



Good fences make good neighbours? Exploring potential transformative impacts of local governance towards livestock fence-in rights in Malawi¹

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Malawi's export earnings are dominated by tobacco, accounting for over 60% of export earnings. The demand for an alternative export commodity, pigeon peas, has been rising over the past decade, especially from India. In addition to their export potential, pigeon peas serve as an effective cover crop to protect soil health and productivity in the dry season. They are mostly grown in the southern region on very small farms, however, there are opportunities for expansion into the 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 the ex-ante implications, especially on agroecological transformation and economic growth, of shifting local governance arrangements among farmers around keeping livestock towards controlled systems. This is a classic Coasean problem and he himself used the example of a cattle owner whose herd strays to destroy crops on neighbouring land. While Coase's example is focused at a micro level, there are significant macro implications for both the

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livestock and cropping industries and all their backward and forward linkages. These externalities have been understudied in the macroeconomics of development, yet their impacts are substantial, especially in lower-income countries.

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. Medium-term policy interventions include varietal development of adaptable short duration pigeon peas, initiating a review of the appropriate laws, and instituting more studies to understand these community norms.

This policy issue applies to many lower-income countries because in most of these countries mixed crop and livestock systems are common. With increasing population, urbanization, and climate change; there is a higher likelihood of conflicts among crop farmers and livestock owners. Such conflicts have already escalated into violent and sometimes armed conflicts in parts of West Africa and East Africa. Therefore, implementation of the suggested policy interventions in Malawi can prevent conflicts that hinder economic activity and increase production of high value and exportable crop commodities. These benefits can then result in increased productive employment in supporting sectors like transport and infrastructure thereby kickstarting the process of structural transformation of the country.

1 Introduction

*“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.”*

Excerpt from ‘Mending wall’ by Robert Frost

Malawi’s export base is dominated by tobacco, accounting for over 60% of export earnings. This is precarious given falling tobacco prices and ongoing anti-smoking campaigns. Diversification of the export base is therefore a requirement for achieving structural transformation and economic growth. This essay focuses on potential export 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.

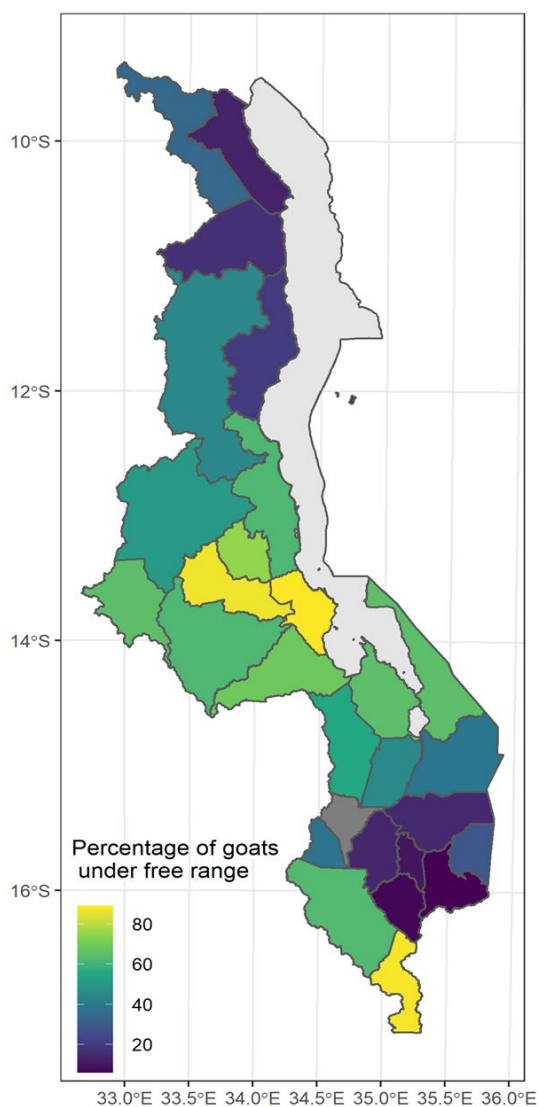
The demand for pigeon peas has been rising over the past decade, especially from India. Pigeon peas are mostly grown in the southern region of Malawi but there are serious obstacles to expansion of production in this area due to small farm sizes. In the central region however, the existence of larger farms and broader agroecological suitability (see Figures a and b in Appendix A) offer greater opportunities for expansion. The challenge, however, is that pigeon peas are 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. The Malawi National Census of Crops and Livestock (NACAL 2007) showed that about 68% of goats roam freely in central region as compared to about 34% and 32% in northern and southern regions respectively (Table 1). These regional disparities are correlated with area allocated to, and production of pigeon peas across the regions with the southern region producing much of the PP in the country.

