Ecologically and Socially Sustainable Livestock Development in Marginal Areas

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ABSTRACT

"Marginal areas" are perceived as difficult and unproductive landscapes, always under the threat of drought, desertification and poverty. Yet, both dryland and high altitude marginal areas have an extraordinary output of livestock products; in the efficiency of producing human-edible protein they far surpass more fertile areas. This productivity under adverse climatic conditions rests on sophisticated strategies and social institutions developed by pastoral communities to deal with variability in the availability of resources. It depends on the use of animal genetic resources that are adapted to make best use of local vegetation and can cope with seasonal variations in availability. Livestock production in marginal areas is based on the principle of opportunistic and optimal use of available resources; it differs fundamentally from the principles of mainstream animal science in which everything is measurable and predictable. The first requisite for ecologically and socially sustainable livestock development in marginal areas is recognition of this fact. Secondly, interventions should focus on enhancing the opportunistic use of resources whose availability is unpredictable. Building on this principle, further essential policy measures include support for mobility and modern communication, securing the commons, payment for environmental services as well as value addition and dedicated marketing channels for the high quality livestock products generated. The UN Convention on Biological Diversity (CBD) provides the legal framework for such an approach and Biocultural Community Protocols as mandated by the Nagoya Protocol on Access and Benefit-Sharing are an important first step towards leveraging such supportive measures.

Key words: Access and benefit-sharing, Biocultural community protocols, Biodiversity, Climate adaptation, Climate resilience, Mobility, Pastoralism

Introduction

Marginal areas are defined as those that are not suitable for crop cultivation, either because of the low amount and unpredictability of rainfall (drylands) or because of the difficulty of terrain and the shortness of the growing season due to low temperatures (mountainous areas). Such areas compose a major part of the world, but they are viewed as remote and difficult to deal with, prone to desertification and drought (drylands) or erosion (highlands). Overgrazing is perceived as an almost inbuilt phenomenon of livestock keeping in these areas.

Extraordinary output

This perception by the general public and by policy makers is in stark contrast to the actual productivity of "marginal areas" and masks the enormous output of livestock products from these areas. The example of India illustrates this very well. India is the largest exporter of sheep and goat meat in the world, exporting close to 23 MT of sheep & goat meat valued at almost 7000 million INR in 2013-14. Most of this meat went to Arab countries, including United Arab Emirates, Saudi Arabia, Qatar, Kuwait and Oman (APEDA). India is the world's largest milk producer and the

world's biggest exporter of beef. It feeds Bangladesh, Egypt, UAE, Saudi Arabia and Algeria with milk and Vietnam Social Republic, Malaysia, Thailand, Saudi Arabia, Egypt Arab Republic and UAE with meat. We can say with some certainty that the sheep and goat meat has been produced practically in its entirety in India's marginal rain-fed areas. For beef/buffalo meat and milk it is a bit more difficult to pinpoint the contribution of marginal areas, but it very likely amounts to more than 50%.

For Africa, statistics show the enormous output of its drought prone countries in the Sahel (Krätli *et al*., 2013). The continent has an estimated 50 million pastoralists and up to 200 million agro-pastoralists. In Chad, pastoral animals make up over one third of exports and feed 40% of the population. In Ethiopia, the livestock exports generated by pastoralists are the second most important foreign currency earner after coffee. In Kenya, livestock raised by pastoralists is worth US$ 800 million a year. In Mali, exported live animals were worth US$44.6 million in 2006. In Mauritania livestock contributes 70% of total agricultural GDP. The traditional livestock sector in Tanzania produces 70% of the country's milk, which was 770 million liters' in 2006. Uganda's pastoralist and smallholder livestock producers contribute 8.5% of total GDP (IIED, 2010).

These figures do not even capture the outputs completely, as they do not include products used for household consumption, milk marketed unofficially, as well as hides, manure and animal power (WISP, 2008).

High degree of diversity of fodder plants

As marginal areas, by definition, are either not cultivable, or can be cropped only during a few months out of the year, livestock is raised either on natural vegetation or on crop aftermath. Thus livestock utilizes an enormous biodiversity comprised of trees, shrubs, grasses and crop by-products – resources that would otherwise go to waste.

