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Abstract

Malawi's export earnings are dominated by tobacco, accounting for over 60% of export earnings. The demand for an alternative export commodity, pigeon pea, has been rising over the past decade, especially from India. In addition to their export potential, pigeon pea is an effective cover crop to protect soil health and productivity in the dry season. They are mostly grown in southern region on very small farms, however, there are opportunities for expansion into central region given the existence of larger farms and agroecological suitability for the crop. Currently, social norms in the central region constrain this expansion. Livestock, and goats in particular, are left to roam free in the dry season by over two-thirds of farmers, relative to only one-third in the south. This leads to significant damage to pigeon pea crops and discourages farmers from growing them and taking advantage of the increased export demand. Much land is left bare and the few farmers that do grow crops during the dry season are forced to put up fences. This study assesses ex-ante implications, especially on agroecological transformation and economic growth, of shifting local governance arrangements among farmers around keeping livestock towards controlled systems. These externalities have been understudied in the development programming, yet their impacts are substantial, especially in lower-income countries. The policy solution under study is for the local government and non-state actors to support local governance arrangements through indirect payments to agroecosystem services. These can include information campaigns on benefits of controlled livestock systems, training and subsidizing modern goat house construction and feed preservation, and contract farming and product certification for adhering to acceptable community norms. Medium-term policy interventions include varietal development of adaptable short duration pigeon pea, initiating a review of the appropriate laws, and instituting more studies to understand these community norms.

Keywords

Malawi, fence-in, mixed farming, local governance, social norms

Before I built a wall I'd ask to know
What I was walling in or walling out,
And to whom I was like to give offense.
Something there is that doesn't love a wall,
That wants it down.

Mending wall by Robert Frost

production volumes are low, or the market prices are low. Diversification of the export base is therefore a requirement for mitigating adverse impacts on Malawi economy and producers from global tobacco price volatility (Benson, 2021) while also achieving structural transformation and economic growth. This perspective focuses on potential export

Introduction

Malawi's export base is dominated by tobacco, accounting for over 60% of export earnings, varying between 35% and 78% since 1961 (Wineman et al., 2022). Between 2015 and 2017 for example, the agricultural sector contributed about 87% of all the export earnings with tobacco alone contributing 52% (Benson, 2021). This is precarious given the falling tobacco prices and ongoing anti-smoking campaigns. This risk has manifested itself in consistent foreign exchange shortages and macroeconomic instability whenever tobacco

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diversification into high-value semi-perennial grains, especially pigeon peas, and how this may be affected by livestock-keeping systems across locations and seasons in Malawi.

The demand for pigeon peas has been rising over the past decade, especially from India. Pigeon peas are mostly grown in the southern region of Malawi but there are serious obstacles to expansion of production in this area due to small farm sizes. In the central region however, the existence of larger farms and broader agroecological suitability (see Figures 1 and 2) offer greater opportunities for expansion.

The challenge, however, is that pigeon pea crop is semi-perennial and social norms in the central region see livestock left to roam free for much of the year. During the wet or rainy season, all goats across the country are either tethered or controlled to avoid destroying crops. In the dry season (June–October), in the south, goats are mostly still tethered or controlled. However, goats in large swathes of the central region roam around free-range (see Table 1 and Figure 3)

A limited number of farmers who cultivate crops during the central region's dry season are forced to put up fences. Pigeon pea provides several agroecological services including (i) as a cover crop (e.g. to cover the soil not necessarily for harvest) in dry season months, (ii) its biological nitrogen fixing properties, (iii) food in form of vegetables from ratooning and grain, (iv) fodder, (v) firewood, (vi) construction material for fences, and (vii) vigorous deep roots (Snapp et al., 2003). To safeguard these services and the export needs of the economy, it is imperative to understand

whether changing the local governance of goat-keeping systems, especially in the central belt of the country, can lead to agricultural transformation in this region and economic growth in Malawi.

This problem is essentially a Coase problem. In describing the problem of social cost, Ronald Coase (1960) presented an example of a cattle owner whose cattle strays to destroy crops on neighboring land. While Coase's case study is thought of as a micro- or local-level issue, in Malawi, the entire goat industry is affecting the cropping industry and all the associated backward and forward linkages. While these externalities are not usually studied in macroeconomics, they can have amplified macroeconomic impacts especially in developing countries where crop and livestock systems co-exist within the same locations, and where they contribute substantially to the local economies.