Table 1: Percentage distribution of households who owned local goats by type of livestock-keeping system by region, Malawi 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

Source: NACAL 2007

A limited number of farmers who cultivate crops during the central region's dry season are forced to put up fences. Given the increasing export demand of these crops (especially pigeon pea demand from India) and the agroecological benefits of having a cover crop (e.g., to cover the soil not necessarily for harvest) in dry season months, 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.



Source: plotted by author using data from NACAL (2007, table 14)

Figure 1: Spatial distribution of percentage of local goats under free range goat keeping system

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 neighbouring 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 aligns 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) analysed how strategic interdependence through expectations of behaviour may result in cooperative behaviour 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, 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’ behaviour. 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*)⁵ implying that you no longer care if your goats get killed. 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 nineteenth-century United States (US), adoption of barbed wire allowed farmers to grow crops with substantial impacts on agricultural development

⁵ The phrase *kutaya mbuzi* in the 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.

(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).

2 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 peas) in the central region parts of the country. Several studies (Roge et al. 2016, Peter et al. 2017, 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 peas. Specifically, Zulu et al. (2018) provides a detailed qualitative analysis of the differences in livestock

management approaches for preventing livestock from damaging pigeon peas. These include individual-, household-, chief-, and community-based systems. They noted that the community-based system worked effectively at ensuring that pigeon-peas are 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.

3 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 peas and confining livestock will affect over one million smallholder farmers who could cultivate pigeon peas. Table 2 provides a trade-off matrix to understand competing interests to think through when designing incentives.

Table 2: Trade-off and payoff matrix

	Livestock (e.g. goats)		Semi-perennial crops (e.g. pigeon peas)	
	<i>Added benefits</i>	<i>Added costs</i>	<i>Added benefits</i>	<i>Added costs</i>
<i>Free range</i>	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
<i>Controlled</i>	Security, Controlled feeding and breeding	Labour to collect feed, Labour to tether and control, Costs for appropriate <i>khola</i> or tethering ropes	Collectible manure, Can grow pigeon peas and other crops during the dry season	None

4 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 labour 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 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 peas across the whole central region, it would be prudent to target locations where it is agroecologically most suitable to grow pigeon peas. 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 peas, 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 peas 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 Ministry of Agriculture and Food Security. 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 (RCTs) in locations where it is agronomically and economically viable to expand pigeon pea production.

4 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.

5 Next steps

This paper has focused on providing an exploratory and qualitative assessment of the agroecological and macroeconomic impacts of changing crop-livestock networks through local governance of social norms of fence-in or fence out policies. Furthering this research agenda, substantial research is required to consider the equilibrium displacement and production networks consequences of such governance structures. Limited research has already developed benchmark models in related applications (e.g., Lee et al 2019, Hornbeck et al 2010, Huang 2023, and Centner and Griffin 1998). We review some of these theoretical and empirical procedures which, if coupled with low-cost data collection efforts, would provide a comprehensive analysis of the quantitative macroeconomic impacts of liability changes on fencing in or out policies. These methods include equilibrium displacement models for simulating impacts of shifts in demand and costs as proposed by Lee et al (2019), and cellular automata agent-based modelling of externalities and rural crop-livestock trade-offs building on literature in urban growth modeling (e.g., Webster and Wu 1998).

