



Agropastoralism and re-peasantisation: the importance of mobility and social networks in the páramos of Boyacá, Colombia

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Abstract

The páramos of Boyacá in Colombia are earmarked for delimitation to prevent the expansion of the agricultural frontier and protect endemic flora that contribute to water provision for cities. A varied conservation toolbox will be used, including the creation of protected areas for re-wilding and the ‘sustainable’ transitioning of livelihoods identified as environmentally destructive. Agriculture and cattle livestock farming has been identified for transitioning. Despite the negative discourse related to livestock holding, this paper argues that small-scale agropastoralism contributes to re-peasantisation and provides the foundations for an agrobiodiverse conservation approach. Agropastoralism facilitates re-peasantisation through strong socio-economic networks, interconnected communities, the solidarity economy, and self-management of natural resources. Whilst, agropastoral mobility spatially binds social networks across large and disconnected spaces. Mobility is also fundamental to dynamic land access and pasture management, as it prevents over-grazing. This exemplifies how resilient socio-economic networks and mobile production strategies could be harnessed for agrobiodiversity, instead of land sparing and other sedentary ‘green’ economies. This paper makes conceptual contributions to ‘autonomy’ in re-peasantisation by empirically demonstrating the importance of mobile and flexible systems of production. It also makes a novel methodological contribution in applying a spatial lens that further unpacks how movement across the páramos facilitates autonomy and re-peasantisation. These themes are explored using interview data from 53 semi-structured interviews with key stakeholders and small-scale agropastoralists from across the páramos and field observation. The paper concludes by recommending a harnessing of agropastoral knowledge, to potentiate agrobiodiversity, for a more socio-ecologically just approach to farming and conservation in the páramos.

Keywords Páramos · Agropastoralism · Delimitation · Conservation · De-pastoralisation · Re-peasantisation

Introduction

This paper explores the importance of cattle to smallholder communities in the páramos of Boyacá, Colombia, as the cattle livestock sector faces conservation threats from delimitation plans. Located across the Andes in South America (Venezuela, Colombia, Ecuador, and Peru), páramos are the ‘most biodiverse high-altitude ecosystems’ (Baruffol 2020). They are particularly characterised by endemic high-altitude flora, including frailejón (*Espeletia* sp.) (see Fig. 1). These plants absorb atmospheric water and transfer it to the soil, contributing to river systems that provide water to key

cities in the country (Instituto Humboldt 2011). The páramos of Boyacá are especially biodiverse, as they hold more than 2354 plant and lichen species, almost half the total for the entire Andean region (Cadelo 2017). According to the Instituto Humboldt (2017), floods linked to the weather phenomenon La Niña (2010–2011) triggered plans to conserve and protect páramos across the country, using tools such as protected areas, payments for ecosystem services and sustainably transitioning environmentally damaging livelihoods (Ungar 2021). Consequently, delimitation of the páramos emerged as a policy objective in 2012, culminating in Law 1930—the Páramos Law—that came into effect from 2018.

Instead of framing conservation around agrobiodiversity (Perfecto et al 2019), the plan to sustainably transition agricultural activities (including cattle livestock holding) threatens to undermine complex and interlinked agropastoral socio-economies. Agrobiodiversity consists of ‘the

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Fig. 1 *Frailejón* plants in the páramo landscape, Boyacá. Source: Mauricio Díazgranados in Baruffol (2020)

conservation of biodiversity in agricultural landscapes' (Jackson et al 2013, 126). This approach is illustrated in the Páramos Law, which states that the Ministry of Agriculture and Rural Development and department level environmental regulators will 'design, authorise and implement plans to substitute and transition high impact agricultural activities' (Article 10 of Law 1930, Congreso de la República 2018). It suggests that 'low impact' activities may persist, as long as they use 'best practice and comply with environmental standards and work in defence of the páramos' (ibid). Although the specifics around 'high' or 'low' impact practices remain unclear, it is likely that agricultural activities and particularly cattle livestock holding will be earmarked for transition. This is evident from numerous reports by Boyacá's environmental regulator (CORPOBOYACA) and the state contracted environmental research institute (Instituto Humboldt). They link environmental degradation in the páramos to intensive crop agriculture, such as the high use of agrochemicals and monoculture (Blake et al. 2023), and fire for opening new pastures/preparing land for re-planting (Hofstede 1995; Instituto Humboldt 2011, 2015). Nevertheless, this paper argues that over the last few decades *small-scale* agropastoralists have shifted their natural resource saving methods using mobile and flexible practices, as well as strong social networks to facilitate autonomous production and sale strategies. Agropastoralism is understood as the combination of sedentary crop agriculture with pastoralism.¹ While these are mixed systems of production, this paper focuses on the livestock element to emphasise the ways in which cattle production and sale processes contribute to strengthening agrarian communities. If effectively built

upon, small-scale agropastoralism has the potential to build an agrobiodiverse and socio-ecologically just transition.

Contrary to industrial farming, agropastoralism feeds into processes of re-peasantisation (Van der Ploeg 2008), which keeps producers connected to their land through autonomous and resilient systems. Re-peasantisation refers to alternative smallholder approaches to conventional or market dominated agriculture. This takes place through many contingent processes, including co-operativised production and sale, and the use of ecologically enriching farming methods. This paper suggests that the current conservation narrative in the páramos blames agropastoralists for environmental degradation, without distinguishing the positive socio-ecological potential of small-scale agropastoralism. Moreover, the current trajectory is dissonant with the discourse of the post-peace accord era and the aim of building socio-ecological peace (Yanuardi et al 2022), as it is generating several livelihood tensions and fear over land dispossession (Blake et al. 2023). The findings of this paper have significant implications for conservation projects beyond the páramos, as this generalisable case underlines how agropastoralism contributes to re-peasantisation and has the potential to build agrobiodiversity in ecologically vulnerable landscapes, where producers have similar socio-ecological production strategies.

This paper also makes theoretical contributions to re-peasantisation by exploring the ways in which agropastoral production supports peasant autonomy. Jansen et al. (2021) identify 'autonomy' as a normative term, lacking analytical clarity in the re-peasantisation literature. This paper adds a spatial lens to the debate, as it unpacks agropastoral practice and networks through mobility patterns to convey how agropastoralism facilitates autonomy. This refers to the ways in which the movement of cattle and people not only sustains frequent social contact/networks across large and poorly connected areas but also supports dynamic land/natural resource access. In turn, this reduces dependency on agribusinesses by providing additional pasture instead of purchased animal feed. The paper also reflects on how cattle livestock produce, particularly milk, enables closer and more frequent interaction along commodity chains, which enriches interconnections from rural to peri-urban spaces. These smaller timescales of production and sale encourage the emergence of alternative economies, such as bartering. This solidarity economy provides agropastoral communities with resilience against market shocks. Another pertinent example of the solidarity economy related to cattle includes half-share agreements, which improve economic prospects for highly precarious smallholders in the long-term, as they use this system to rebuild their herds. Together, this underlines the ways in which agropastoralism supports autonomy through mobility and alternative socio-ecological relations.