Addressing these externalities through policies that start at the local level, as opposed to government-imposed bylaws, could still have large aggregate level implications. This is in line with the theoretical predictions from the assurance problem succinctly stated by Runge (1981, p. 603) as follows:

The lesson of the assurance game is to let individuals have full freedom to innovate self-binding rules which best serve their needs before enforcing rules from outside. (Runge (1981, p.603)

In a series of papers, Carlisle Ford Runge and co-authors (Runge, 1981, 1985, 1986) analyzed how strategic interdependence through expectations of behavior may result

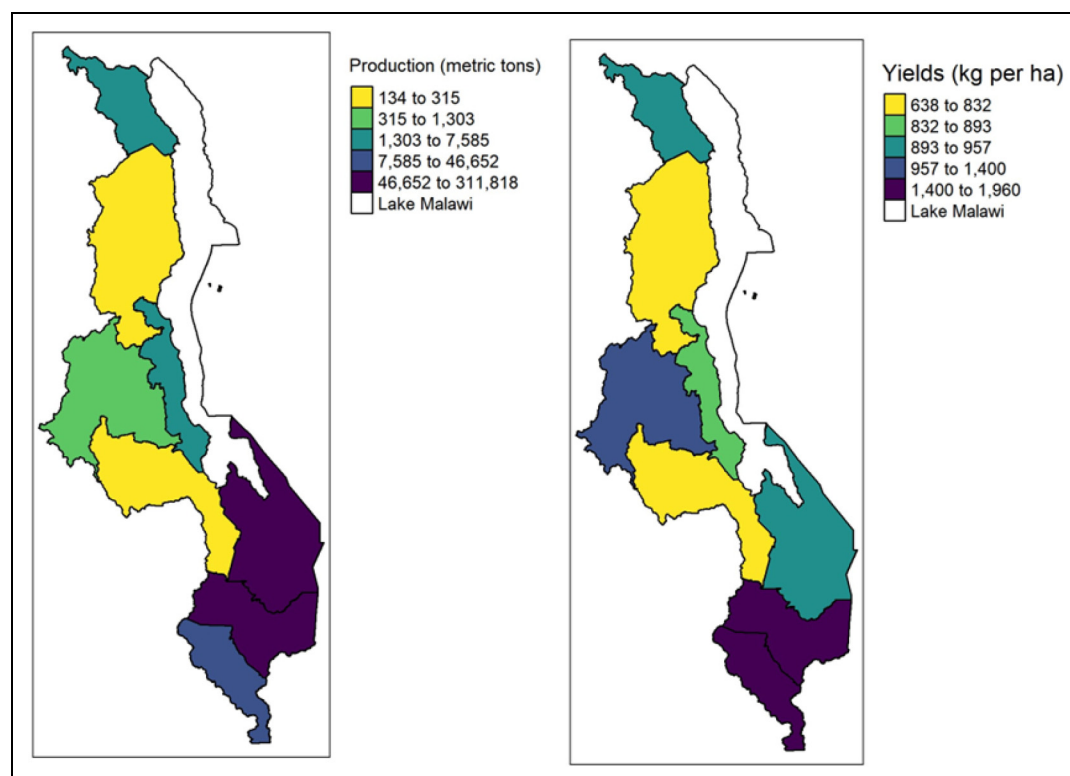


Figure 1. Pigeon pea production and yields at extension planning area level. Source: Zulu et al. (2018).

