI2017/052. Consent details are curated by Rhodes university.

4. Data analysis

4.1. Descriptive statistics

Descriptive statistics enabled a first analysis and summary of the data from the interviews. These analyses focused on the frequencies and percentages of the importance and condition of seep wetlands, hillslope seep wetland protection and restoration, benefits of owning livestock, challenges of raising livestock and livestock feed.

4.2. Thematic analysis

Thematic analysis is a method that includes identifying reporting patterns (themes) within data and establishing a framework for presenting the meaning of the data collected (Creswell, 1998; Braun and Clarke, 2006). Thematic analysis enabled analysis of the semi-structured interviews. Themes that emerged in the whole or sub-set of interviews were identified to create a framework for making contrasts and comparisons between the different participants (Gomm, 2008). In this study, the thematic analysis was based on the six phases of thematic analysis developed by Braun and Clarke (2006). These phases were xxx, ?

5. Results

5.1. Demographic information

Of the 31 respondents interviewed, 80.1 % were heads of households and each had lived in their village for more than five years. A household usually included an adult man as a head of the family, and/or his wife, their children and other dependants. A wife or a widow is the head of the household in the absence of a husband. About 55 % of the respondents were male; female respondents comprised 45 %. The respondents' ages ranged from younger than 30 to older than 70 years of age. The majority of the respondents were more than 50 years of age (80.1 %). The youth were the least represented age group (16.1 %).

5.2. Livestock numbers

All respondents were willing to divulge their livestock numbers. Sheep numbered the highest, with 753, followed by goats (323) and cattle (286). Of the 286 cattle, about 49.3 % were cows, 25.5 % were oxen and 25.2 % were calves. Of 753 sheep, ewes comprised the highest percentage of 43.8 %, followed by lambs at 33.7 % and rams at 22.3 % (Table 1).

5.3. Themes and sub-themes

Results presented in this section highlight the perception of the people interviewed. The responses suggested the importance and benefits of hillslope seep wetlands, wetlands and rangeland degradation status, problems associated with hillslope seep wetlands, changes in grazing land quality, causes and impacts of these changes on livestock production, and hillslope seep protection and restoration. Eight main themes (Table 2) were identified as the key perceptions of participants.

5.3.1. The importance and condition of seep wetlands

Most participants (45 %) perceive hillslope seep wetlands as very important ecosystems for livestock grazing (Fig. 2), They reasoned that, in winter, seep wetlands assist in maintaining livestock grazing by providing fresh green grass that is not available in other ecosystems. These ecosystems are not only important for grazing, but the participants also recognised other ecosystem services provided by these wetlands, such as water for their livestock. Of the participants, 19.3% felt that hillslope seep wetlands were not important because livestock get stuck in the mud and die. If "very important" and "important" responses were combined as a category that says "yes," the overall percentage

Table 1
Total livestock numbers in the studied communities.

Livestock				Total
Cattle	Cows	Oxen	Calves	286
	141	73	72	
Sheep	Ewes	Rams	Lambs	753
	330	168	255	
Goats	-	-	-	323

Table 2
Themes and sub-themes.

Themes	Sub-themes
Hillslope seep wetlands	<ul style="list-style-type: none"> • Provision of fresh green grass and water (importance) • Seep wetland protection and restoration
Grazing management practices	<ul style="list-style-type: none"> • Camp division and fencing • Rotational grazing and resting • Employment of Eco- rangers
Climatic conditions	<ul style="list-style-type: none"> • Drought • Lack of rain
Grazing land problems	<ul style="list-style-type: none"> • Donga expansion and erosion • Unexpected fires • Wattle invasion • Livestock theft • Camp fence theft
Lack of institutional structure, enthusiasm for developing institutions and governmental factors	<ul style="list-style-type: none"> • No rules in the community • Uncontrolled livestock grazing • Only people with herders have rules • Community structures are needed for community development • Structures can help people communicate better with government • Communication with Traditional leaders and animal health technicians when livestock are sick.
Benefits of owning livestock	<ul style="list-style-type: none"> • Community lack trust in government • Income • Food • Wealth status • Ritual • Other
Challenges in raising livestock	<ul style="list-style-type: none"> • Grazing and feeding • Water scarcity • Animal diseases • Drought

would be 64.5 %, whereas "probably" and "unimportant" as a "no" category gave an overall result of 35.4 %. Some explanations with respect to the importance of the wetlands included the following:

“Seep wetlands are the only place with fresh grass. We don't have any choice; we are forced to take livestock up there during dry season.”