¹ Pastoralism is understood more broadly than nomadic activity undertaken in the Sub-Saharan. It also pertains to different forms of mobility, such as movement up and down mountains, as well as grazing in open plains.

In bringing together literatures on pastoralism and critical agrarian studies, this paper responds to calls for closer conversations between livestock and crop agricultural scholarship (Scoones 2021). It argues that agropastoral production provides important insights for how to build smallholder autonomy and resilience. It also finds implications for conservation in other pastoral landscapes (mountainous or large plains)—namely the potential to boost agrobiodiversity through agropastoral systems. In cases such as the páramos of Boyacá, where agropastoralism is flourishing, conservation could undermine processes of re-peasantisation and instead accelerate de-pastoralisation (Caravani 2019). De-pastoralisation relates to the dispossession pressures that small livestock owners are facing from intensive and industrial livestock holdings. This runs in parallel to de-peasantisation, which van der Ploeg defines as the ‘weakening, erosion or even disappearance of peasant practices and associated rationality’ (2008, 35) among crop agriculturalists.

The agrarian context in Colombia

Since the 1990s, there has been a slow but steady trend in Colombia away from national smallholder production, towards higher levels of imports, which has underwritten processes of de-peasantisation. This began in 1991 with the ‘apertura’ or opening, during which the government reduced import and export tariffs and removed market boards (Jaramillo 2001). Subsequently, neoliberal policies have been applied unevenly and mixed with protectionism (Chohan 2020). Nevertheless, Colombia signed 156 different free trade agreements (FTA) between 2000 and 2010 (World Trade Organisation 2018), several of which have liberalised agricultural trade, including those signed with the USA and EU. For instance, the EU FTA led to an increase in imports of primary food products by 67% (Forero and Urrea 2014) and the FTA with the USA exponentially increased corn imports. Both Colombian smallholder and industrial agriculturalists have struggled in this landscape, but particularly small producers who are resource poor, as higher volumes of imported primary goods undercut the prices of national produce. This has left smallholders more vulnerable to market shocks and therefore de-peasantisation.

The changes in international food trading have also influenced agriculture in the páramos of Boyacá, as producers have increasingly specialised their production over decades and increasingly moved towards livestock holding. Motivated by changing import levels of primary produce, crop selection in the region moved from wheat in the early 1920–30s, to other grains such as barley and rye, and more recently potatoes. For instance, interview participants repeatedly noted that potato prices drastically fell in the summer of 2020 because imports were up 20% in 2020 from the previous year (Red Agrícola 2020), leaving many in debt. Faced with rising global costs in

production and lower market prices, many have few choices but to leave agriculture (Blake et al. 2023). These de-peasantisation pressures in crop agriculture have encouraged a shift towards agropastoralism in the páramos of Boyacá from the 1980s onwards (Instituto Humboldt 2015), as livestock provides a steadier dual income from milk and meat than crop agriculture. Similarly, livestock herds have become less diverse, as smallholders mainly keep cattle. Consequently, the once prevalent ovine sector has dwindled.

An additional factor that has underwritten the transition towards cattle in Boyacá is the national market protection of milk since 2007, which contrasts with the liberalisation of trade in several staple crops. Cadena et al (2019) argue that Colombia provides the most financial assistance to milk producers in Latin America. In this agricultural landscape, cattle and its produce provide a safety net for farmers, which helps off-set agricultural losses. Despite the existence of a minimum price support for milk, there remains a highly prevalent informal milk sector, which makes up 40% of the overall national market (ibid). Conditions in the informal sector are variable and comparatively precarious for producers but the limited rates of dairy imports, especially in comparison with the rest of the continent, and a regulated formal market reduces the price volatility of milk. Interview data corroborated the relative stability of prices in the milk market. The World Bank (2019) also acknowledges the importance of cattle to rural livelihoods in Colombia, estimating cattle-ranching provides 28% of rural employment in the country. This underlines the potential and reach agropastoralism has for building both autonomy and agrobiodiversity in smallholder communities in the country.

To further this argument, the paper first frames the discussion by exploring re-peasantisation and pastoralism literatures. It also touches upon the de-peasantisation and de-pastoralisation pressures farmers face, as well as how this relates to conservation. The next section outlines the methodologies used to conduct the research, namely the decision to interview the most socio-economically precarious producers and the novel contribution of a spatial lens to re-peasantisation literature. It then proceeds to the empirical section, which explores agropastoral practices, mobility, and the importance of social networks to re-peasantisation in the páramos. Finally, the discussion underlines the new insights provided by agropastoralism to ‘autonomy’ in re-peasantisation literature, while the conclusion finishes with thoughts on the policy implications of this research for the delimitation process in Boyacá.

Theoretical framing

Agropastoralism and re-peasantisation

Critical agrarian scholarship has variously reflected on the negative impacts of the global food system on smallholders,

as well as the resistive movements that agitate for peasant land access and support alternative production patterns. Re-peasantisation and its oppositional process of de-peasantisation belong to this agrarian change literature. Re-peasantisation is the ‘struggle for autonomy that takes place in a context characterized by dependency relations, marginalization and deprivation’ (van der Ploeg 2008, 23). This is evidenced through ‘cooperation’ and ‘interrelations’ (van der Ploeg 2008, 23) between producer communities and consumers. Autonomy also refers to reduced dependency on multinational agribusinesses through alternatives to synthetic inputs, certified seeds, and market relations. Additionally, re-peasantisation consists of a ‘self-controlled and self-managed resource base’ (ibid) of ‘co-production with nature’ (Rosset and Altieri 2017, 50), which has positive ecological feedback for soils and biodiversity. This ecological dimension also links closely to the concept of agrobiodiversity, which is based on ‘the variety and variability of living organisms that contribute to food and agriculture’ (Jackson et al 2007, 197). The ecological planning within re-peasantisation reflects planned agrobiodiversity, where farmers opt for biodiversity in crops and livestock (Perfecto et al. 2019). In turn, this supports associated biodiversity, such as soil microbes and fauna (ibid). Consequently, re-peasantisation is highly relevant for conservation projects that aim to bring about agrobiodiversity (Thrupp 2000).