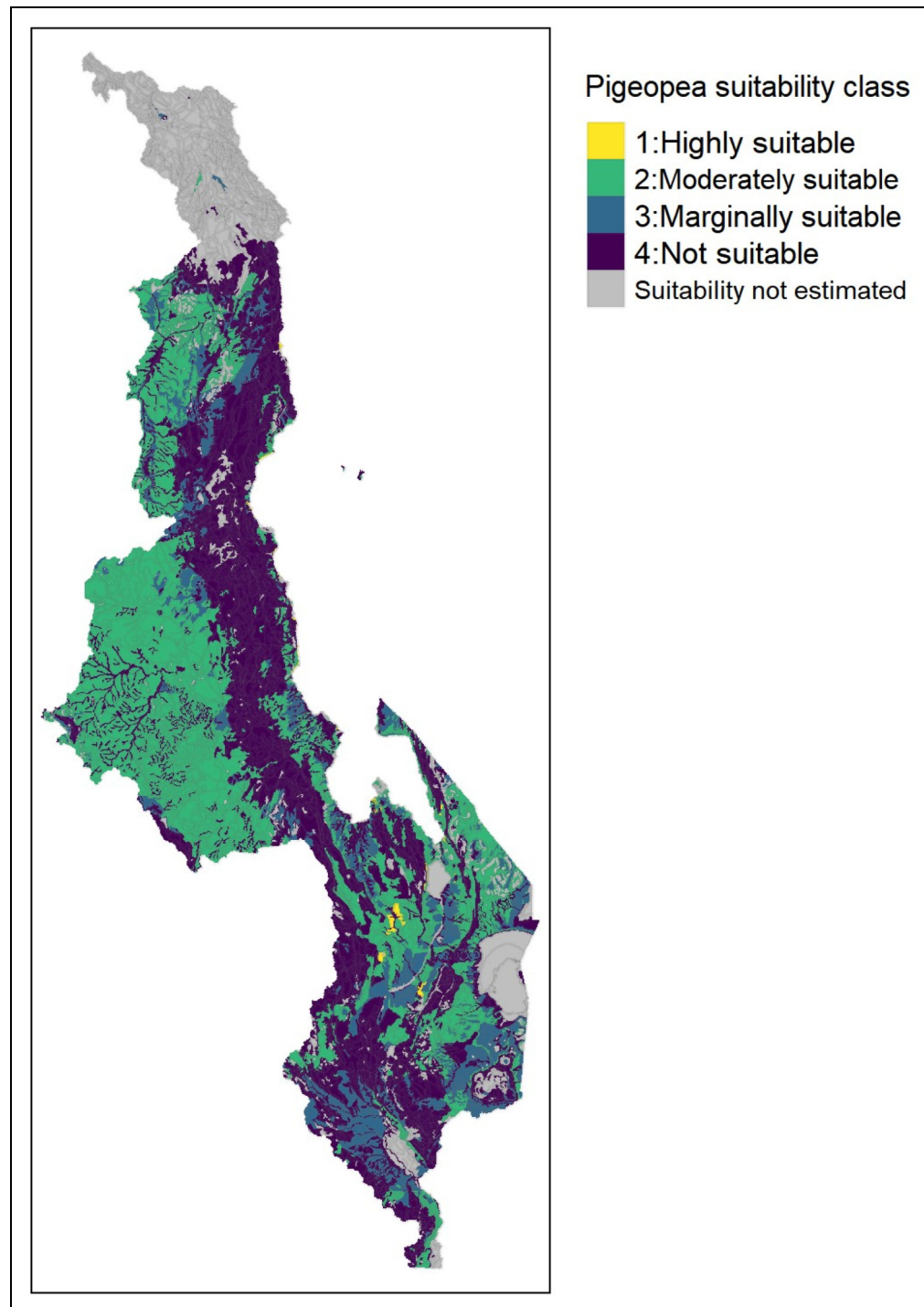


Figure 2. Pigeon pea suitability. Source: Benson et al. (2016).

Table 1. Percentage distribution of households who owned local goats by type of livestock-keeping system by region, Malawi 2007 (Source, NACAL 2007).

Region	Free range	Tethering	Controlled	Herding
Northern	34	19	8	39
Central	68	16	8	8
Southern	32	35	21	12
Malawi	49	25	13	13

in cooperative behavior even in circumstances where traditional game theory or Coasean theory predicts otherwise. The case studies were from multiple countries and times including Haiti, England, and Botswana. Runge (1986) argues that observed property rights institutions are endogenous, such that one cannot simply advocate for one type of property rights institutions as superior in all circumstances. Rather, different property rights institutions are responses to different local environments. Theoretically,

