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Perceptions of Smallholder Farmers towards ban on Livestock Grazing in the Mount Kenya West Protected Forest, Kenya

By

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Abstract

Participatory Forest Management (PFM) ensures that protected forests meet local development needs, especially supporting the rural poor without compromising the long-term persistence of forests. This requires data on perceptions and attitudes towards forest protection strategies, alternative livelihoods and implications on coping with restrictions implemented towards forest recovery. This research conducted in Mount Kenya West protected forests, analyzed smallholder farmers' perceptions towards a forest ban on livestock grazing, and further examined coping mechanisms in response to forest bans. Interviews with a sample of 234 smallholder farmers in Chehe, Hombe and Kahurura forest blocks were conducted and data was transcribed then translated into English. Both deductive and inductive coding were used for analysis. Five themes emerged, with the most frequently mentioned theme as the reduction on land available for livestock keeping. Others included reduced family cash flows, disruptions of income for paying fees for children, coping strategies and seeking alternative sources of pasture without reducing cattle numbers. Coping strategies highlighted two segments of the population; those who had the ability to cope with restrictions to forest access for livestock grazing and those who would be vulnerable to such policy actions. Sustainability of livelihoods is thus a major consideration in any intervention measures.

Key words: Mountain communities, livelihoods, livestock grazing ban, protected forests, perceptions, Kenya

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1.0 Introduction and background

Kenya became a British Protectorate in 1895 and remained colonized until 1963. Before colonialism, forests were managed by indigenous communities (Matiku, Caleb & Callistus, 2013). During the colonial period, the Colonial Forestry Department, established in 1902, displaced the traditional African production systems and focused on developing suitable legislation for a National Forest Reservation Policy (Bosire et al., 2003). After independence, the government upheld most of the legislative framework regarding forests, including the centralized forest management structure. According to the sessional paper number 1 of 1968, the Forest Department managed forests without consultation outside the relevant government ministry. Conflicts increased in the late 1980s between forest dependent communities and the Forest Department (Ongugo and Njuguna 2004). In 1994, the forest master plan was prepared, leading to the establishment of the forest Act (2005) that embraced the concept of Participatory Forest Management. The first batch of Participatory Forest Management Plans (PFMPs) was prepared in 2008 and since then, the number of Community Forest Associations has continued to increase, now at 325.

CFAs have shaped livelihood strategies of forest-fridge communities. In Nyeri County (where the study was conducted), for instance, the number of CFAs increased from 3 to 13 between 2007 and 2019; with 7 in Mt Kenya West (Kahururа, Gathiuru, Narumoru, Kabaru, Hombe, Ragati and Chehe) and 6 in the Aberdare ecosystem (Zuti, Muringato, Zaina, Kiandongoro, Kabage and Embaringo). Forest dependence has grown rapidly following the development of forest management plans and signing of 5-year Joint Forest Management Agreements (JFMA) between CFAs and KFS. This approach has helped forest user-groups to focus intensively on user rights associated with utilization and collection of various forest resources.

The Hombe forest block has 23 user-groups, Chehe 18 and Kahurura 21, with each of these having about 80 members. KFS has power to withdraw particular user-rights when the CFA breaches any forest products utilization terms including effecting bans without consulting the CFAs or user-groups (such as the existing one on firewood collection ban effected in 2017). The different forest user-groups (regulated by an umbrella CFA) have constitutions that guide the level of member engagement based on the Forest Act, (2016). The user-groups regulate resource harvesting and ensure that members pay for forest resources. KFS rangers enforce compliance by ensuring the production of evidence of payment for forest product use.

Some scholars contend that PFM promotes the local ownership needed to maintain ecological integrity and that its implementation enhances conservation of protected forests (Matiku et al. (2013). Ogada (2012), for instance, emphasizes that by embracing decentralization of forest management activities, FPM can accelerate Kenya's efforts to increase forest cover. Other scholars and practitioners, however, warn that there are high

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possibilities of community overdependence on forests due to poverty and poor forest governance structures.

2.0 Statement of the Problem

Mount Kenya is one of the most severely threatened mountain ecosystems in Kenya. Kenya's Government policy allows communities living adjacent to protected forests access to, and utilization of a variety of non-timber forest resources has continued to attract conflicts between environmental conservation agencies and communities. For environmentalists, allowing livestock grazing further exacerbates vulnerability of forest cover to degradation. Previous scholars have also investigated attitudes by farmers and professionals towards bans on livestock grazing in protected ecosystems. However, there is limited research on smallholder farmers' attitudes towards stringent policies banning access to livestock grazing in the protected forest, particularly regarding how such policy actions would affect livelihoods, and also how communities would cope with the ban and its subsequent implications.