Re-peasantisation also has a quantitative aspect, denoting ‘a return to the countryside by non-peasants or former peasants’ (Keresson 2015, 3), i.e., a numerical increase in peasant producers. Equally, it also reflects a qualitative shift, where ‘autonomy is increased, while the logic that governs the organization and development of productive activities is further distanced from markets’ (van der Ploeg 2008, 7). This paper adopts a qualitative lens of analysis, however, as its methods did not include a statistical study in the increase of peasant farming over time. It must be emphasised, that both quantitative and qualitative elements can occur independently of each other, which in turn points to the contingent and diverse characteristics of re-peasantisation processes.

There are many critics of re-peasantisation, as scholars such as Jansen et al. (2021) argue the term has normative and political aspects to it. Instead of seeing peasants as intrinsically ‘autonomous’, they note that scholars must move towards more contingent analysis that unpacks the different dependency relations in which smallholders exist (ibid). This paper contributes greater conceptual clarity to this debate by engaging with pastoral literatures, which reveal the different ways milk, meat and mobility facilitate frequent social connection and socio-economic interdependence between individuals across cattle commodity chains. Drawing from pastoral literature and findings from the case study, this paper understands autonomy as smallholder alternatives to conventional agricultural patterns, through deeply

interconnected, spatially bound networks of production and sale. The paper, therefore, moves the argument on autonomy and re-peasantisation further, underlining the ways in which agropastoral mobility and specific production/sale patterns related to milk and meat enhance cooperation and interrelation among peasant producers, thus, fundamentally boost autonomy.

Although the re-peasantisation literature has been applied to many case studies from around the world, agropastoral systems are glaringly absent. This is constitutive of a wider divide between agrarian peasant scholarship and pastoralism (Scoones 2021). In fact, re-peasantisation literature has much to learn from the flexible production strategies constructed by agropastoralists, which help them to build ‘emergent self-organizing territories’ (van der Ploeg 2021, 114) through diversified economies and broad social networks (Scoones 2021; Nori 2019). Although agropastoralists are more sedentary than nomadic pastoralists, due to combining crop agriculture with mobile livestock holding, they share many common characteristics. Primarily, both work with a natural resource saving and boosting ethos, depending on strong and spatially expansive social networks to mitigate against market fluctuations (ibid). In turn, this strengthens producer autonomy and resilience. Moreover, mobility remains essential for dynamic land access strategies (Krätli et al 2013), as this helps agropastoralists cope with changing climatic conditions and ‘green grabbing’ conservation policies exercised through the creation of protected areas (Butt 2011, 2014). These descriptive aspects of agropastoralism map onto the definition of agrarian re-peasantisation, underlining how agropastoralism contributes to re-peasantisation but also where this literature can learn from existing synergies.

Livestock economically sustains agropastoral communities in distinct ways to crop farming and prevents abandonment of agriculture by supporting the most socio-economically marginalised producers. Firstly, the dual purpose of cattle (dairy and meat) inherently diversifies production, providing income at different time scales (Scoones 2021). Milk pays producers weekly and beef is often a longer-term investment, which allows the former to cover subsistence costs, whilst the latter is kept for emergency payments and ‘act[s] as insurance in hard times’ (Herrero et al 2010, 822). The daily collection of milk and weekly payment also allows the emergence of alternative economies, such as bartering in exchange for staple goods. Another alternative socio-economic strategy is cattle half-share agreements (Scoones 2021). Under this system, a producer buys the cow, whilst the other maintains it and earns from its produce. In the long-term, when the cow is sold for meat, the original owner is first repaid in full, any profits (including off-spring) are then divided between the two. This covers daily subsistence through frequent milk sales but also enables the long-term

rebuilding of herds even if producers lack the means to own cattle in the immediate term. Together this boosts agropastoral autonomy and resilience against market shocks, consequently also preventing de-pastoralisation.

The specificities around livestock farming also enable more frequent and interdependent social connections than crop agriculture. The shorter time-scales of production and sale particularly related to milk (*ibid*) alters the frequency with which agropastoralists connect with other producers or intermediaries along dairy commodity chains. As Kraub and Olwig (2018) underline, agropastoral social networks are essential for collaborative production and sale, which runs contrary to the increasing individualisation of crop agriculture. This paper argues that transitioning cattle livestock towards other livelihoods, would endanger this social ecosystem and the autonomy of agropastoralists, which would in turn undermine re-peasantisation processes.

Mobility is also a key factor that lubricates social networks, co-operation and importantly 'co-production with nature' (Rosset and Altieri 2017, 50) in agropastoral communities. Pastoral mobility has multiple definitions, pertaining to several types of movement (Turner and Schlecht 2019). This paper refers to mobility as the movement of livestock up and down the páramo, across varying distances to facilitate resource access. It also encompasses inverse mobility, where cattle are not moved but instead produce (such as milk) or pastoralists themselves move between herds. Mobility patterns not only underwrite dynamic land access strategies (Krätli et al 2013) but spatially widen social networks across large and poorly connected landscapes. Patterns of movement reveal important details about production and sale systems (Simula et al 2021) but also give insight into 'the rules around resource use' (Scoones 2021, 17). As Easdale et al. argue, mobile pastoral systems employ 'different patterns of landscape management' (2016, 2250), which is indicative of situated environmental knowledge. In this case study, mobility patterns illustrate the complexity of socio-ecological relationships in the páramos, i.e., how moving cattle herds avoids overgrazing and in turn connects individuals along the dairy commodity chain. Engaging with pastoral production, land, and resource management strategies, therefore, reveals how producers connect across the páramos, the overlooked knowledge agropastoralists have of the landscapes they traverse and the natural resource saving systems they use.

De-peasantisation and de-pastoralisation

Importantly, re-peasantisation is not a static end goal or state of being, as it exists along a continuum in dialectical tension with de-peasantisation. De-peasantisation is driven by a number of factors, including but not limited to market deregulation, globalisation, trade liberalisation and

corporate land grabbing. In short, it explores the erasure of peasant crop farming. A parallel and often linked process of de-pastoralisation is also taking place, as small livestock owners are out-competed by industrial and intensive livestock farming (Caravani 2019). Like de-peasantisation, Caravani suggests de-pastoralisation takes place through the 'dispossession of the major means of social reproduction, such as livestock, mobility and communal grazing land' (2019, 1325), due to structural factors and macro-economic decisions that support large-scale farming or intensive livestock. Consequently, pastoralists are pushed into different forms of sedentary labour, which limit their connections to land, other pastoralists, the wider livestock commodity chain and animal ecologies.