“Seep wetlands are very important because when livestock come home from seep wetlands they come back full in their stomach because the grass that is there is soft and fresh.”

“Seep wetlands are important because they always have water so when livestock done grazing they drink water without going far looking for water.”

Although hillslope seep wetlands were perceived as important ecosystems for livestock grazing, a consensus emerged among the participants that the majority of the seep wetlands are degraded, some with dongas that are dangerous to livestock. The participants further indicated that seep wetlands with dongas represent traps for livestock into which they easily fall, which may lead to death. About 54 % of the participants indicated that hillslope seep wetlands are highly eroded. Forty percent felt that seep wetlands are moderately eroded, whereas only 6% mentioned less eroded (Fig. 3). Livestock getting stuck in mud was mentioned several times as a problem. Typical responses included the following:

“Cattle go to seep wetlands because they are attracted by the green grass, but most of these seep wetlands are degraded and there is dongas in the seeps, they are dangerous because cattle fall and sometimes no one is close by to help the cattle.”

“They sometimes graze more on seep wetlands to the extent that there is no grass covering surface that's when they get stuck in the mud.”

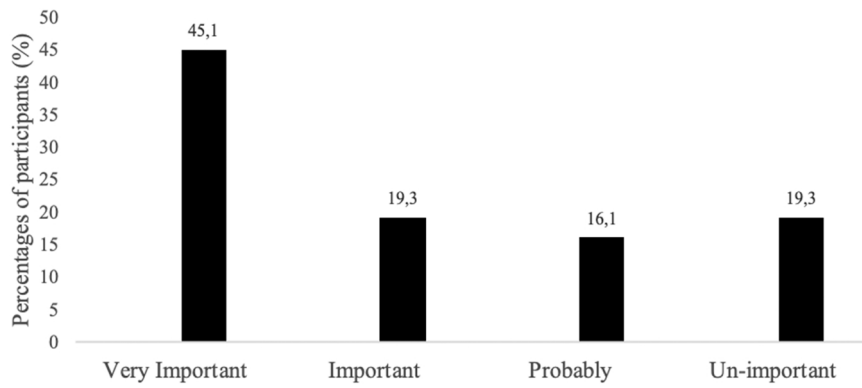


Fig. 2. Percent of participants indicating the importance of hillslope seep wetlands for livestock grazing.

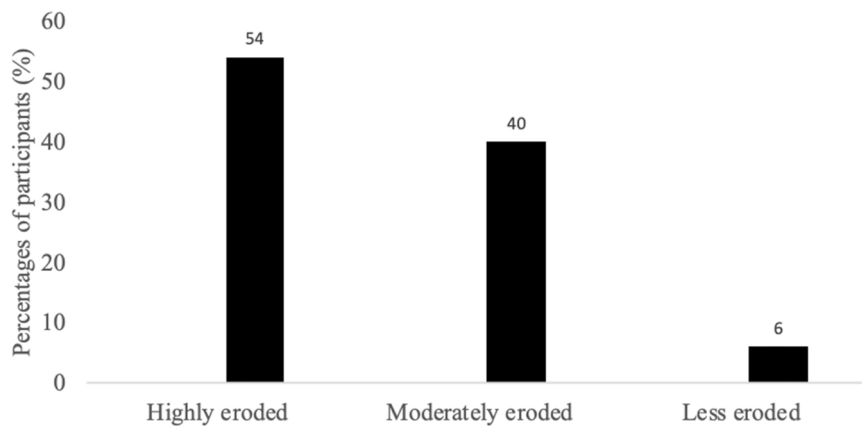


Fig. 3. Percent of participants indicating the ecological condition of hillslope seep wetlands for livestock grazing.