An example for use of biodiverse highland resources is provided by the *Gaddi* who migrate between winter pastures in the foothills and summer grazing in the Alpine meadows of the Himalayas. Their sheep and goat utilize 84 major fodder trees and 40 shrubs with high nutritive value in the Himalayas (Misri and Dev, 1997). The *Raika* camel pastoralists furnish another well-studied example of the use of biodiverse resources: their camels feed on 36 different forage plants (LPPS, 2013).

Nutritional value

An increasing body of evidence shows that the nutritional quality of products from pasture raised livestock is higher than that of stall-fed animals. These studies have been undertaken in developed countries and often focused on the proportion of omega 6 versus omega 3 fatty acids which is better in pastured animals (Daley *et al.*, 2010; Wood, 2008). Investigations in India comparing meat and ghee quality from animals raised in the *Thar* desert with those raised on farms appear to confirm this (Kamal Kishore, pers. comm.). Local people have a strong belief in the superiority of products, especially ghee, from pastoral systems and ascribe this to the diverse diet of livestock kept in such systems. This remains a neglected research topic, because such (micro-) nutrient analyses are expensive.

Production of human-edible protein

Mobile pastoralist systems are amazingly efficient with respect to the production of animal protein. Protein efficiency is measured by the Human-Edible Protein Balance (H-EPB),

an index value that represents the edible protein output that is produced per unit of human edible protein input that was required to produce it. When comparing H-EPB on a country-by-country basis, countries with a high proportion of marginal lands, such as Ethiopia, Kenya and Mongolia come out on top, while countries such as Europe and USA trail far behind. This is due to the fact that the former have functional pastoralist systems who convert cellulose rich vegetation into protein by means of their ruminant populations. Kenya for instance produces 20 times as much animal protein as it uses to feed its livestock (FAO, 2011).

Pastoralist strategies and social institutions for exploiting variability

The utilization of marginal areas for livestock and food production requires knowledge, experience and social institutions. Knowledge and experience are necessary for the successful management of livestock in tune with the availability of the two critical resources of biomass and water. This knowledge is not learned through formal education, but passed on from one generation to the next and not only among humans, but also among the herds: young animals learn from their elders about what and where to graze and not to graze.

Mobility is essential for the successful raising of livestock in marginal areas (Krätli, 2015) and a number of African studies indicate that output generated per acre or hectare - is actually higher in pastoral systems than in ranching (Scoones, 1995). Research in south-western Uganda indicated that returns per hectare are 6.8 times greater in pastoralism than ranches (Ocaido *et al*., 2009). In Southern Darfur, Sudan, calf mortality in migratory herds is 11% whilst in sedentary herds it is 40%. Similar observations hold true for India as well: the health of migratory flocks is generally better, as are reproductive rates, according to information provided by sheep pastoralists who migrate between Rajasthan and Madhya Pradesh (own data).

Much of marginal land is not privately owned, but represents "commons". Social institutions are essential to provide access to and to equitably use such resources. One such social institution is the *patel* system in Western India n which shepherds form herding groups under the leadership of a *patel* who is in charge of negotiating access to harvested fields and to sort out disputes that arise during migration. *Patels* are elected annually before the migratory cycle starts anew. Herding groups are newly constituted at this time as well.

Animal genetic resources

A prerequisite for utilizing marginal lands is livestock that has the ability to walk long distances, that can thrive on fibrous and thorny vegetation and that can cope with both seasonal shortages and abundance of biomass, in short that is adapted to variability. Pastoralist animals must be able to rough it out through droughts and the way they manage to do this is by temporarily lowering their metabolic rate, so as to avoid any unnecessary energy expenditure. For these reason, breeds adapted to marginal areas are recognized as being of great value for climate change adaptation (Hoffmann, 2013).

Development interventions

Historically, most livestock development interventions in marginal areas have not been successful as they fail to acknowledge the need for mobility on one hand and are dominated by the automatic assumption that land is being "overgrazed" on the other. A classic example is that of the settlement policies for nomads in Inner Mongolia (Li *et al*., 2011) and in Tibet (TCHRD, 2015) in order to protect the

environment. Yet it is lack of mobility that leads to overgrazing. As long as livestock can be moved around, livestock populations adjust to the availability of resources, with droughts leading to loss of animals and reduced reproduction rates. Due to enormous subterranean root systems most desert vegetation quickly recovers if left ungrazed for even short periods of times. Furthermore, grassland requires some degree of grazing pressure to be maintained; in the absence of grazing shrubby vegetation takes over.