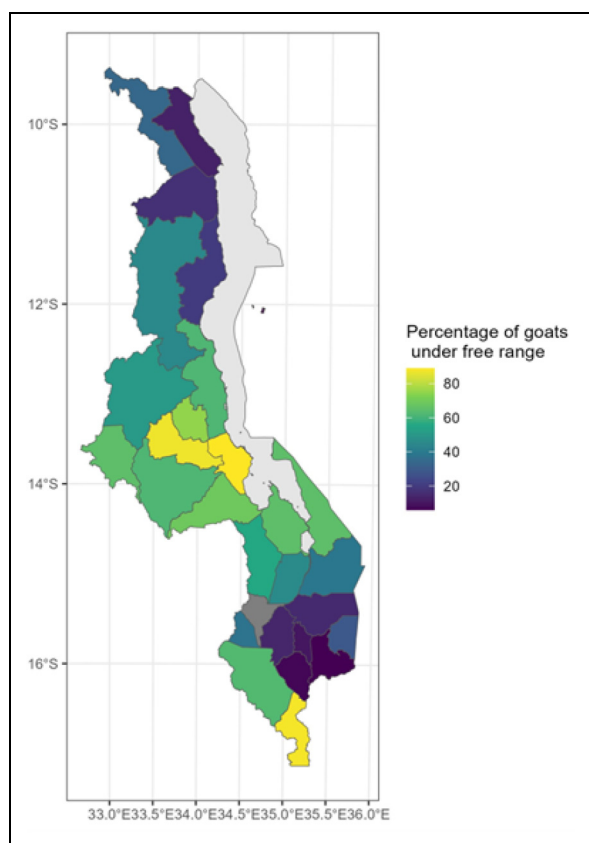


Figure 3. Spatial distribution of percentage of local goats under free range goat keeping system. Source: plotted by authors using data from NACAL (2007, table 14).

such outcomes are solutions to an “assurance problem” in which non-separability of individual choices imposes uncertainties that are resolved through institutional rules that allow forming of expectations of others’ choices (Runge, 1981).

Thus, the regional differences in the goat keeping systems in Malawi reflect how communities internalize the expectations of others’ behavior. For example, in places where goats are tethered or controlled (e.g. the Machinga District), the local sentiment is that if you let your goats graze freely, then you have literally “thrown them away” (*kutaya mbuzi*) implying that you no longer care if your goats get killed. The phrase *kutaya mbuzi* in Malawian language (Chichewa) is directly translated as “throwing the goat away” and can be interpreted to mean the goat owner no longer cares about the goat and anyone can kill it without facing any consequences. Thus, every owner expects others to control or tether their animals. In the central region, where goats graze freely, there is a different local sentiment. There is mutual understanding that the dry season is a time to let goats roam freely to eat the residues in any of the farm parcels. If one does not prefer this, then it is expected that they construct a fence around their farm parcel. This expectation formation therefore implies that coercion or external institutional enforcement are not necessarily needed to achieve cooperation in following

the local rules of the game. Runge (1981) conjectures that the equilibrium that is taken “depends on individual’s bargaining power, their initial endowment of resources, their culture, climate and so on.”

In a historical context, a simple change in property rights contributed to industrial revolution in Britain (Ashton, 1997; Hornbeck, 2010), and in 19th-century United States (US), adoption of barbed wire allowed farmers to grow crops with substantial impacts on agricultural development (Hornbeck, 2010; Huang, 2023). The fence-in and fence-out laws have had mixed effects across the US (see Huang, 2023 for a discussion and review of the relevant literature). In the context of Africa, except for few studies (e.g. Zulu et al., 2018), there is a dearth of published literature on the potential impacts of fencing laws and norms across Africa. This remains an important area of research due to the increasing livestock and crop farmer conflicts over resources, especially due to climate change.

To explore these issues in the context of Malawi, we used multiple data collection methods. We use mixed methods including focus group discussions (FGDs) with farmers and traditional leaders, key informant interviews, and geospatial analyses of secondary datasets. On FGDs, we conducted two farmer FGDs in two villages and two traditional leader FGDs in the same villages. The FGDs were aimed at understanding the evolution of the governance norms on fencing by-laws in the village, the advantages, and disadvantages that farmers perceive when applying these governance norms.

The villages are in Traditional Authority (TA) Chamba in Machinga District. In terms of agricultural regions, they are also in Domasi Extension Planning Area under Machinga Agricultural Development Division. The first village where the FGDs were conducted was Lungu Village. The five male chiefs that were part of the FGD included: Village Head (VH) Lungu, Village Head Tokomana, Village Head Katunga, Senior Group Village Head Mitawa, and Village Head Kachere. The farmer FGD included five women and five men. They were all members of Lingoni river catchment conservation group. In M’mina village, we conducted interviews with three chiefs (two male and one female) namely: Group Village Head Ngunga, Senior Group Village Head M’mina, and Group Village Head Chamatwa. The farmer FGD comprised of six women and five men. The main questions were on cropping patterns across seasons, the goat keeping systems across seasons, and the local governance or by laws put in place for controlling goats and residue management. The detailed checklist of questions is in the Supplemental materials. We supplemented evidence from these FGDs with similar FGDs conducted by Zulu et al. (2018) in the central region. On administrative and secondary datasets, we used the available national agricultural census of crops and livestock to analyze the geospatial patterns in the goat keeping systems. We also used agricultural production estimates from the Ministry of Agriculture and Food Security (MoAFS).