“We use to have this seep as you can see it was big but we have lost it now, it is a gully.”

5.3.2. Hillslope seep wetland protection and restoration

With regard to the protection and restoration of hillslope seep wetlands, the majority of participants (81%) suggested fencing as a better way of protecting seep wetlands (Fig. 4), whereas 13% suggested gabion construction for those wetlands with dongas or gullies. Some participants suggested avoiding overgrazing and trampling by livestock and

dividing camps for rotational grazing as strategies for wetland restoration. All of these strategies are achievable by employing herders and eco-rangers to look after the livestock. Responses included the following:

“Livestock have open access to these seep wetlands since they are not protected.”

“We need to divide camps like commercial famers, what they do is to divide camps and put livestock in other camps and rest others.”

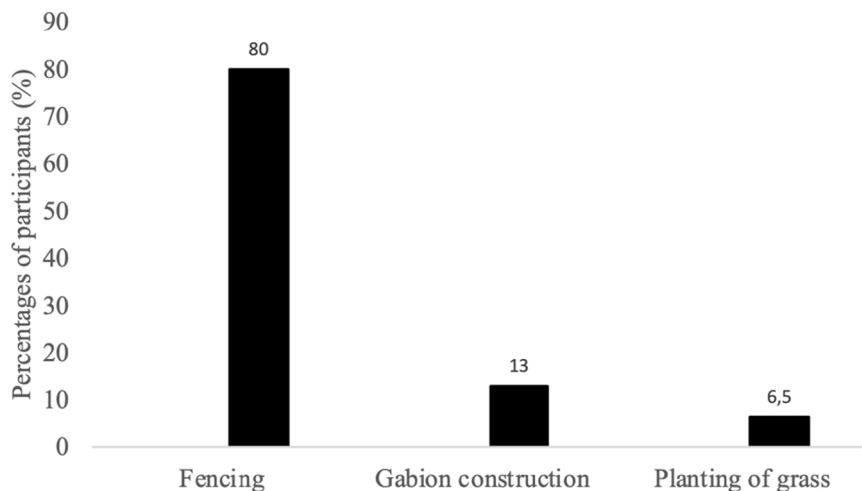


Fig. 4. Percent of participants indicating possible ways to protect erosion in seep wetlands.

“Protection of grassland is better by fencing, so that we get enough grass for livestock.”

“If we protect the seep wetlands it means they will produce more grass for our livestock and that we will also protect them from grazing too much and trampling, since they will not spend too much time on seeps.”

5.3.3. Grazing management practices

Lack of grazing management practices in the studied communities emerged as the perceived cause of changes in grassland conditions. A number of participants perceived that, currently, no grazing management practices exist. When comparing the current situation with previous years, participants were not happy with the current condition of the grazing landscape. Participants recalled that, in times past, eco-rangers employed by the government were available to look after grazing lands. They recalled that, at that time, they had fenced grazing camps that were divided into dry and wet season camps. The camps were divided for rotational and resting purposes. During that time, the condition of the grassland was good, with a corresponding good condition of livestock. Responses included the following:

“Our cattle go and graze anywhere around catchment.”

“Long time ago when I was young we had rules, where we had one camp closed and one open, we usually use the one open for grazing for a particular season, and rest the other piece, but now we don't have any rules.”

“It used to be there long time ago, where we use to open one camp and rest the other, and rangers were looking after these but the trust disappeared now.”

5.3.4. Climatic conditions

The majority of participants mentioned climatic characteristics, including drought and changing rainfall patterns, as factors that contribute to grassland degradation. Participants from the studied areas reported that, over the past two years, changes in rainfall patterns have affected the condition of the grassland. Responses included the following:

“This area is not the same, there is drought; we don't have grass this year at all.”

“Last year we had no rain, it usually rains in summer but it is not; hey our cattle were hungry and thin, just like now there is no rain, no grass.”