3.0 Forest restriction management policies and implications on rural livelihoods

Imposing of bans when forest overutilization threatens ecosystem health is of the strategies used by governments to regulate forest access towards forest conservation. However, such restrictions on cattle grazing in protected forests can have profound impacts on livelihoods of forest-adjacent communities such as changing livestock compositions and husbandry practices. For instance, Gurung et al. (2009) focused on the impact of restricting cattle grazing in protected forests on livestock composition and husbandly practices in Nepal and noted that most households resulted to zero-grazing following the grazing ban. Although the increased adoption of zero-grazing units reduced grazing pressure and increased forest cover, it consequently raised demand for fodder and changed livestock rearing practices from transhumance grazing to stall-feeding. Communities also reduced livestock number, changed livestock composition and reduced the number of large ruminants.

Mullan et al. (2009) evaluated the impacts of a logging ban program in water sheds and natural forests on rural household livelihoods in China and reported that the poor felt that bans had infringed on their rights to forest access. Similarly, Suominen et al. (2010) focused on the impacts of enforcements of forestry laws and the regulation livelihoods of forest-adjacent communities in Ghana, observing that strengthening and enforcement of forest laws mostly affected poorer groups than the wealthier ones. Other studies reaching similar conclusions include Venkatesh et al. (2020) (in South India), Madegowda & Rao (2013) (in India) and Cao et al. (2010) (in China).

4.0 Livestock grazing ban in the Mt Kenya West Protected Forest

In 1986, mismanagement and failure by the communities to establish new plantations led to a presidential decree banning of the *shamba* system and livestock grazing in protected forests in Mount Kenya. In 1987, all forest residents were evicted from the forest since livestock grazing was blamed for the destruction of tree seedlings in nurseries, affecting afforestation efforts. In 2003, the Ministry of Environment and Natural Resources banned livestock grazing and non-residential cultivation following unregulated livestock grazing in the protected forests. In 2010, the National Environment Management Authority (NEMA), through the Ministry of Environment, banned livestock grazing in protected forests in Mt.

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Kenya West owing to uncontrolled grazing, lack of defined livestock carrying capacity and failure by KFS to conduct environmental impact assessment before logging, among other reasons. The coming decades are likely to see forest ban becoming more prevalent due to multiple stresses in the Mount Kenya ecosystem through overdependence on forests, including livestock grazing.

5.0 Research Questions

The study sought to analyze smallholder famers' perceptions towards forest protection strategies, alternative livelihoods and implications on coping with restrictions implemented towards forest recovery. The research questions were:

i. What are your perceptions towards a ban on livestock grazing in the protected forests?
ii. How would your household cope with a ban on livestock grazing in the protected forests?

5.1 Analytic framework

The sustainable livelihood framework, which provides insights to understanding the links between sustainable forest management, community conservation attitudes and sustainable livelihoods, was used. A livelihood is sustainable when it can cope with and recover from stresses and shocks and progressively maintain or enhance its capabilities and assets without undermining natural resource bases. Acquisition of more assets empowers communities to influence the next component of the framework, the structures and processes that affect them.

6.0 Methods

6.1 Data collection and transcription

There were 234 respondents who were interviewed; 66 (Chehe), 54 (Hombe), and 114 (Kahurura). Participant's responses to each of the two questions were recorded verbatim in the Kikuyu language and mapped on a standard data transcription grid. The grid ensured a consistent manner of recording responses for each question asked across the three forest blocks. Participants were assigned pseudo-codes to enhance anonymity of data and to reduce the chances of mixing them up during the analysis process (Kvale, 1994). After transcription, translation into English was done, ensuring due diligence so that the translated work did not mute the respondent's voice in any manner but maintained the opinions of the participants (Austin & Sutton, 2014).

6.2 Overview of the Study area

The study site comprised three protected forest blocks, namely, Hombe, Chehe and Kahurura, which are protected under Kenya's Forest Act (2005) and are managed by KFS. Choice of the three forest blocks was informed by the fact that they were the initial blocks in the region to embrace and implement the concept of Participatory Forest Management.