In order to prevent overgrazing and to ensure best use of resources as well as optimal level of animal health, livestock development interventions in marginal lands should be oriented at enabling mobility and at securing space for livestock, including for the movement between different grazing areas. Unfortunately, mobility continues to be regarded as undesirable and as associated with backwardness. For example, in India, the National Commission on Denotified, Nomadic and Semi-nomadic tribes in a recent report makes frequent references to animal herding nomads, including the *Gaddi* of Himachal and the *Rebari* of Rajasthan to underline their backwardness and their exclusion from the mainstream. It describes nomads as being marginalised from the social and economic mainstream, having a low human development index and a high deprivation index, being deprived from the gains of planned development, of not being empowered and of being carriers of social stigma (National Commission For Denotified, Nomadic And Semi-Nomadic Tribes, 2008). While it is certainly true that a nomadic way of life has many challenges, it also has its own rewards, among them higher economic returns from livestock than if kept in a sedentary system.

Land (user) rights

Marginal lands have many competing uses which have increased in recent years, including for energy generation and mining, as well as conservation. While these are also essential activities, there must be awareness that these proceed at the expense of food production and food security. Furthermore, conservation and mobile herding are mutually compatible and should not be separated from each other. Disappearance of common grazing grounds is perceived as biggest threat by pastoralists. Formal recognition of user rights would go a long way towards encouraging sustainable livestock production in marginal areas.

Value addition

Products from marginal areas have high nutritional value and are extremely tasty because of the herbs and shrubs that livestock grazes on. These factors and their heritage value make such products very appealing to consumers and have great potential to generate higher prices. This requires the setting up of special marketing channels and branding rather than selling a generic product. While pastoralist products do not conform to formal organic standards as the feed stuffs are not "certified organic", they can be marketed as natural products.

Payment for environmental services

Livestock performs valuable environmental services in marginal areas. It maintains grasslands which act as important carbon sinks and mitigate climate change. The dense root systems of grassland purify groundwater. It transports seeds and helps with their germination. Some plants disappear if not grazed upon and with it certain wildlife species. In Europe, grazing with livestock is

recognized as important tool for biodiversity conservation and is frequently supported by nature conservation agencies. This approach needs to be further disseminated.

The role of the UN Convention on Biological Diversity (CBD) and the Nagoya Protocol

The legally binding UN Convention on Biological Diversity (CBD) in its Article 8j commits its signatory countries *to respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity*. Pastoralists/livestock keepers inhabiting marginal areas most certainly embody such traditional lifestyles, nevertheless they have received scanty support or recognition from national governments that are contracting parties to the CBD. In 2014, the Nagoya Protocol on Access and Benefit-Sharing came into force. For the purpose of implementing benefit-sharing agreements for local and indigenous communities, it mandates the establishment of community protocols in which communities document their role in biodiversity conservation and articulate their demands for access and benefit-sharing (Köhler-Rollefson and Meyer, 2014). A number of livestock keeping communities from India, Pakistan and Kenya have developed such community protocols, also referred to as Biocultural Community Protocols or BCPs (Köhler-Rollefson *et al*., 2012). These represent an important tool opportunity for pastoralist communities to put on record their contribution in terms not only of their genetic resources but also in terms of food production while conserving biological diversity. Their wider application could help governments better understand the important role of communities in marginal areas and eventually, it is hoped, convince them to orient their policies to support mobile pastoralism rather than try to force it into the regimented patterns promoted by mainstream animal science.

Conclusion

Research needs to make visible and provide proof for the largely unrecognized role of marginal lands and their livestock keepers in efficient production of animal protein to drive home this point. This research needs to be participatory as it cannot be conducted "under controlled conditions" on a government farm. It should be conducted in close association with pastoralist communities and at the same time support them to develop Biocultural community protocols in an effort to secure their rights under the CBD.

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