5.3.5. Grazing land problems

Donga expansion and erosion, fires, wattle invasion, theft of fenced camps in the past, and livestock overgrazing emerged as the main grazing land problems that communities faced. Donga expansion and erosion were perceived as the biggest challenges in these communities. The challenges were attributed to the absence of controlled grazing practices and seep wetlands that extended the degradation to the landscape. A participant from Caba village observed that the erosion in the community is caused by livestock coming from neighbouring communities. The majority of the participants mentioned wattle invasion as the problem that destroys grass. Participants also indicated that criminals hide within the wattle forest, escalating livestock theft. Some participants recognised that livestock theft is linked to the absence of camps and the fact that livestock graze far away from home. In addition, participants shared their concern about unexpected fires, mostly connected to drunken people with a tendency to throw out live cigarettes. Some participants felt that fires are not caused by the people in their community but by people in other communities. Responses included the following:

“These dongas are expanding every year.”

“We get fires out of nowhere.”

“Wattle is invading the whole grassland, you see this area, and we used to have our grazing land clean without wattle, but look at it now.”

“The main problem is that our livestock graze up close to that forest up there and now they get stolen.”

5.3.6. Lack of institutional structure, enthusiasm for developing institutions and governmental factors

Participants indicated that no generally accepted livestock management rules exist in the communities. This lack of livestock management rules has contributed to many of the challenges, including stock and fence theft, veld fires, and landscape degradation. Some participants mentioned that only people with herders have rules, and this has helped to reduce stock theft, because herders stay with livestock in the veld. Participants mentioned that people do whatever they want because they are not held accountable for their actions, which was also linked to the unexpected fires. Responses included the following:

“We do our things separately, the way we want, sometimes we call the meetings but no one will come, sometimes people do wrong things and not being responsible because no one will ask why they do such things.”

“Our seep wetlands (intlambo) are degraded because there is no structure in our community.”

When participants were asked about joining organisational structures like a forum that could help them communicate with the government about land and water issues, the majority of the participants were willing to join a catchment management forum/network for various reasons. Some perceived that a forum would be good for community development in order to decide on some rules that are not currently in place. They also mentioned that a forum might help to improve their lives. Some participants recognised that communication was lacking between them and the government. They therefore saw the community management forum as an opportunity to bridge the communication gap. Responses included the following:

“I was going to join if I was a young person because I like to see development in our community.”

“I would join because I saw the benefit from the one we had, we were getting money from the sheep wool.”

“I would join because in rural areas we really need help and our government is far away from us, there is a big difference between people in town and us here.”

Consensus also emerged among the participants that they do communicate and discuss their grazing land and livestock issues. The majority of the participants noted that they have contact details for their animal health technicians in Qumbu, a nearby town. Some mentioned that, when livestock are sick, they quickly call the animal health technicians. Some, especially women who have less understanding of livestock, mentioned that they communicate with other community members and traditional leaders. Responses included the following:

“Yes, we do get some advices from each other as the community to the extent that when our livestock get sick, we call “abalimi” to come and vaccinate the livestock.”

“Yes, I do talk with my neighbours because I am a female, I seek advice from male for example when my cattle is too thin, I ask what can I do for it to gain weight and they give some advices.”

Although participants acknowledged the provision of government veterinary services, they also expressed general concerns regarding these services. The issues included, for example, a dwindling trust between the community and the government. Participants further indicated that government officials only listen to people in towns, paying

little attention to rural dwellers. Some participants mentioned that only the government could assist with resources so that the grazing land could return to its original state.

“If only our government can be reliable and bring services to us, because our government takes time to give us attention in rural areas.”

“In rural areas we really need help and our government is far away from us; there is a big difference between people in town and us here.”

5.3.7. Benefits of owning livestock

In the communities studied, livestock are primarily raised for ritual (39%), generating income (32%), and food production (30%), which includes both milk and meat. About 87% of the participants mentioned that wealth status was the least important benefit for raising livestock (Fig. 5).

5.3.8. Challenges of raising livestock

Lack of grass for grazing, animal disease, and drought were ranked equally (29 %) (i.e., Fig. 6) as the primary challenges mentioned by participants in raising livestock. Water scarcity was listed as the least important challenge in raising livestock in the catchment (Fig. 6), but 71% of the participants mentioned livestock theft as the main challenge faced by the community in the category "other".