We also visited and carried out investigator observations at almost three sites keeping goats either in controlled or tethered systems and several farm fields to observe the

existence of cropping patterns as described by the farmers. While the primary focus was to get the farmer and local leader's perspective, we also consulted with experts at district and agricultural development division level to get a sense of the institutional position on the prevailing local governance systems. All the coauthors facilitated the FGs and interviewed the key informants. The interviews were all conducted in August 2021.

Policy context

Malawi's agricultural policies are collectively guided by the 2016 National Agricultural Policy which is currently being reviewed while the livestock sub-sector is also supplemented with sub-sector-level policy documents. The key policy document is the recently launched National Livestock Development Policy 2021–2026 (GoM, 2021). Some crops of strategic importance like cotton and tobacco are also guided by legal instruments in the Special Crops Act while the rest of the agricultural sector is legally guided by the Agriculture (General Purposes) Act and Control of Goods Act (Comstock et al., 2019). Nonetheless, there are neither national policies nor legal instruments regulating the crop-livestock trade-offs, especially on who is liable if livestock destroy others' crops. While this may be interpreted in the courts using acts related to property ownership, the formal legal framework is unknown. Unwritten and informal community norms which vary across space and time are the ones that guide the compensatory actions.

These community norms however can either foster or deter adoption of agroecologically sustainable methods of farming. The history of agricultural policy since the colonial times in Malawi has shown that coercion through formal regulations does not result in soil and water conservation as is planned (see Mulwafu, 2010, and McCracken, 2012). In terms of historical legal instruments, Malawi as a British protectorate might have followed the English common law, which would subscribe liability to the livestock owner to fence in the animals (Ashton, 1997). While there are no national policies and no legal instruments on open ranging of livestock, the literature has demonstrated that these types of disputes are best dealt with at a local level and by employing preventative and practical solutions (e.g. invention of barbed wire) rather than formal legal reforms (Hornbeck, 2010).

The literature on pigeon pea integration in maize farming systems has recently identified livestock damage as one of the leading factors for lack of adoption of perennial grains (especially pigeon pea) in the central region parts of the country. Several studies (Peter et al., 2018; Roge et al., 2016; Zulu et al., 2018) have observed that in southern Malawi, unlike in the northern and central regions, community norms ensure year-round control of livestock which allows survival of pigeon pea. Specifically, Zulu et al. (2018) provides a detailed qualitative analysis of the differences in livestock management approaches for preventing livestock from damaging pigeon pea crop. These include individual-, household-, chief-, and community-based systems. They noted that the community-based system

worked effectively at ensuring that pigeon pea crop is cultivated, and livestock are controlled. Though this property or liability right has been neglected in the policy and formal legal spaces, the macro trends of climate change, urbanization, and increasing land pressures due to population growth all point to a future of increased conflicts.

Across Africa, farmer-herder conflicts are increasingly escalating into wars. Recent literature has focused on the causes of these conflicts (weak and non-inclusive governance, pastoral mismanagement, poor relationships, and ethnic bias) and link them to the political economy aspects of conflicts (e.g. Nassef et al., 2023). The combined effects of these interrelated reasons escalate farmer-herder conflicts. For instance, Song et al. (2024) argued that climatic shocks and linguistic differences result into more deadly conflicts among farmers and herders. There is however a dearth of literature exploring how the farmer-herder local governance norms affect economic and agroecological outcomes.

Policy impact

Given the nature of the problem, central government policy through legislation is most likely to backfire unless exhaustive consultations and careful research studies are undertaken. A policy that would work is one that is democratic and allows institutions to develop endogenously without external influence. The central government and its partners can nonetheless change the nature of the incentives. Supporting farmers to set community norms that are optimal in the economic and agroecological sense has important ramifications for structural transformation and economic growth in Malawi. Policy change that builds on the existing local governance structures can lead to substantial gains to Malawi's export earnings and nutritional goals with increased goats' production.

This support for local governance by changing the incentives for growing pigeon pea and confining livestock will affect over one million smallholder farmers who could cultivate pigeon pea (Table 2).

Plausibility, feasibility, and implementation

The policy solution under study is for the local government and non-state actors (including traditional leaders, ministry of agriculture extension workers, and farmer organizations) to support local governance arrangements through indirect payments to agroecosystem services. These can include information campaigns on benefits of controlled livestock systems, training and subsidizing modern goat house construction and feed preservation, and contract farming and product certification for adhering to acceptable community norms.