Although Caravani (2019) highlights that de-pastoralisation is underwritten by the conversion of communal grazing rights to individual land rights and state-owned natural reserves, they do not discuss the more covert 'green transitions' that similarly dispossess farmers. Agrarian studies literature has extensively demonstrated that 'green grabbing' and the creation of 'green economies', under the guise of conservation and sustainability transitions, are often precursors to de-peasantisation (Fairhead et al 2012; Hall 2013; Gimini and Fonck 2018). Similar studies within pastoral studies are limited (with notable exceptions such as Butt 2011, 2014). 'Green grabbing' refers to the overt accumulation of land for conservation but also more covert processes that lead to the removal of control over natural resources and territories in the name of sustainability. This paper analyses the delimitation process using this lens, particularly the intention to sustainably transition practices such as cattle farming, which would reduce land, mobility, and natural resource access. Drawing from previous studies in Kenya that underline the ways in which pastoralists continue to graze in and use protected areas as coping strategies (Butt 2011, 2014), this paper explores the ways in which pastoralists are spatially embedded in páramo socio-ecologies. It finds important implications for this debate, as the delimitation process could potentially divorce 'animals, landscapes and ecosystem processes...from the historic-ecological processes that gave rise to them' (Fairhead et al 2012, 243) under the guise of an 'economy of repair' (*ibid*). This lens not only helps to illuminate the policy implications of the páramo case study but also makes a conceptual contribution by bringing the green grabbing literature into direct conversation with de-pastoralisation.

In the case of the páramos in Boyacá, the negative discourse around the use of fire in livestock keeping and agriculture reinforces the need for green economies and 'green grabbing'. Fire has been identified as one of the most ecologically damaging practices related to the expansion of the agricultural frontier for potato farming and pasture (Instituto Humboldt 2011, 2015). Another stated motivation for

using fire is to encourage improved pasture growth higher up the páramos (Hofstede 1995), due to land access pressures and a changing climate that is causing drier seasons lower down the mountains. Consequently, since 2010 it became illegal to burn fields for the purpose of clearing páramo land. Additional delimitation tools were announced from 2011 onwards, including payments for ecosystem services and the rewilding of protected areas (Ungar 2021). Despite the passing of these laws, Boyacá's environmental regulator-CORPOBOYACA-stated that 2020 had the highest levels of deforestation driven by fires in 16 years (El Tiempo 2020). There were 179 fires registered in 59 of 87 municipalities, which affected 2089 ha of forest and páramo vegetation. The pressure to use the upper reaches of the páramos is unlikely to slow down or reverse, however, as Tapasco et al (2019) project that pasture growth in Colombia will be severely affected by climate change by 2100. In some regions, this is likely to reduce production of meat and milk by 24.9%, compared with average rates of production from 1970 to 2010 (ibid). Amidst the dual pressures of climate change and an unfavourable agricultural economy, agropastoralists face recrimination for environmental degradation without enough recognition of the exogenous factors shaping natural resource use.

Methodology

This paper takes an interdisciplinary approach by situating agropastoralism within re-peasantisation, an area of scholarship that traditionally belongs to agrarian studies and political economy. Instead, it employs a political ecology approach and spatial lens to unpack the different production strategies used by agropastoralists, the complex inter-relationships between producers, the alternative economies they construct and how this relates to their use of natural resources. The use of a spatial lens is methodologically innovative in re-peasantisation scholarship, as it highlights the importance of mobility to the construction of socio-economic autonomy and self-management of natural resources. Lessons from this case study are not only applicable to agropastoralists in mountain landscapes and large plains but also to sedentary peasants, as it provides replicable examples of how to build cooperation around livestock produce and production strategies, using mobility and resource sharing.

Differing from much of the policy literature on the páramos, this research foregrounds the experiences and socio-ecological practices of marginalised páramo communities. This enabled an exploration of the production strategies of small-scale agropastoralists and how these relate to agrobiodiversity. This is influenced by related global cases that have demonstrated the environmental potential of small-scale livestock keeping through sustainable ranching (Ferguson

et al 2013), regenerative rotational grazing (Otálora et al 2021; Loring 2022) or silvopastoralism (Gliessman 2015). Thus, the research challenges the epistemological privilege that the Colombian state has afforded research institutions and environmental regulatory agencies, by re-asserting the socio-ecological experience and insights of agropastoralists.

Study sites were chosen using data from the 2014 Agricultural Census. Three municipalities with the smallest cattle livestock holdings in terms of herd sizes (Möngua, Monguí and Gámeza) were selected, three municipalities that had stronger links with the formalised dairy sector and larger herd sizes (Santa Rosa de Viterbo, Bélen and Tutazá), as well as two with a higher incidence of mining (Socha and Tasco). This provided a cross-section of livelihood experiences, including mining and eco-tourism commingled with agropastoralism. Fieldwork took place between December 2020 and January 2021. A total of 53 interviews were conducted, 50 of which were with current or former agropastoralists, i.e., those for whom livestock and associated activities provide most of their monthly income, as well as some participant observation including farm walks. Across all participants, the average heads of cattle numbered 10, with a range between 0 and 37. Those who no longer had cattle were still involved in the livestock sector through the renting of land for pasture. This reflects that interviews were mainly held with smallholders with limited financial means, as Etter and Zuluaga (2018) note that small-scale livestock holding in Colombia consists of 10 heads of cattle or less. A diverse data set, in terms of herd size and composition, also facilitated analysis of agropastoral socio-economic differentiation. This particularly revealed the socio-economic structures of support that exist between owners of larger livestock herds and those who are the most economically precarious in the páramos.

Research methods

Interviews were conducted in adherence with strict data protection and ethical protocols. Indicative interview questions related to two broad areas: farm operations (including but not limited to the number of cattle kept, breeds of cattle, cattle ownership structures, hectares of land used for grazing/farming, location of this land in the páramo, grazing patterns, and technology used for insemination or milking) and the socio-economy/cultural dynamics related to cattle (the amount of milk/cheese/meat produced, how this was produced/sold, the importance of cattle in relation to other economic activities). Interviews were digitally recorded and uploaded on the same day to a secure, encrypted file on University of Bristol (UoB) servers. All data was anonymised and provided with a numerical code to prevent identification of participants. Interviews were organised according

to municipality, to geographically locate key livelihood-environment tensions. Interviews were analysed daily, which facilitated adapting or revising interview guides to reflect the themes relevant to participants. More importantly, it also gave the opportunity to deliberate over and record direct observations from the field. In turn, this provided an insider–outsider dialogue (Kerstetter 2012) between the first and second author, as the second author is from Boyacá and was accompanied by a gatekeeper known to locals in each municipality.