5.3.9. Livestock feed

Approximately 55 % of the participants reported that their livestock depend exclusively on grazing for feed. The remaining 45 % mentioned that, with the current situation of inadequate grass, especially in winter, and the drought, they are currently forced to supplement with ruminant feed, salt bran (ikhafu), lucerne, maize, and molasses meal (Fig. 7).

6. Discussion

6.1. The importance and condition of hillslope seep wetland

In the current study, the results revealed that communities largely perceive hillslope seep wetlands as important ecosystems for their livelihoods. They recognise that the importance stems from the services provided by the wetlands, particularly for livestock grazing during the dry season. The results of this study are consistent with those of Pollard and Cousins (2008), who reported that more than 70 % of the Craigieburn village people depend on wetlands for their livelihoods in Mpumalanga province of South Africa. Other studies that have reported the importance of wetlands for livelihoods include Kotze et al. (2008) and Drayer and Richter (2016). Although hillslope seep wetlands are viewed as important ecosystems for livelihoods, however, the communities also

perceive these wetlands as highly eroded. Considering the dependence of local people on livestock and the potential vulnerability of the wetlands in the event of disturbances, it is clear that, if they are not well managed, they could negatively impact the entire landscape, where livestock depends, with serious social-economic consequences for people and their livelihoods. It is therefore important to protect hillslope seep wetlands for the benefit of the local people of the Tsitsa River Catchment whose livelihoods depend on livestock.

Due to the growing awareness of their importance (Dini, 2004), South Africa has embarked on rehabilitating and protecting degraded wetlands. The South African rehabilitation system has mainly excluded local communities from decision-making, however, and this has contributed to the lack of sustainability of such projects. The inclusion of social or local involvement in the ecological work is crucial in rural projects because it allows community members to participate and take responsibility for sustaining and managing their natural resources (Pollard et al., 2010). Because of the complexity of the hillslope seep wetlands, this study used a holistic complex social-ecological systems approach to understand the complexity of hillslope seep wetlands. It allows communities and other related stakeholders to participate in improving the condition or protection and restoration of the hillslope seep wetland.

The separate roles of the ecological and social processes in natural resource management are relatively well known, but very little attention has been paid to integration so that both processes are concurrently taken into account in natural resource management strategies and plans. Therefore, this study used an integration of social and ecological components in a social-ecological systems framework to assess the condition of hillslope seep wetlands. The integration of the social and ecological components provides a better understanding of the system involving people and natural resources than focusing only on the effect of people on the environment. This integrative research approach combines local and scientific knowledge on wetland management. It can lead to the development of strategies for increased productivity and improved livelihoods in hillslope seep wetland. A study conducted by Libala et al., 2019 in the same catchment using an ecological approach acknowledged the degradation of hillslope seep wetlands.

6.2. Governance improvements and management of livestock for better management and restoration of hillslope wetlands

Strong natural resource governance institutions, particularly at the community level, are critical for sustainable management of natural resources, including hillslope seep wetlands. In South Africa, catchment management forums (CMFs) are envisaged as non-statutory bodies for democratising inclusive decision-making regarding natural resources (Munnik et al., 2016). In areas where such forums are functional,



Fig. 5. Benefits of owning livestock ranked in order of importance from very important (1) to least important (4) by household respondents.