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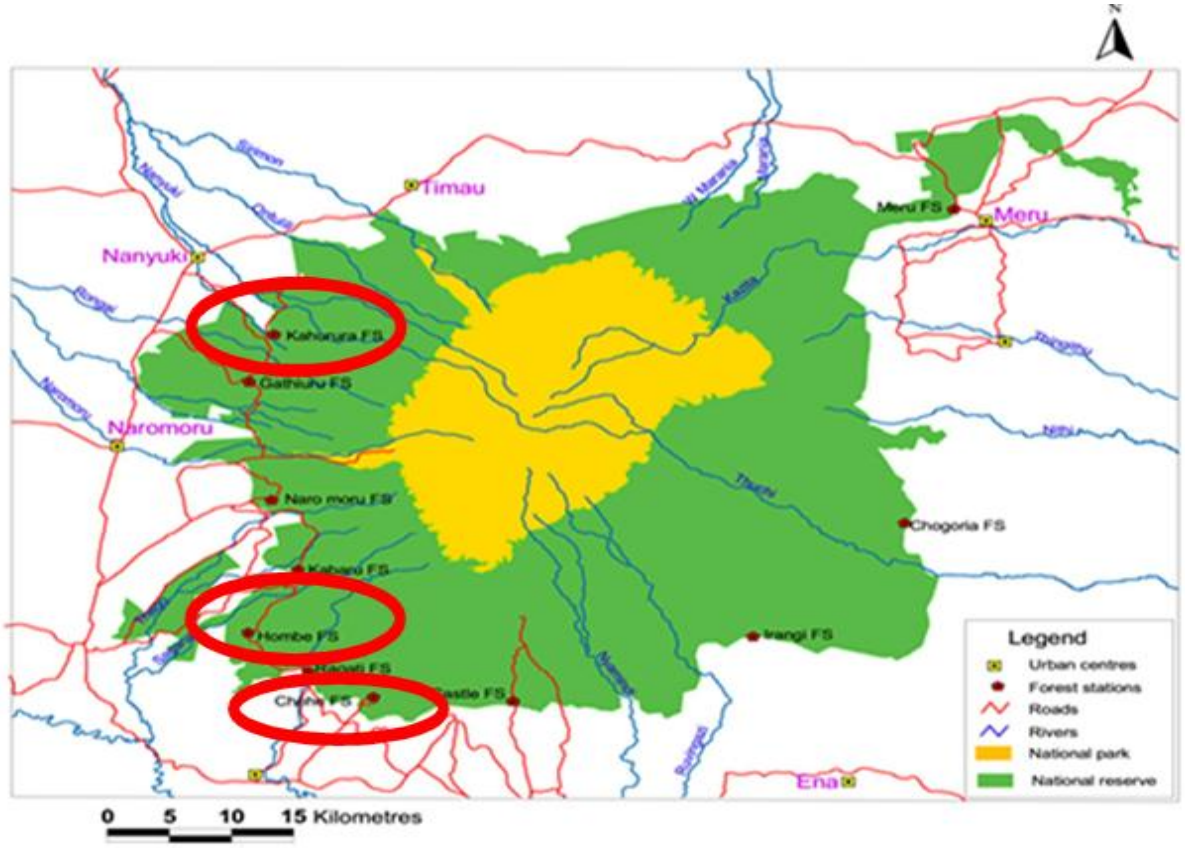


FIGURE 1: AREA OF STUDY:
Source: Courtesy of Kenya Forest Working Group, East African Wildlife Society, (2014)

6.3 Data Analysis

The translated English scripts were analyzed using the content analysis method. The study identified categories and frequencies within the data and further sought for descriptions to support the identified categories. The unit of analysis was the participants, each with a short story on what they thought would be the impact on their household following a cattle grazing ban in the protected forest, as well as the measures they would take to mitigate such impact on their household. A total of 41 stories weighted across the sample strata were used for initial categories. These stories were chosen using systematic random sampling. For each sample strata two to three extreme and negative cases were added.

Two coding cycles were used; first, identifying initial categories, then uploading them in an excel spread sheet and adding more codes in the process of coding and secondly, combining the codes generated in the first cycle to identify categories. According to Malvini et al. (2013), the first cycle helps to describe the data and the second one to organize the codes into categories. The codes, categories and coding procedures were peer-reviewed and discussed in detail to enhance credibility. In developing categories, Strauss and Corbin's (1998) method of constant comparison, where codes and incidences are compared, was used. In the first coding cycle, the inductive coding method was used; while in the second coding cycle, a deductive coding derived from the sustainable livelihood framework was used to group the codes into categories. A high level of reliability and validity focusing on

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consistency, repeatability and stability of the participant's responses and the researcher's ability to collect and record information accurately was ensured.

7.0 Results

7.1 Description of socio-economic Characteristics of the Sample

Table 1 below presents summary statistics of the smallholder farmers who participated in the study. It shows that the age ranged between 20 and above 61 years with majority being aged 41 and 60 years, (60.3%), while those above 61 years were at 22.6%. This implies that majority of the farmers were advanced in age. Less than 18% of farmers were aged 40 and below. In terms of sex, there were more males (56%) compared to females (44%) while with regards to education level, majority of farmers (52.6%) had completed primary education, but did not proceed further, 38.9% had secondary education and 8.5% had post-secondary education.

Table 1: Demographic Information of Respondents

Demographic Characteristic	Frequency	Percent
Age (years)		
20 – 30	4	1.7%
31 – 40	36	15.4%
41 – 60	141	60.3%
61 & above	53	22.6%
Sex		
Male	131	56.0%
Female	103	44.0%
Highest Education Level		
Primary	123	52.6%
Secondary	91	38.9%
Post-secondary	20	8.5%

Source: Author Survey Data (2019)

Sources of income by forest block

An analysis of farmers' income sources was done and actual monthly income amounts reported in Kenyan currency (Ksh). Out of the 234 respondents, 219 mentioned that they got income from sale of milk, 84 from selling cash crops like tea and coffee, 84 from table-banking, 75 from sale of livestock (cattle and goats), 51 from small businesses like small shops and *Boda*, 48 from remittances from their grown-up children and 29 earned from formal employment as presented in Table 2.