Solutions to dealing with the problem revolve around resolving the trade-offs in the use of labor for either fencing on the part of the pigeon pea farmer or for accessing feed on the part of the livestock owner. In addition, it requires one to make assumptions about access to livestock feed and output markets. Feed availability especially during drought years may be a limiting factor to evolution of community norms for close range goat farming. That is, even if

Table 2. Tradeoff and payoff matrix.

	Livestock (e.g. goats)		Semi-perennial crops (e.g. pigeon pea)	
	Added benefits	Added costs	Added benefits	Added costs
Free range	Livestock weight gain	Risk of theft, poisoning, and road accidents	Manure falling on the field	Risk of crop damage from livestock, Fencing costs/labor costs to guard the plot
Controlled	Security, controlled feeding and breeding	Labor to collect feed, Labor to tether and control, Costs for appropriate <i>khola</i> or tethering ropes	Collectible manure, Can grow pigeon pea and other crops during the dry season	None

the pigeon pea farmers are in majority, the lack of feed for the increasing number of goats given the demands for meat in urban areas will result in a conflict for use of wetlands. This will especially be the case because the wetlands are also mostly being converted for small-scale groundwater irrigation. Thus, establishing a market for feed and providing training for feed formulation that reduces the wastage of feed due to poor handling can lessen the nature of conflicts.

Therefore, instead of broadly introducing pigeon pea crop across the whole central region, it would be prudent to target locations where it is agroecologically most suitable to grow pigeon pea. Training in modern goat house (*khola*) construction and feed preservation should be provided to targeted farmers. Improving access to non-wood materials (e.g. wire) for making the *khola* is a good strategy to incentivise controlled systems. Providing predictable output market access for pigeon pea, either in the form of contract farming or some form of certification for adhering to socially acceptable community norms could help in reducing the price risk perception and therefore allow increase farmer's land allocation to the pigeon pea crop. In addition, varietal developments in adaptable short-duration pigeon pea can help in getting win-win solutions because farmers would harvest pigeon pea as any other annual crop while allowing others to raise livestock on free range during the dry season. As such, the central government needs to invest in directed research towards varietal development. Given the macro trends of climate change, population growth leading to land pressures, increased pigeon pea export demand and increased goat demand due to urbanization; the community norms will be tested continuously. As such, it would be prudent to start reviewing the formal and informal laws around fencing in of livestock and instituting more studies to understand the evolution of these community norms. These solutions collectively represent indirect payments to agroecosystem services that are provided to avoid livestock damage while allowing for local governance structures to operate normally. The supportive interventions for social norm changes do not have to target all potential pigeon pea farmers or goat owners. A critical mass of either is enough to tilt the incentives towards local governance structures that are more efficient economically and for the environment.

Such programs would be best implemented by NGOs, development partner funded projects, and the MoAFS.

The key to successful implementation of such incentive schemes is to avoid introducing any formal rules on open or close ranging without thorough consultations with all stakeholders. It is important to let the communities themselves see the benefits of establishing property rights governance that is best suited for the location. This type of a program would require piloting probably through randomized control trials in locations where it is agronomically and economically viable to expand pigeon pea production.

Conclusion

This study has explored the transformative impacts of supportive policies to drive livestock fence-in social norms. We have conjectured that such a change would be agroecologically and economically beneficial for Malawi. In addition, it would help mitigate potential large-scale conflicts as the climate changes. Though plausible and implementable, the set of solutions proposed may face several challenges. First, there may be countervailing power held in traditional leaders and other village elites who tend to own large numbers of livestock. For them, access to other farmers' crop plots is a good source of feed during the dry season. Second, though growing of perennial grains is agroecologically superior to leaving the ground bare; on the same agroecology basis, other scholars argue that confining animals either by tethering or in pens is tantamount to imprisoning the animals and a neglect of "animal welfare." It is even argued that such tethering systems lead to concentrated ticks' infestation due to wounds that inevitably develop on the animal's body. With these reasons, it is potentially easy to dismiss any attempt to introduce fence-in systems across the whole country as a form of tilting the local structures and advancing "crop welfare" at the expense of "animal welfare." Either way, the case of shifting local governance arrangements surrounding livestock management in Malawi presents a compelling illustration of the intricate interplay between micro-level Coasean problems and their far-reaching macroeconomic implications. As lower-income countries continue to grapple with the challenges posed by mixed crop and livestock systems amidst urbanization and changing climate patterns, the lessons drawn from Malawi's experience offer an opportunity for research and collaborative solutions.

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Author's note

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Supplemental material

Supplemental material for this article is available online.

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