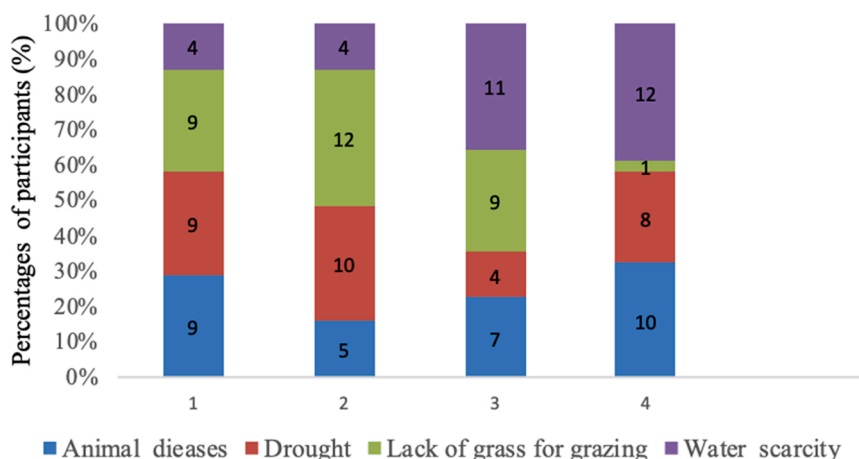


Fig. 6. Challenges faced by communities in raising livestock from very important (1) to least important (4).

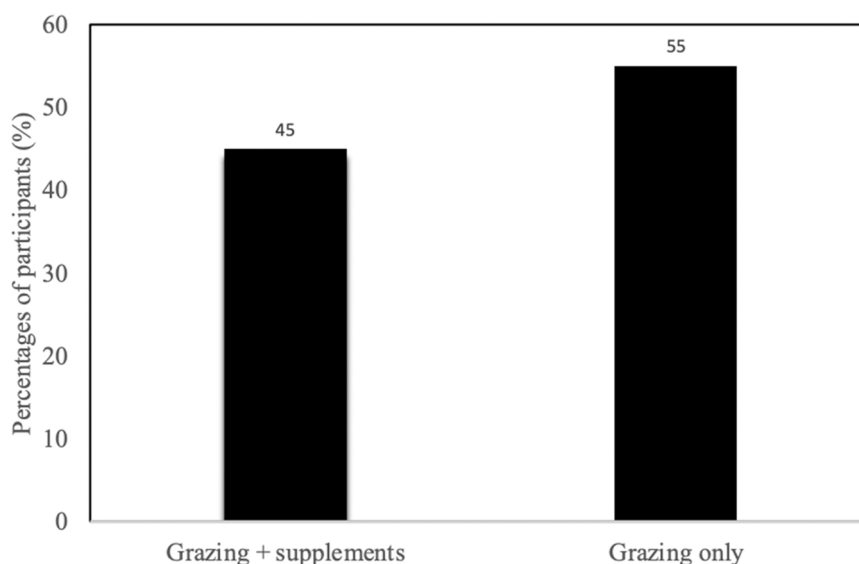


Fig. 7. Participants' use of livestock grazing and supplements.

evidence exists that natural resources are better supported as people collectively hold each other to account for the common good. In this study, the results indicate participants' willingness to join a governance structure if and when one comes into existence. Such willingness suggests the enthusiasm of community members to strengthen local natural resource governance, which could lead to better management of hillslope seep wetlands, so increasing the potential resilience of these systems to disturbances. Many studies have also recognised the importance of community involvement in natural resource management, such as wetlands, through the formation of local institutions and utilisation of local knowledge to improve management of natural resources (Pollard et al., 2010; Shrestha, 2013; Dixon and Carrie, 2015; Lamsal et al., 2015). Therefore, establishment of a structure in the study area, with a full participation of local communities, could help address the concern about rural people feeling excluded from natural resource management, as well as improve governance in wetland management.

Most rural communities in South Africa still use open access to communal grazing lands with no grazing management rules (Fraser, 2004) This approach poses a serious negative threat to natural resources, especially hillslope seep wetlands, which are vulnerable to disturbances. A holistic management approach is required to ensure sustainable use of these natural resources. Several grazing management practices are available to minimise erosion of natural resources, and many of these