Potential future study 1: Equilibrium displacement model for simulating welfare impacts of shifts in crop-livestock demand and costs under liability rules (following Lee et al 2019)

Lee et al (2019) presented an equilibrium displacement modelling framework for pollination markets which is used to simulate the impacts of changes in almond demand growth, costs and technology on the bee keeping and number of hives. Similarly, one can consider an externality system or network in which demand for goat meat, cost of livestock feeding, and technology (e.g., fencing material availability) affects the production of pigeon peas. For instance, the increased supply of pigeon peas would possibly increase livestock feed and would be a good source of firewood that would help in reducing deforestation. At the same time, the requirement of goat owners to feed the goats would mean labour reallocation from either leisure or other economic activities. The required baseline production, labor supply, and sales variables are readily available in large household surveys (e.g., Living Standards Measurement Surveys (LSMS)).



Potential future study 2: Macroeconomic agent-based model of externalities and rural crop-livestock trade-offs

There is a general lack of empirical data to understand the rural-crop livestock trade-offs at community level. Such data would be collected using agricultural censuses to understand the full network. However, in censuses, the detailed information on flow of resources across individual households are not collected. In addition, it is difficult to understand individual motivations to the evolution of the social norms in each of the communities. Future research should go beyond case studies (e.g., Zulu et al 2018 and our focus group discussions in selected villages) to develop an agent-based model using cellular automata to understand how the micro-level processes can develop into aggregate patterns that match the scenarios in the central and southern regions of Malawi.

We propose modifying an urban growth model (Webster and Wu 1998) into a rural crop-livestock externality cellular automata model. In the urban growth model, decisions of developers and communities to allocate land to industry or residences result in patterns of urban growth that may affect welfare. Similarly, decisions of communities on enclosed livestock or crops can affect the patterns of enclosure and aggregate macroeconomic welfare.