All interviews were transcribed in Spanish and transcriptions were anonymised, using the same numerical codes from the interviews, and stored on password protected UoB files. The first author translated Spanish interview data into English. Thematic codes for analysis were then defined iteratively through consulting the literature and discussions with the second author on the key themes emerging from the data. The thematic codes included: organic practices, technological modernisation, pastoral mobility, biodiversity, conflict, páramo ecology, environmental change, favours, income, savings, barter, market access, land access, land titling, infrastructure, training programmes, knowledge exchange, relations of trust, women and livestock, and finally state policies/relations with the state. These codes are reflective of the interdisciplinary methodology outlined above.

Agropastoralism supporting re-peasantisation in the Páramos

Cattle and socio-economic survival

Similar to peasant producers around the world, smallholders in Boyacá's páramos have experienced significant economic pressures, linked to national and global agricultural landscapes that favour industrial-scale food production and sale. Cattle has been a crucial source of economic stability amidst acute losses from crop agriculture because agropastoralists have constructed resilient production and social strategies.

Every interviewee repeated the importance of livestock farming to their existence and permanence in the páramos. They noted that if cattle are prohibited as part of a sustainability transition this 'would erase our only means to live, we don't know what we would do...it's as if we have been told to starve' (Interview 10). This emphasises the importance of cattle to food security and livelihoods in the páramos, without which many would face economic destitution, with no option but to abandon agriculture. Before the 1980s, the páramos were largely crop agriculture zones, often in combination with a small number of ruminant animals, particularly sheep. However, due to falling crop profits 'people chose cattle, which somehow keeps us tied over' (Interview 53). Consequently, there is a generalised perception that

'someone who owns cows stays financially afloat' (Interview 34). Herds of cattle have enabled farmers to compensate for losses in agriculture to remain linked to the land.

Agropastoralists are managing to keep afloat because cattle provides both short and long-term income, due to the varying production timescales of dairy and beef cattle. Beef cattle are:

a saving over time that you cannot touch. You can't make sales every eight days; one must leave beef livestock a minimum of three to six months...so one needs to have a dairy cow to cover everyday costs (Interview 51).

On the other hand, milk from dairy cows is useful for 'daily upkeep, to pay for the weekly shop' (ibid). Unlike increasingly specialised crop farming, which typically has longer periods of production, agropastoralists have adapted their herds to cover both their long and short-term needs. The diverse economic markets that livestock provides access to, boosts economic resilience against market and other shocks.

Cattle is also essential for socio-economically challenged demographics, such as the elderly and women. Interviewee 28 described himself and others like him as 'old, unhealthy and unable to work in anything...we have no choice but to live from a cow or a sheep and this is how we peasants survive and eat'. For the elderly and physically less able, the livestock sector provides an income through pasture rental. This is a crucial lifeline as they do not have access to pensions, due to working in the informal sector. Similarly, this has given rural women incomes, many of whom are occupied with domestic and caring labour. Men can find:

other forms of income, but for those who are confined to their homes, this is their only income. The vegetable garden, livestock, this is mine and for my needs. Ok, I must take out some money from this for the weekly shop, but I also eat, I also have expenses, I also contribute [labour], and I also want to fulfil my needs. (Interview 10).

Thus, cattle supports those who are excluded from social-state benefits, helping them to stay on their land, and reinforces the economic agency of women in agriculture, who face gendered employment barriers in other sectors.

Agropastoralists have constructed several socio-economic agreements to work with and own cattle, facilitating the involvement of the most resource poor in this economy. Co-ownership or half-share systems are commonplace alternatives to the outright ownership of animals, especially for those who cannot afford to buy cows; this is referred to as possessing cattle in '*compañía*' or '*al valor*'. In this arrangement the principal owner of the cow loans the animal to a partner, who assumes the cost of upkeep and invests

their labour. This agreement usually occurs when farmers are experiencing acute financial difficulty or poverty, leading them to sell their own cattle to pay for urgent debts or costs. Instead of being left with no income and no option but urban migration, they ask buyers to 'leave them the cow *en compañía* because one can keep earning from the sale of milk and from the offspring it gives, which one shares with their co-sharing partner' (Interviewee 19). After the cow is sold, the principal owner is re-paid the original investment, and the remaining profit and offspring are divided between both parties. This system effectively combines loaning and co-ownership, which enables agropastoralists to cover their daily needs through milk sales but also build their livestock herd in the long-term, preventing de-pastoralisation in the páramos. It also evidences an alternative value system of support and solidarity, which goes beyond profit.

Strengthening autonomy through favours and the solidarity economy

Agropastoralism in the Boyacá páramos depends heavily on a complex system of social interrelation and co-operation, which is evidenced through favours. Participants noted that the livestock half-share agreement was driven by favours and:

more by friendship or because sometimes one is short on money and doesn't want to sell their animal completely, and so asks their neighbour: Look, if you have any spare money, buy this animal from me but leave it with me [in co-partnership] (Interview 23).

Favours are key to other socio-economic transactions between agropastoralists and *lecheros*, keeping the informal milk market afloat. *Lecheros* are milk intermediaries who collect milk from remote locations for cheese making factories in urban centres.

A *lechero* in Socha explains:

the producer asks us for many favours- to take them [items], to bring them [down to the town], to do them a favour. One needs to be conscious that sometimes we [*lecheros*] are the only way they [*peasants*] access the municipality, right? The urban centre. They ask us to bring them staple goods, to take them things, like concentrate for the cows or salt. So, one has to be aware that we have to help the producer (Interview 33).

Lecheros are crucial links to urban centres and central to the functioning of agropastoral activities in the páramos, as they transport key inputs, staple food items and also provide transportation for producers. The system of favours also extends to credit. If the weekly wages made by producers does not cover the cost of goods ordered, *lecheros* will allow campesinos to pay them back the following week. This

solidarity economy of favours strengthens co-operation and social connections between different actors in the milk chain, who support each other in mitigating infrastructural under-development and spatial marginality. This social structure and network of connections supports autonomous exchange in these communities and makes them more resilient to external shocks.