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Table 2: Source of Income

Source of Income	No. of Mentions			
	Combined	Chehe	Hombe	Kahurura
Milk Sales	219	64	53	102
Cash Crops	84	59	24	1
Table Banking	84	41	15	28
Livestock Sales	75	23	26	26
Small Businesses	51	20	12	19
Remittances	48	9	13	26
Formal Employment	29	9	10	10

Source: Author Survey Data (2019)

Sale of milk was the most prevalent source of income for farmers in Mt Kenya West (53 in Hombe, 64, Chehe and 102 in Kahurura). Sale of cash crops was prevalently mentioned by farmers in Chehe (59) while a negligible number of farmers in Kahurura (1) earned from this. This observation could be due to the fact that the Kahurura forest block lies on the leeward side of Mt. Kenya which receives the least amount of rainfall annually. This would consequently reduce the growing of cash crops such as tea and coffee compared to Chehe and Hombe forest blocks, respectively. Table banking activities seemed to be highest in Chehe compared to Hombe and Kahurura at 41, 15 and 28, respectively.

Sale of livestock was highest among farmers in Hombe and Kahurura forest blocks with 26 farmers (more than Chehe's 20) indicating it was their source of income. Similarly, the study revealed that 20 farmers in Chehe earned income from small businesses, higher than both Hombe and Kahurura (12 and 19, respectively). The proportion of farmers who relied on remittances was lowest in Chehe at 9 and highest in Hombe and Kahurura (13 and 26, respectively). Hombe and Kahurura forest blocks had the highest proportion of farmers in formal employment at 10 and lowest in Chehe at 9.

7.2 Perceptions of the Smallholder Farmers Towards a ban on Livestock Grazing

Results obtained from qualitative analysis showed that major themes such as the disruption of household natural assets for livestock keeping, disruption of the number of cattle the family keeps, disruption of family cash flows, disruption of household's ability to pay school fees for children and disruption in quality of life in general emerged as summarized in Table 3.

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Table 3: Smallholder farmers' perceptions of how a ban would affect livelihoods

Perceived livelihood disrupted	**No. of Mentions**
Disruption of household natural assets for livestock keeping	
Reduction of available pasture	56
No land or less land for grazing	44
Divert cropland for fodder	6
	106
Disruption of cattle farming activity	
Household reduced cattle herd	68
Animals suffer from hunger	16
Household reduced milk production	55
Household reduced manure production	9
	148
Disruption of family cash flows	
Reduced income from the sale of cattle products	41
Loss of cattle farming jobs	6
Increased cost of pasture	19
Households' increased cost of buying milk	3
	69
Disruption of household's ability to pay school fees for children	**14**
Disruption in quality of life in general	
Worsen poverty levels	11
Worsen economic hard times in the households	78
Trigger insecurity	8
Trigger conflicts	3
Increase uncertainty with the future	7
	107
Disruption in social relations with the Kenya Forest Services	
Benefits of forest membership	7
	7

Source: Author Survey Data (2019)

Disruption of households' income / ability to pay school fees for their children

This category captured how disruption in family income due lack of cattle grazing could consequently affect the education of their children by reducing the proceeds from the sale of milk and animals. Thus, a disruption in their farming activities would adversely curtail their ability to pay school fees as participant K90 asserted;

> It is through the cows we are able to educate our children, which is after selling milk, so it could lead to some problem because like during the dry seasons' milk production is always low, so if grazing activities in the forest were closed it could be stressful.

Ultimately, limiting children's access to quality schooling in the present implies reduced opportunities for future generations, thus a vicious circle of poverty in the community.

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Disruption of the household's land available for cattle grazing
This category had three subcategories touching on how a forest ban would cause a reduction in (i) available pasture, (ii) available land for grazing, thus (iii) diversion of cropland to fodder land.

Reduction in available pasture: Banning access to pasture from the forest especially during the dry months would adversely affect farmers as farmer C150 alluded;

> I think the consequences could not be favourable because at first, we depend on the grass, so I can say the forest means a lot to us because for instance if you buy 8 bags of grass the cows will consume like 2 bags in the morning and just a little Napier grass.

This can be interpreted to mean that dependence on forest grass is relatively high and without the resource, there may be no livestock farming.

Less or no land for grazing: To some farmers it would mean no land at all to keep animals or very limited land for grazing as echoed by C28: "It could be a bit difficult because we don't have anywhere else, we can do cattle grazing." The comment implies that land size per household is a challenge and farmers may have a limitation to allocate more land to cattle grazing.

Diversion of cropland to fodder land: A ban on livestock grazing would risk lower crop harvest and food insecurity in an effort to increase grazing land by diverting from food and cash crops to growing fodder for the cows as reported by H133: "I think people would interfere with the already growing crops like maize to feed the cows. "This implies that more land is likely to put under fodder productions hence threatening food security.