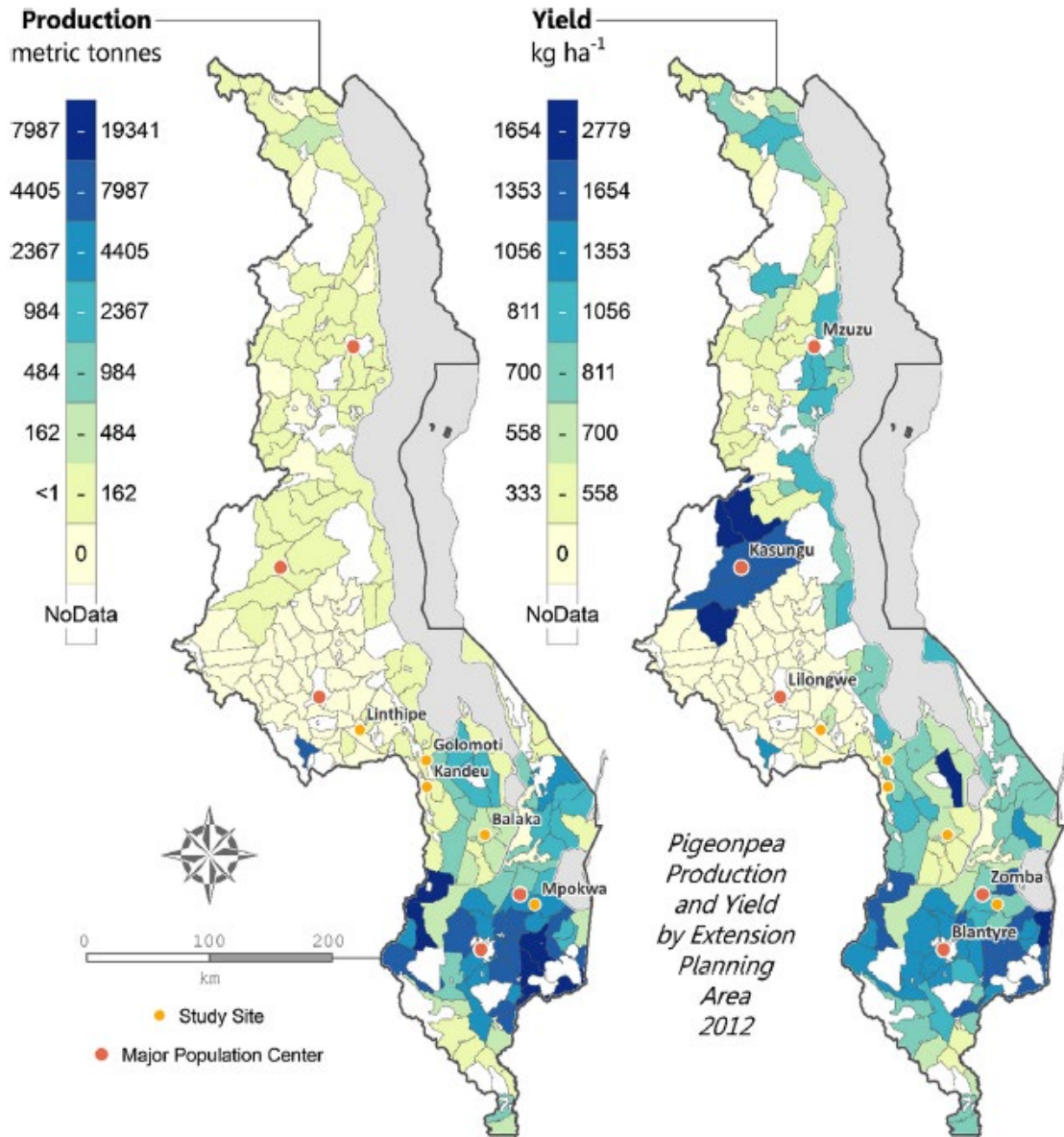
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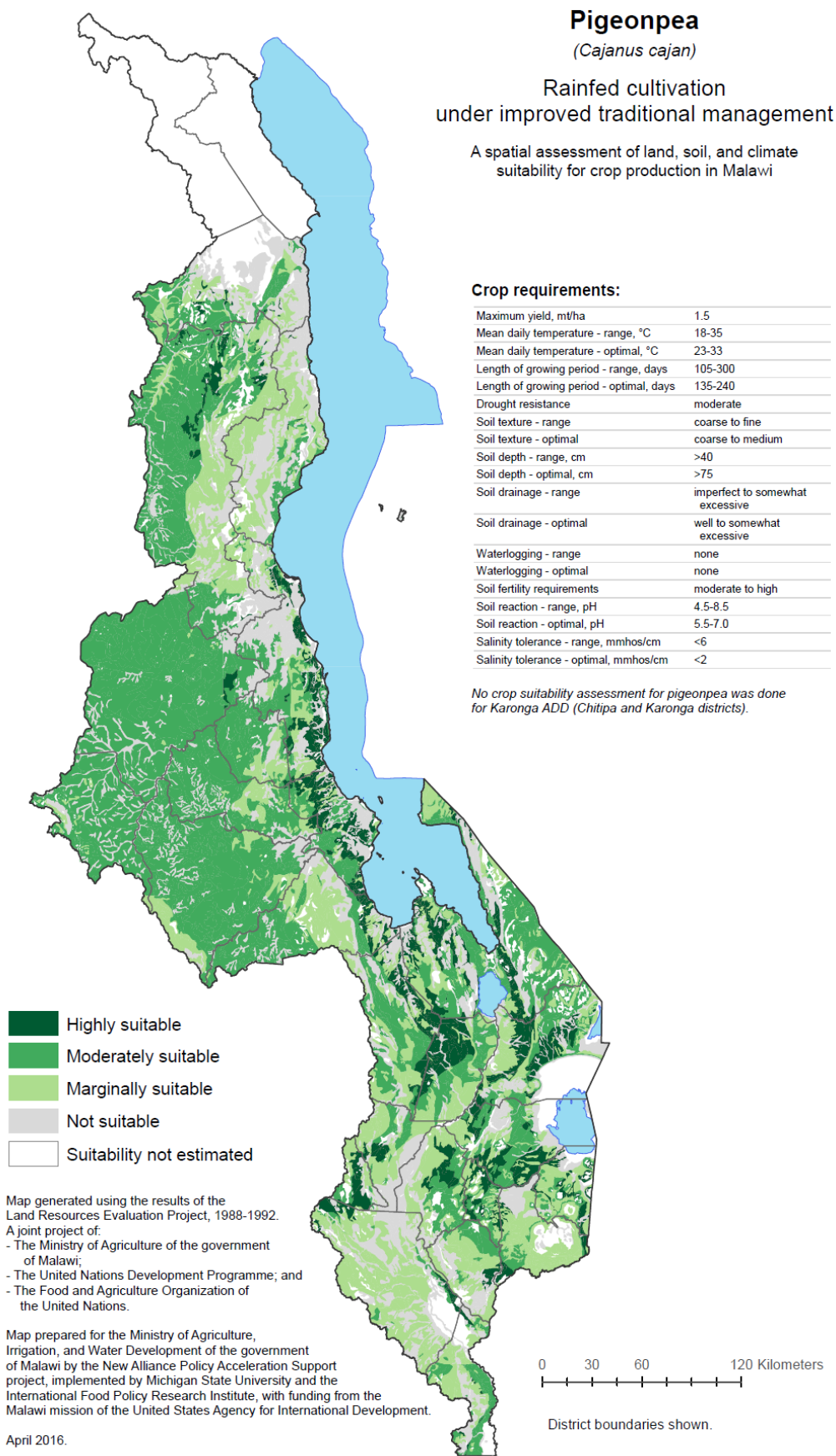
Appendix A: Agroecological suitability in the central region