Further evidence of this alternative economy is the existence of bartering using milk. Producers noted a preference for receiving consumable goods from *lecheros* instead of money, in exchange for milk:

one tells the *lechero*: do me a favour and bring me a box of raw sugar cane and one discounts the cost of this from the money owed from the milk...as we are paid every 15 days, we use this to cover our weekly food shopping (Interview 11).

These perceived 'favours' are explicitly stated as reasons for why people do not just sell their milk to *lecheros* who pay higher prices: 'we are attached to him [the *lechero*] because he brings us what we need in the house' (Interview 27). Both producers and intermediaries view agropastoralism through a solidarity lens, and not only as a means of profit, emphasising an alternative value system within the páramo milk economy. Together, this exemplifies the more than profit socio-economic strategies constructed around cattle. These social connections, particular to agropastoralism, contribute to re-peasantisation in the páramos, as they support socio-economic resilience within the community through co-operation and interrelation between more resource rich agropastoralists and those with less. In turn, this prevents the most economically marginalised agropastoralists from de-pastoralisation, i.e., the dispossession of their land and herd.

Agropastoral social networks

Although cattle livestock economies have supported processes of re-peasantisation in the páramos, there are also numerous uncertainties related to informal markets that threaten economic loss through precarity. Producers in the informal sector do not work with contracts but oral agreements, therefore, they rely heavily on trust and good will. Consequently, interviewees complained of precarious paying conditions, as some *lecheros* 'have robbed us because they take our milk, but they don't come back and pay us' (Interview 28). However, agropastoralists demonstrated significant resourcefulness and ingenuity in their dealings with milk intermediaries. For more security, producers look for individuals from their own villages to have 'the certainty that the man...is paying us on time' (Interview 28). Having a trusting and honourable *lechero*, who consistently turns up to collect milk and pays on time, therefore, has higher value than short-term profit. Evidently, social networks are

central to mitigating against the inherent uncertainties of the informal market, which in turn strengthens re-peasantisation processes, as it drives communication between producer communities.

The strength of agropastoral social networks is further evidenced by collective agency and organisation in agreements over price freezes with *lecheros*. Using collective action, dialogue and consensus, producers gain assurances that prices will be maintained, even in situations of overproduction. For instance, if the demand for cheese drops and with this milk prices, producers agree to accept ‘cheese as payment [for milk]’ (Interview 15) to ensure stable milk prices. In so doing, they assume a shared loss with *lecheros*, which they rationalise as a ‘favour’ in return. This is because if intermediaries cannot collect milk, agropastoralists do not just lose income and food, but also their links to urban centres. Again, this concept of doing favours reveals the deep interconnections and acknowledged interdependent livelihoods of producers and intermediaries in the informal milk market, which helps to lubricate these social networks.

Agropastoralism and self-management of natural resources

In the context of climate change and significant environmental degradation, which has been heavily linked to the agricultural sector, agropastoralists with small herd sizes have adapted and developed a variety of strategies to save natural resources. Unlike in crop agriculture, which remains largely intensive and heavily input-dependent (Blake et al. 2023), there have been several changes in pastoral systems. This is evident from shifts in pasture management over the last 15–20 years:

before people looked for areas in the páramos and these kinds of places to sow and to open land for pasture. They would deforest to create new land for pasture but these days they don’t do this because people are more aware (Interview 24).

Instead of leaving cattle to graze openly in the upper reaches of the páramo:

they sporadically leave cattle, mostly during the summer, when they leave animals up there to graze this... grass, but this doesn’t do as much [environmental] damage as before. Before they would leave a multitude of animals, horses, sheep, and goats’ (Interview 23).

Interview data reveals that the upper reaches of the páramo are less aggressively managed than lower down the mountain because now only beef cattle is kept above for long-term investment, therefore, daily weight gain is not of a high priority. Farmers do not plough the land in the upper reaches to re-sow pasture, as cattle are left to graze openly

in specific areas, which are restricted using barbed wire and rotated periodically to avoid overgrazing.

On the other hand, lower down the mountain, pasture is renewed every 2–3 years through crop rotation with potatoes, which is partly undertaken to loosen compacted soil. This is an environmentally invasive process, as ploughing with tractors is used where terrain permits, and significant agricultural inputs are applied to ensure high potato crop yields (Robineau et al 2010). This approach is influenced by Green Revolution approaches to agriculture, which arrived in Boyacá in the 1960s. Despite this high chemical input agriculture, pasture for dairy cattle is left to fallow every couple of months through rotation, as producers supplement this with short-term rental (*pastadas*) in different locations and use silage in a few cases. Flexible mobility patterns, the moving of cattle and producers around the páramos, and broad social networks are crucial to accessing short-term pasture rental: ‘I go from one place to another...to see where there may be pasture that someone can rent to me’ (Interviewee 4). This system works to prevent exhaustion of pasture, as Interviewee 28 notes: ‘one cannot leave them [the cattle] a long time because there is little pasture, so I have to go about to rent pasture’. This is illustrative of using short-term pasture rentals to conserve or manage environmental resources, which contrasts to Green Revolution extractive processes.

These grazing changes have been partly enabled by the introduction of different breeds of cattle (namely Normande, Holstein, Swiss Brown, and Simmental) that produce more milk and meat. In turn, this has facilitated a shrinking of herd sizes over time, as agropastoralists realise ‘that one does not want to have the same 15 or 20 cows that they had before because there are greater advantages of having 5 or 6 cows of these other breeds...to also reduce expanding the agricultural frontier’ (Interview 36). There is a lack of statistical data over time tracking herd sizes and composition in the páramos but these changes were consistently repeated in interviews. Transitions in herd composition and size are again linked to interrelations between agropastoralists, as interviewees mentioned the insemination of dairy cows took place through borrowing a bull from neighbours: ‘here between neighbours, we take the bull to our farms and then return it’ (Interview 9). This system also depends on mobility (the moving of cows from a neighbouring farm). Together, this builds autonomy in production strategies, as producers avoid relying on external experts for insemination.