Disruption of family cash flows: The effects of the ban on family income cash flows were captured under four subcategories: (i) reduced income from the sale of cattle products, (ii) loss of cattle farming jobs, (iii) increased costs of pasture, and (iv) household's increased costs of buying milk.

Reduced income from the sale of cattle products: Here, households would experience reduced income from selling the proceeds of cattle farming such as milk, beef, skins, and manure as H134 asserted: "I think if they ban livestock grazing in the forest, it could lead to low milk and meat production and other things like hides as well." The comment implies that forest grazing ban is likely to affect animal productivity and hence reduce household income.

Loss of cattle farming jobs: Since cattle farming employ a good number of rural people, disruptions from a ban would lead to job losses for those who herd the cattle in the forest. Farmer 10H said: "We do even employ herders to help in grazing activities, so their contracts would come to an end." The comment can be interpreted to mean that reduction of livestock is likely to cause unemployment in the livestock sector

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Increased cost of pasture: Family cash flows would decrease due to increased costs of buying expensive animal feeds. For those who opt for zero-grazing, it would even be more expensive as C164 said: "One of the problems we are facing is that we don't have huge tracts of lands so I don't think it would be a favourable decision because we cannot do zero-grazing." The comment implies that not many households can easily adopt zero grazing mode of farming due to cost therefore forest grass remains the best option.

Household's increased costs of buying milk: Family cash-flows would reduce due to increased cost of buying milk at prevailing market prices as mentioned by 19H: "I would sell the cows because there is nowhere else to do the grazing as a result, I would be forced to buy milk for home consumption of which could not be easy." The comment can be interpreted to mean that farmers keep animals to provide basic food necessities like milk and manure cheaply.

Disruption of the cattle farming activity: Under this, a ban would affect herd size under five subcategories (i) Reduced cattle herd, (ii) animals suffering from hunger (iii) Reduced household milk production (v) reduced amount of household manure production.

Reduced cattle herd: It was noted that a ban would eventually reduce the size of a household's herd especially those with small farm sizes or alter the animals kept from large to small animals such as goats. H124 narrated: "I will be forced to sell the cows and remain with just a few of them like one or two that i can easily handle." The comment can be interpreted to mean that farmer's income is likely to become less due to reduction of livestock to focus on small livestock which may not be of preference.

Animals suffer from hunger: Following a ban, animal health would deteriorate due to limited affordable pastures, potentially causing sicknesses and death as opined by 54K: "We would suffer as we do rely on the forest grazing especially during the dry seasons. The cows would suffer and maybe as a result die of hunger." This implies that dependence on forest grass for pasture is high during drought and farmers are likely to lose animal if grazing is restricted.

Reduced manure production: Here, a ban in cattle grazing in the Mount Kenya forests would lower manure production as anticipated by C165: "If I don't have grass for my cows to feed on, I don't expect manure in return." The interpretation is that farmers are dependent on farmyard manure to grow crops as a by-product and plays a role in enhancing food security.

Reduced milk production: Similarly, a would lead to lower milk production among households according to C164: "It would affect me because no access to forest pasture means low milk production." This can be interpreted to mean that lack of access to forest pasture correlates with low production hence low income.

Disruption in social relations with the Kenya Forest Services: A majority of rural households near the Mt. Kenya West forests felt that banning them from benefiting from the forest pasture would be interpreted as a breach of trust and loyalty between the farmers and the forest agents according to participant C147:

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> That would be nonsense because I am a member; we have been working hard to ensure that we take good care of the forest. We used to plant trees because we were told that would be allowed to do some cultivation in some parts of the forest.

These farmers believed that they were legitimate stakeholders and as members of these forest associations, they felt obliged to take good care of the forest, and to be compensated by being allowed to use it for cattle grazing. Participants C160 and C48 supported this position. C160: "I don't think that would be possible because we do have a permit to do grazing in the protected forest." The comment implies that communities understand the concept of Joint Forest Management and they have a role in forest management and benefit sharing but its applications have limitations and this disrupts social relations between KFS and community.

On observer C48, said:

> What I can say is that when you are in a group, you cannot be told to keep off the forest because we do even pay but there is a formality. You cannot come from anywhere and bring your cows in the forest. You must be a member of a group so that you can be given license and a membership ID.

These imply that communities understand the concept of joint forest management and appreciate that current CFA regulations, if well implemented, can significantly reduce resource abuse towards forest conservation. This positivity is there despite there being a record of the forest bans in prior years. However, there would be some hostility as C49 sees it: "My cows could die of hunger and there would be a conflict or confrontation between the KFS and the community. The farmers would be quite unhappy." The comment confirms the high dependency level on forest grazing and high cost zero grazing. There are also chances of hostility between KFS and smallholder farmers.

Disruption in the quality of life in general: A forest ban would lead to decline in the quality of life among the people dependent on the mountain protected forest for grazing. This theme had four subcategories: (i) worsened poverty levels, (ii) worsened economic hard times in the households, (iii) insecurity in the area, (iv) uncertain future.