require the cooperation of governments and communities. In the current study, the results reveal the lack of grazing management practices as a contributing factor to the degradation of hillslope seep wetlands and grazing land. Communities suggested fencing as a solution. They have experienced theft of fence materials, however, in the past. They believe that active herding, grazing by-laws enforced by fencing, rotational, seasonal grazing and employment of eco-rangers could contribute to restoration of hillslope seep wetlands. Eco-rangers are hired to provide landscape management support, whereas herders are hired to look after livestock. A study conducted by Wang et al. (2014) comparing fenced conservation and grazed wetlands with similar environmental conditions also found that livestock grazing and trampling increased soil compaction in the grazed wetland more significantly than in the fenced wetland, leading to the degradation of the grazed wetland sites. In Australia, the Queensland Wetlands Programme lists overgrazing and trampling as impacts of poor wetland ecosystem management (Reference). Overgrazing can shift the vegetation community, reducing ground cover, creating bare areas and increasing erosion. Managing wetland areas as a separate paddock would allow the wetland pastures to be used as a drought or dry season resource (Wegscheidl and Layden, 2011). Wegscheidl and Layden (2011) demonstrated that fencing wetland areas as discrete paddocks and grazing smaller wetland paddocks for short periods (rotational grazing) reduces overgrazing, allows

wetland plants to recover, and promotes evenness of grazing pressure in adjoining terrestrial pastures. Similarly, in the current study area, fencing or active herding, with the support of government and community members, could contribute to hillslope seep wetland resilience, the improved condition of hillslope seeps, better livestock production, and, in turn, better livelihoods.

Weak institutional structures and lack of grazing management rules are clearly linked, and one way to connect them would be by drawing on some of the basic ideas of common property theory. This approach suggests that, what separates a common property regime from an open access situation is that the former specifies a defined resource, a defined user group that accesses the resource, and a set of institutional arrangements that set out how the resource is managed. For the Eastern Cape, Bennett et al. (2010) have suggested that, for example, one of the main problems in trying to implement grazing arrangements is inadequate institutional structures as the locus for defining boundaries and grazing management rules.

6.3. Livestock importance and challenges

Several researchers have reported that generating income and the importance of ritual (Bettencourt et al., 2013; Magangana et al., 2015; Mhlobo, 2016) are primary reasons for raising livestock. This is particularly true for poor rural communities with a high rate of poverty and unemployment and a high affinity for traditional practices. In the Tsitsa River Catchment, livestock species play very important economic and socio-cultural roles in the well-being of rural households. The results of this study reveal that livestock in these communities are primarily important for income generation and rituals. Taking into account rural poverty and unemployment, the findings of this study suggest that policymakers and natural resource managers should protect and manage hillslope seep wetlands in order to preserve deeply held traditions and rituals and provide an income for the people. The rituals include traditional ceremonies like circumcision, the bride's welcoming "Utsiki", and the first ceremony when the new baby is born, "imbeleko." With the help of the uMzimvubu Catchment Partnership Programme, the South African government has cleared alien invasives and, with the rural communities, is practising rotational grazing through eco-rangers with the help of the programme. The land restoration has improved livestock production and increased the prices livestock sell at auctions, thus having a positive impact on the rural economy (Environmental Rural Solution, 2011).

7. Conclusion

Results of this study permit insights regarding the main question addressed in this paper: What do people in the community feel can lead to better management and restoration of hillslope wetlands? From the results, it is evident that local people are aware of the degradation status of wetlands. They have clear ideas that could contribute to the restoration of wetlands, including rules governing grazing use and enforcing them through fencing, rotational and seasonal grazing, with eco-rangers.

These findings suggest that developing participatory governance institutions that might balance the ecological condition of hillslope seep wetlands with human needs in the Tsitsa River Catchment will require the active participation of different stakeholders. They include the government, research institutions, municipalities, non-governmental organization NGOs, traditional authorities, and local people. Currently, the Tsitsa project has employed two eco-rangers to provide support for grazing management. The lessons from the uMzimvubu Catchment Partnership Programme 4 approach in Matatiele (Reference) also have potential for development in the study area. Potential exists, therefore, for the community to take control of the situation, possibly assisted by the uMzimvubu Catchment Partnership Programme. In the absence of fencing, co-management between communities represented

by institutional structures is a way forward to coordinate grazing and restoring hillslope seep wetlands.

This study provides one example demonstrating the utility of local knowledge in environmental restoration. In this case, such knowledge was clear about the hillslope seep wetlands, the degradation state, and the ecosystem services they provide. Excluding this knowledge base from sustaining or restoring hillslope seep wetlands can lead to further degradation of wetlands and, in turn, no management.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The datasets generated during and/or analysed during the current study will be publicly available.

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