Interview participants also noted that there is increased conservational awareness about fire to promote pasture growth or expand the agricultural frontier. In Socha, ‘before wherever one used to walk, they could find a burned *frail-ejón* or trees that had been burned. Now it’s not like that’ (Interview 30). Although CORPOBOYACA’s 2020 report noted an increase in fires, indicating this continues to be a

problem, interviews reveals a growing understanding of the negative environmental consequences of fire in the páramos. In Socha, this awareness is partly explained by the presence of armed groups prior to the peace process, who controlled fires using threats: ‘the groups that operated outside of the law said that any person who burns the páramo, or who continues to burn the páramo, is a dead person’ (Interview 30). This system of violence or threats existed alongside state regulatory mechanisms, e.g., fines. The state has also allegedly used threats of land dispossession for conservation in some places, as an interviewee in Gámeza recounted they were displaced from their land by *Parques Nacionales* [National Parks], due to the area falling within territory designated for a national park. Although this relates to a different state institution and not CORPOBOYACA, who is overseeing the delimitation process, it points to existing examples of ‘green grabbing’ and why there is a continued fear of dispossession linked to conservation. These different threats—both extra-legal and legal—have motivated changes in livestock practices, resulting in de-pastoralisation for those who have experienced ‘green grabbing’ of their land, but also greater conservation awareness in some areas of the páramo.

Agropastoral mobility and social networks: laying the foundations for agrobiodiverse conservation in the páramos

Agropastoralists across the páramos in Boyacá and globally have been priced out of crop farming—from wheat, to barley and potatoes—evidencing de-peasantisation pressures. In the páramos of Boyacá, however, the cattle livestock sector has been stable and provided income to cover losses from crop agriculture, triggering a transition towards agropastoralism. Over time, páramo producers moved away from mainly growing cereals and other crops with a small number of different livestock species (including sheep, pigs and cows) for domestic consumption, to relying on cattle for income with some crops (such as potatoes), used in rotation with pasture (Instituto Humboldt 2011, 2015). This change has been facilitated by more specialised cattle breeds, which have increased the production of milk and meat. In turn, this has also reduced herd sizes and the area of land needed for grazing. In the case of agropastoralists with small herd sizes, this has changed land use in the upper reaches of the páramo, which is used specifically for beef cattle in more controlled ways through paddock rotation. Additionally, this land is not tilled for pasture renovation, as is common practice lower down the páramo in pasture used for dairy livestock. These agropastoral systems rely on strong social connections and solidarity, which have kept producers on their land and in agriculture. This paper is not making a

quantitative assessment on the number of people who have returned to farming but a qualitative analysis of re-peasantisation, which evidences how agropastoralism connects producers spatially through mobility, and in turn enhances socio-economic interconnection/autonomy in marginalised contexts.

As noted above, earnings from beef enable producers to re-pay loans for losses incurred by crop agriculture, helping those who cannot access crop insurance to mitigate against fluctuating market prices and climate related complications, such as drier seasons. The *compañía* or *al valor* system also supports the most economically precarious farmers by covering their daily costs, whilst simultaneously providing a crucial means to re-build cattle herds in the long-term (Merry et al 2004). This further emphasises the different ways in which livestock systems provide a socio-economic buffer, keeping producers on their land and in agriculture. These production and sale systems are not unique to the páramos or even Colombia, making the findings from this case study generalisable for much of the country and other pastoral areas. Although, the delimitation process and its sustainability transition are particular to this case, it provides lessons for other cases of ‘green grabbing’ in pastoral communities (Butt 2011, 2014). This is because the proposed sustainability transition could undermine the socio-economic safety nets and complex co-ownership systems created by agropastoralists, which are crucial to their socio-economic survival and connections to the land.

The half-share agreement is but one example among many of a grassroots solidarity economy based on non-economic or extra-economic concerns (Bauhardt 2014). These varied expressions of the solidarity economy not only increase resilience against de-pastoralisation but boost social connections and increase interdependence, all of which evidence agropastoral autonomy. Nori cogently notes that these expressions of support exist because ‘the high transaction costs, distortive measures, asymmetric relationships, and related uncertainties generated by the market dimensions to pastoral economies are typically dealt with through substantial investment in... social capital [which] provides the financial and socio-cultural assets to navigate trade dynamics’ (2019, 18). In the páramos, favours or the solidarity economy, as well as the strong social networks/connections on which these are premised, are essential aspects of this social capital. Moving away from livestock farming, towards more isolated and individualised forms of ‘sustainable agriculture’ such as apiculture for instance, would fragment these deeply interconnected social landscapes.

Agropastoralists in the páramos have built bonds of cooperation with other producers and intermediaries along key commodity chains, such as milk. In the absence of mechanisms ensuring accountability in informal markets, producers use their own tools. For example, they assume losses

from further down the milk chain by purchasing cheese or accepting payment for milk in cheese, to ensure the continued collection of milk and its processing. Creativity is also evident in how agropastoralists use and maintain wide social networks. These networks provide crucial information on market prices, technology, best practice, and the performance of intermediaries/other individuals in dairy and meat commodity chains. Social accountability creates pressure on *lecheros* to abide by regular payments because reputational damage impacts their ability to attract further clients. This informal, non-digital system of reviews exists due to strong communication and connections between agropastoralists, which is helped by mobile phone technology and mobility patterns that build new connections across geographically disconnected areas. Together, this is constitutive of autonomy through interrelation and alternative forms of exchange that are governed by values of solidarity and community benefit. These examples enable a practice driven definition of autonomy and re-peasantisation.

For decades agropastoralists have been adapting to and coping with environmental uncertainties (Scoones 2021) related to climate change, and in Boyacá also because of environmental degradation linked to agriculture. However, they have found innovative ways to manage and renew their resource base, which is a key aspect of re-peasantisation. Government institutes highlight cattle livestock practices as environmentally degrading, particularly the use of the upper reaches of the páramos, without acknowledging the shifts that have taken place in the last 15–20 years amongst agropastoralists with small herds. These include the introduction of different breeds of cattle, shrinking herd sizes and higher levels of ecological awareness evidenced by transitions in pasture management. These changes are illustrative of a process of evaluation and redefinition of ‘herd composition, structure and management strategies and practices’ to enhance ‘the effective use of available resources and opportunities’ (Nori 2019, 8).

The erasure of mobile livestock systems would negatively affect agropastoral social networks and natural resource saving strategies. Mobility is essential for the sourcing and use of short-term pasture rental, which prevents farmers investing more money in concentrate through continued access to fodder. This not only boosts the autonomy of these communities from agribusinesses by reducing dependency on synthetic feeds, but also lessens environmental damage.² It also strongly exemplifies re-peasantisation because social networks facilitate short-term and quick access to paddocks. Together, this emphasises the importance of mobility around the páramos, which connects farmers and pasture landowners across an expansive landscape. If agropastoralists are pushed towards more sedentary forms of agriculture, this movement, connection to landscape and people would be irreparably compromised. Moreover, Colombian research

institutes and the departmental environmental agency have not considered how short-term rental of pasture could further reduce pressure on using the upper reaches of the páramos. Nor have they recognised the importance of this system to avoiding overgrazing and land compaction.