Worsened poverty levels: Here, a poverty spiral would result from losing a major source of livelihood as mentioned by 187K: "There would be several consequences, for example, low income and high level of poverty because in this community livestock keeping is like our cash crop."

Worsen economic hard-times in the households: Under this sub-category, lack of income would adversely affect households to the point of being unable to do basic things such as educating their children and providing food. Participant H128 reported: "I think it would be challenging. I would not be in a position to educate my children and even provide basics needs like food and clothing."

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The statement indicates that livelihoods priorities focus on basic needs and education for children and cattle farming is the only option in these communities

Trigger insecurity in the area: Serious insecurity could be triggered by poverty and high unemployment levels in the area such as cases of people stealing Napier grass from their neighbours. Participant H11 reported:

> I think a high level of insecurity [would be witnessed] because most of people would abandon livestock keeping, because we do even employ people to help in grazing activities, so their contract would come to an end.

The comment implies that the livestock value chain plays a role in creating employment.

Trigger conflicts: This subcategory explored the possibility of increased unhealthy competition, strife and conflicts arising from reduced resources as participant H123 mentioned:

> Things could be difficult to us as we rely on the forest to feed our livestock. It could also cause conflicts within the community members because everyone wants to benefit with the little pasture that we will be having in the community.

The statement implies that limited resources may cause unhealthy competition as supported by the tragedy of the commons theory where the pursuit is on individual gains.

This conflict could be escalated to the forest authorities, as these farmers would resist the move. Participant K205 said:

> It would not be easy because it can even cause riots. I think we have a right to use the forest as we are not destroying the forest. We could even burn it down if such decision was made.

The comment portrays the frustrations the community could experience if ban is effected and this indicated that direct gains from the forest is the likely priority compared to conservation interventions.

Lead to uncertain future: This sub- category focused on the emotional and psychological effects resulting from loss of livelihoods as echoed by C162 and K 228. The views of K 228 were: "It could affect food production, especially milk. We do rely on cattle grazing so if the operations were closed, I think it could affect income as well."

The statement indicates the unpreparedness and limited diversification options the communities have if a forest grazing ban was implemented and that crop production is dependent on manure obtained from livestock keeping.

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Table 4: Smallholder Farmer Livelihood Strategies to Cope with a ban on Cattle Grazing in the Forest

Strategy	No of Mentions
Option 1: Diversify partially from cattle farming:	
Reduce herd	49
Zero grazing/tethering	22
Making silage	8
Begin poultry / change from cows to goats	6
Option 2: Diversify completely from cattle Farming:	
Sell all animals	40
Do something else …. "not specified"	10
Pursue other forms of employment	7
Pursue trade	6
Grow crops	3
Buy milk for households needs	1
	67
Option 3: Try to seek alternative pasture without reducing herd	
Buy animal feeds	19
Graze on the roadside	5
Lease more land for fodder	5
Convert cropland to fodder	1
	30
Option 4: Other sources	
Renegotiate with KFS	9
Rely on children	2
Illegal business	2
Use compost manure	1
	14
Option 5 Do nothing	**8**

Source: Author Survey Data (2019)

The second research question focused on how farmers in the three blocks would handle a government ban on livestock grazing in the forests. It had five categories (See Table 4). The most sought category in order of decreasing importance were: diversifying partially from cattle farming, diversifying fully from cattle farming, seeking alternative pasture without reducing herd size, and exploring other sources of income.

Option 1: Diversifying partially from cattle farming: This was the largest category and most sought option where farmers would reduce the scale of cattle farming operations to fit the available pasture. It had four subcategories namely: reducing herd size, zero grazing or tethering, poultry farming or changing from cow to goats, and making silage.

Reduce herd: Here, most farmers suggested that they would reduce the number of cattle a manageable stock without relying on the forest as farmer K 198 said: "I would sell some of the cows and remain with a few for zero-grazing. I have land where I can satisfy like one

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cow." The comment means that some of the coping mechanisms available are due to frustrations. Reduction of animal herd means less production hence less family income.

Others would opt to sell their animals and buy like one cow of a good breed that produces more milk. Such herd reduction would force farmers to sell their animals at non-competitive rates thus losing more of their resources, sentiments that H97 raised: "I would reduce the number of cows I'm keeping of which it would be at a throw-away price." The quote implies that capital accumulated over the years may go to waste since chances of selling of animals at a loss are high.

Zero grazing/tethering: In this subcategory, farmers would opt to make a zero-grazing unit or tether their animals as mentioned by farmers K 98 and H23: "I would plant Napier grass to do zero grazing. These farmers must have some to plant Napier grass." The statement indicates that fodder domestication is likely to become a priority following a forest ban as a coping mechanism mainly to support zero grazing units. Tethering would also be an option as reported by H23: "Maybe I would remain with just one cow of which I can even do tethering. Tethering is a feasible solution to a few cows." Due to the high initial cost of establishing a zero grazing unit, tethering could be an option. However, this may imply low animal productivity.