Figure a: Pigeon pea production and yields at extension planning area level.



Source: Zulu et al. (2018)

Figure b: Pigeon pea suitability.



Source: Benson et al. (2016)

Appendix B: Data collection methods

The local governance or collective action problems associated with integrated goat keeping-cropping systems are assessed using analyses of administrative and secondary datasets interfaced with detailed qualitative assessments through focus group discussions, key informant interviews, and farm visits. 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) and the Integrated Household Surveys by National Statistical Office (NSO) and World Bank's Living Standards and Measurement Surveys team to understand the goat and cropping systems across locations and seasons in Malawi.

We conducted four focus group discussions. Two FGDs with traditional leaders from two villages, and two with goat and crop farmers from the same two villages. 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, VH Tokomana, VH Katunga, Senior Group VH Mitawa and VH Kachere. The farmer FGD included 5 women and 5 men. They were all members of Lingoni river catchment conservation group. In M'mina village, we conducted interviews with 3 chiefs (2 male and 1 female) namely: Group VH Ngunga, Senior Group VH M'mina, and Group VH Chamatwa. The farmer FGD comprised of 6 women and 5 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 villages are in T.A. Chamba in Machinga District. They are also in Domasi Extension Planning Area (EPA) under Machinga Agricultural Development Division (ADD). We collected geospatial information to help in characterizing the study site. The two villages where we conducted the FGDs are 2.4km apart and the nearest tarmac road (Malosa trading center) is about 6.28km by road. The elevation is about 744m above sea level.

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 FDGs and interviewed the key informants. The interviews were all conducted in August 2021. The findings of the FGDs were also reported in a policy brief by the Malawi Agroecology Hub (Mkondiwa et al 2021).

The detailed checklist of questions to farmers and chiefs is below:

Crops

- Which crops are grown in the area?
- Under what cropping patterns?
- What are the differences across seasons in the cropping patterns?
- Are there any crop residue burning by laws in the village?

Livestock

- What are the major livestock owned in the area?
- What is the proportion of farmers who own goats?
- Under what goat keeping systems are these kept?
- What type of feed is given to the goats? Where do the farmers get it?
- What are the differences across seasons in the practices?

Local governance issues

- Why are the farmers in the section practicing this system?
- Who introduced it?
- What punishment is given for failure to follow the rules?
- What are the benefits as compared to tethering goats?
- What are the advantages and disadvantages?
- What are constraints to this system?
- How are the farmers addressing these constraints?
- What are the trade-offs? What are you losing by using this approach?
- Are you doing it happily?
- Who instituted the rules? Were you involved?

Drivers of change and interactions

- How have by laws affected your sales and incomes from crops and livestock?
- What foods are you eating that you wouldn't have before the bylaws?