It would be prudent for policy makers to consider how grazing can be used as part of a conservation agenda, embedded in agrobiodiversity, instead of simply outlawing it from protected areas. Examples of this were touched upon in the methods section, including sustainable ranching (Ferguson et al 2013) or regenerative grazing (Otálora et al 2021). Loring (2022) also argues that seasonal higher grazing in the winter has been used in the Burren region of Ireland as part of a regenerative approach to agriculture and conservation. In this case, livestock have helped to boost biodiversity, soil, and plant health. The state entities working on the delimitation process have not recognised these above-mentioned shifts in productive strategies, nor have they explored the potential to use seasonal higher grazing. Small-scale agropastoralists are on the front lines of climate change and natural resource scarcity, their livelihoods depend on adapting to a changing climate and effective self-management of resources, as this area has historically been underserved and disconnected by state institutions (Instituto Humboldt 2015). For this reason and the evidence of changes in livestock keeping practices, it is important to explore how agropastoralism can be used to build an agrobiodiverse approach to conservation in the páramos.

It is also important to note that many interview participants admit that their use of chemically intensive agriculture (Robineau et al 2010), fire for slash and burn agriculture (Instituto Humboldt 2011) and deforestation using fire (Hofstede 1995) have had adverse consequences on the páramo environment. Moreover, whilst producers still plant several different crops, farm biodiversity levels have dropped over the years, due to agricultural specialisation and intensification (Blake et al. 2023). Macro-economic policies have shaped this trajectory, and require re-dress alongside conservation policies, to enable agropastoralists to become potentiators of agrobiodiversity. As Perfecto, Vandermeer and Wright convincingly argue, higher levels of planned biodiversity have ‘a positive effect on associated biodiversity’ (2019, 239). This points to the need for highly biodiverse farms and pasture, which tie conservation objectives more effectively with agroecosystem and farm level planning. Building on existing practices and shifts, this approach can support agropastoralists to boost positive environmental

² Intensive production of crops for animal feed is a primary factor behind deforestation in areas such as the Amazon, as it pushes monocultural production of commodities such as soy in the Southern Cone of Latin America and in Asia, which requires chemical intensive methods of production (Gliessman 2015).

biocultural diversity (Haider et al 2020), which would also support re-peasantisation. Equally, this would reduce socio-ecological tensions around the delimitation process.

Conclusion

This paper argues that agropastoral production strategies in the páramos of Boyacá are contributing to re-peasantisation through social networks (cooperation and interrelation) and mobility, which connects producers across vast landscapes and supports self-management of natural resources. Interviewees repeatedly underlined that without cattle they would have to abandon agriculture and their land, as milk sales cover vital daily needs, while the sale of beef is a long-term saving and safety net. The existence of co-ownership or half-share agreements around cattle also provides socio-economic support for the most economically marginalised agropastoralists. Once again, this enables them to fulfil their daily needs but also re-build their herds in the long-term. Cattle enables producers to stay on their land, in agriculture and in the páramos themselves, against a global, national, and local trend of de-peasantisation.

Agropastoralism not only keeps producers from abandoning agriculture, but it also contributes to re-peasantisation. This paper has demonstrated that agropastoral production heavily relies on cooperation and interrelation, due to particularities related to the production and sale timescales of milk that require frequent connection with *lecheros*, as well as through numerous examples of the solidarity economy and community support. Some of these include half-share agreements where wealthier neighbours or friends support those who are economically struggling, the lending of bulls for insemination, accepting payment in cheese or milk, the transport of goods/food by *lecheros*, as well as the offer of transport by *lecheros* to name but a few. Moving away from a normative understanding of autonomy, these examples illustrate concrete ways in which agropastoralists build socio-economic autonomy. These practices make these communities more autonomous by providing a safety net that the state does not give them, reducing numerous costs (insemination or transport of goods/people), and compensating for economic precarity using alternative economies, such as bartering. Many of these examples also enhance the economic resilience of agropastoral communities, as they reduce dependence on agribusiness companies, e.g., for insemination technologies or animal feed, and keep these informal economies afloat in moments of market shock.

Mobility and the flexibility that comes with it is another essential factor that supports re-peasantisation. Movement around the páramos of livestock, people and produce is crucial for connecting producers to each other, to *lecheros*, as well as to the landscape. This allows agropastoralists to

source *pastadas* (pasture rental) at short notice, which prevents over-exhaustion of pastures and additional purchase of animal feed. In so doing, this exemplifies both autonomy and self-management of natural resources and qualitatively demonstrates re-peasantisation. Mobility is also crucial to changing grazing patterns in the upper reaches of the páramos, which are now only used for smaller herds of beef cattle. The movement of dairy cattle also creates new connections between people and place across the páramos, which is crucial to the pasture rental system. A spatial lens and analysis of movement is an innovative methodological contribution to the re-peasantisation literature, which importantly reveals how mobility and flexible production strategies contribute both to the building of autonomy and natural resource saving strategies.

The páramos of Boyacá hold important insights and implications for conservation projects in pastoral regions, which look to phase out or transition mobile agropastoral systems. Current environmental studies on the páramos do not note the potential agrobiodiversity gains and rich socio-ecological practices within small agropastoral systems. Although there are global calls for a shift away from livestock, due to the negative environmental consequences of intensive and extensive production, this paper has highlighted the ways in which small agropastoral production could not only positively impact conservation but also re-peasantisation. Any future sustainability transition in the páramos that looks to push agropastoralists towards more sedentary activity, will undermine this complex and rich socio-ecology. Instead, policy makers should build on the shifts that have taken place in the last 15–20 years, such as shrinking herd sizes and shifting grazing patterns, to explore pathways towards agrobiodiverse farms, which rely on mobile production strategies and use of the landscape, instead of land sparing through protected areas. Further research should be done on the inclusion of rotational grazing in the upper reaches of the páramos, as in other global cases. Agropastoralists must be given incentives and support for organic farming, as with milk, so that crop agriculture can better integrate with livestock holding, to further diversify livelihoods and boost positive environmental feedback. This is because agropastoralism supports autonomous socio-ecological connections between land, agriculture and communities, something which more sedentary agriculturalists around the world can learn from. Any future substitution or reconversion strategies within the delimitation process in Boyacá must take this into account, particularly, to prevent socio-economic and cultural loss but also to ensure the success and longevity of sustainability transitions in the páramos.

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