Begin poultry or change from cows to goats. Some farmers would opt to diversify from large animals to smaller ones which would require less land and food to keep as recorded from participants C45 and H110.

C45:

> If you serve me with a notice to keep off the forest, I will be forced to sell the cows and keep goats for milk. This would be a very drastic change as you cannot compare the value of cows to goats.

The comment can be interpreted to mean that keeping small livestock has lesser benefits for the farmers and can only be adopted as a desperate coping mechanism following a forest ban.

H 110 said: "After selling three of them maybe I would chip in poultry farming which is not dependent on forest products." The comment implies that forest adjacent communities are mainly attracted by the forest products and take advantage of the rare opportunities.

Making silage: Some farmers like H104 would opt to make silage for their cows rather than rely on cattle grazing in the forest despite the limitations in silage making technologies and related high initial costs: "So when there is surplus pasture, I would make silage. I also have a good area of land where I can plant grass for the cows."

The comment can be interpreted to mean that value addition of fodder is an option and technologies like silage and hay making can be adopted although cost and limited technology sometimes may inhibit adoption rate.

H 133 added: "Maybe you can store silage so that you can be on a safer side during the dry season." The statement can be interpreted to mean that farmers would make silage as a buffer feed during dry seasons. However, since silage making is capital intensive, only high end farmers are likely to afford it.

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Option 2: Diversify completely from cattle farming: This was the second most sought option where farmers opted to pursue alternative income generating ventures completely away from cattle rearing. This category had six subcategories: selling all animals, doing something else unspecified, pursuing other forms of employment, pursuing trade, growing crops and buying milk for household needs.

Selling all animals: A significant number of farmers suggested selling all the cows, for instance participant K199: "I would sell my cows as I do depend on the forest fully. There is nowhere else I can graze." The comments indicated the high dependence level on forests for fodder and limited diversification opportunities which may be a threat to the ecosystem

Additionally, H 77 commented: "I would sell the cows and keep off from livestock keeping because like during the dry seasons, you cannot even get anywhere to graze." The farmers quote indicates frustration of obtaining fodder during dry seasons which may result to reduction of animals.

Doing something else: In this subcategory, a significant number of farmers suggested that they would do something else, for example; Participant C164 commented: "I would just quit from the business and look for something else to do…." The quote implies that over dependence of forest pasture through cattle grazing is a challenge and this has made forest adjacent communities to ignore alternative sources of livelihoods.

Pursuing other forms of employment: In this subcategory, farmers would seek employment such as being casual workers or running a business as was the case of H106: "I think I would sell the cows and convert them to cash and start another business like poultry farming, a shop or butchery or even look for employment." The quote can be interpreted to mean that farmers are in a way conversant with the alternative sources of income including employment and pursuing business opportunities to reduce pressure on forest resources.

Growing crops: Other farmers would opt to do crop farming partly or wholly and diversifying from cattle farming which relies on the forest for fodder. This was the position for participants H53 and K231. H53 said, "I would also sell some of the cows and remain with one which I can maintain. For income, I would decide to do crop growing." This implies that some farmers have an opportunity to focus on other enterprises if provoked.

K 231, said: "There is nothing we can do not unless we graze along the road sides at the reserves, I can do crop farming as an option as well." This confirms that farmers have other options through not sustainable. Grazing on road reserves is not regulated and is unreliable.

Buying milk for the family: This was the least sought category where farmers would opt to buy milk for their households rather than keep animals for milk as it would come with unwelcome costs for most households. M231 reiterated: "I would sell the cow and start buying packet milk." The quote indicates that rural families depend on milk for survival and other options come with a cost which is not welcome in most households.

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Option 3: Seeking alternative sources of pastures without reducing herd. In this category, farmers suggested they would seek for alternative sources of animal food without necessarily reducing their herds. It had four subcategories namely; buying animal feeds, grazing on the road sides, leasing more land for fodder, and converting crop-land for fodder.

Buying animal feeds: Some farmers would opt to buy animal feeds to sustain their present cattle herds as reported by K114:

> If they banned cattle grazing, i would buy animal feeds since getting grass from other areas is a bit expensive because you have to cater for transport. I think the immediate idea would be buying [feeds].

This implies that there would be an increase in the cost of keeping cattle due to expensive and unreliable feeds.

Grazing on the roadside: Some farmers considered roadsides as viable places to graze their animals as mentioned by farmer H134: "Maybe I would try to graze on the road sides." The quote indicates desperate measures which are not sustainable although road side access is free.

Leasing more land for fodder: In this subcategory, the farmers would opt to hire land to grow fodder. Farmer H127 commented: "Not unless I work hard and buy my own land, there is nothing else that I can do; maybe I would lease or buy more land so that I can plant forage." The quote implies that leasing land is more viable than buying land for fodder production and it is an option in case a forest ban is affected.

Using cropland for fodder: This was the least suggested option that farmers would pursue. Participant 155C said: "I think most of our land is occupied by tea growing, so we could uproot tea for fodder crops." The comment indicates the value farmers give to fodder crops compared to other cash crops. However, it's important to note that Chehe farmers have limited land due to cash crop cover.

Option 4: Relying on external support: This category was the least suggested option farmers would follow to cope with a ban on forest access. It had four subcategories namely: renegotiating with KFS, relying on children, doing illegal business, and using compost manure.

Renegotiating with KFS: In this subcategory, farmers hoped that dialogue with the KFS authorities would help rather than having to suffer losses from restricted forest use. Moreover, they considered such a decision to ban forest use as a loss to both KFS and them as C 145 and 157C posited: "Nothing we can do. Something else, KFS would also be affected in terms of revenue collected because we also do pay for cattle grazing." The quote is advocating for a win - win situation including dialogue with KFS considering that the institution generates revenue from the user rights fee paid monthly.

Other farmers reported that they would protest against the decision by staging demonstrations as participant C29 reported: "I think we would come together and do

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demonstrations." Demonstrations may attract media attention and are tools to pass a message. The farmer in Chehe believes it's one of the desperate options to convey grievances.

Likewise, if a ban were to be inevitable, some farmers proposed for a notice in good time to enable them to prepare for alternatives as opined by C 170.

> If they could serve us with a one year notice, that would be enough time where one can plant fodder crops or even sell some of the cows and remain with a minimum number that you can manage.

The quote outlines the need for negotiations including giving notice to implement coping strategies like fodder growing and appropriate method to dispose the animals.

Relying on children: Some farmers would choose to rely on remittances from their children to sustain their livelihoods as participant H111 commented: "I would just keep all my hope on my kids, because after selling animals, you remain with nothing but just be poor." The comments can be interpreted to mean that dependence on children is an option since finances are needed to meet household basic needs.

Engaging in illegal business: Farmers with limited options would resolve to do illegal businesses within and around the forest such as burning charcoal and illegal grazing in protected forests as participant K178 commented:

> I think I would be resistant to that decision and do illegal grazing against their wish. If going there by force does not work, at that point I would sell the cows which would lead to high level of poverty about which I would try on how I can benefit from the forest either legally or illegally.

The statement notes that option of cattle grazing with no permit is illegal. However, engaging in illegal business may be a risky option for some farmers to avoid sliding back to poverty.

Using compost manure: In this subcategory, farmers who relied on cattle manure would opt for compost manure for their manure needs as participant K 224 commented: "First I could sell the cows and for manure i would embrace use of composed manure." The comments means that cattle support crop production through provision of manure which is most preferred compared to other types like compost manure.

Option 5: Doing nothing: In this category, a number would simply resign to fate. Such farmers would be ready to struggle looking for pasture until the next rainy season. However, being unsure of which decision they would take to handle the disruption, their helplessness made them open to any external solutions as echoed by participant H15: "Okay, I don't know because it has never been like that before. I don't know what would be the reactions but it would not be that good hence painting a bleak future." The comments can be interpreted to mean hopelessness and despair due to consistence dependence on forest grass for pasture without imagining there can be a forest ban.

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8.0 Discussion, Conclusion and Recommendations

Smallholder farmers' perceptions towards the use of a ban to manage access to protected forest for pasture can be understood from the perspective of PFM and its role in rural poverty reduction and sustainable livelihoods (Schreckenberg & Luttrel, 2009). One of the components of this framework is the vulnerability context that takes many forms depending on the rural context (DFID, 2000). Protected forests comprise an important buffer for forest-adjacent households. Any forest ban would, therefore, most likely disrupt livelihood assets such as land, household income sources, physical assets for livestock-dependent livelihoods, household social capital necessary for livestock grazing as well as limit development of household human capital assets. This would cause adverse socio-economic shocks as farmers try to engage in various coping mechanisms.

From the findings, the effects of a KFS ban restricting access to protected forest area would not be felt homogeneously amongst the smallholders in the three forest blocks. It was observed that some smallholder farmers would be less vulnerable to such policy actions since they have assets to diversify partially or even completely from keeping cattle to pursue alternative livelihood sources. However, there were some smallholder farmers who, due to capital limitations, would only partially diversify and cope by reducing the numbers of dairy cows or constructing zero-grazing units. The greatest concern, however, has to do with the third segment of smallholder farmers who would be extremely vulnerable to policy actions such as a forest ban, resulting to dangerous coping mechanisms such as engaging in illegal business or simply resigning to fate. This calls for a re-evaluation of the entire policy action framework towards safeguarding this section of the society even as the forest conservation endeavour is pursued.

Again, while the ban and its consequent re-adjustments by farmers would logically be expected to ease pressure on the forests, a research by Gurung et al., (2009), however, showed that switching from cattle grazing into protected forests did not significantly achieve that as grass harvesting for fodder increased remarkably. There would also be need to assess and mitigate the negative impacts of various diversification strategies from social, economic and environmental perspectives. For instance, increased grazing on the roadside might contribute to increased conflicts with road users and potential road degradation.

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