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From Degraded Pasturelands to Climate-Smart Livestock Production Systems in Northwest Cameroon

DANILO A. PEZO,[1] MUHAMMAD IBRAHIM,[2] AJAGA NJI,[3] JONATHAN AGWE,[4] AND CHICK HERMAN AZAH[5]

The Tugi Silvopastoral Project (TUSIP) is a climate-smart livestock and pasture management pilot program that was introduced in the village of Tugi in the Gutah Hills of the Northwest Region (NWR) of Cameroon in January of 2010. TUSIP is a World Bank-supported initiative of South-South Cooperation between the Tropical Agriculture Research and Higher Education Centre (CATIE) based in Costa Rica, and the Akwi Memorial Foundation, which is an NGO based in the NWR.

Crop-livestock systems are the most prevalent form of agricultural land use in the Gutah Hills of Cameroon. Livestock production is one of the main livelihood strategies used by families living in the area, and throughout the larger NWR enabling them to accumulate assets and capital that can be crucial in ensuring the survival of their households in times of crisis. Livestock also provides a major pathway through which poor rural families can improve their incomes and social status. However, the combined threats of food insecurity, under-nutrition, poor health conditions, and climate change subject these communities to serious stress, limiting their ability to cope with each respective threat and undermining efforts to reduce poverty.

Livestock in the NWR is managed using traditional technologies in an extensive agro-pastoral system that regularly encroaches on fragile and protected areas. These traditional technologies and practices are markedly unsustainable, and entail poor integration of crops, trees, and livestock. They include the use of fire to control weeds and external parasites in cattle as well as to eliminate residues and the over-matured grasses that are less nutritious for animals. Combined with a continual increase in stocking rates over time, these practices have resulted in widespread decline in soil fertility and loss of soil cover that leaves the land more prone to erosion. Pasture degradation is characterized by the loss of edible forage species and its replacement by less palatable grasses and weeds. Patches of bare soil are observed in the pastures, and are easily eroded by rains. The incursion of pasture land into what little forest area remains has led to substantial biodiversity loss, and to reductions in available water. Water quality has also been adversely affected because animals are watered directly from the streams, damaging the existing vegetation and soils in the adjacent riparian forest as well. This pattern of land use has also increased emissions of greenhouse gases and severely diminished the volume of carbon that is sequestered in local soils and biomass.

Poor pasture management is moreover a source of frequent conflict between pastoralists and farmers because animals invade croplands in search of food they cannot find in the overgrazed, degraded pastures, particularly during the dry season.

Source: Authors.

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HOW PASTURE DEGRADATION AFFECTS CROP-LIVESTOCK FARMERS

Livestock animals become less productive on degraded pastures, with stocking rates between 0.5 - 0.7 animal units per hectare.[6] Cattle take between six and seven years to reach market weight, compared to cattle raised in healthy pasture, which typically take between three and four years. This loss in animal productivity leads to substantially less income and to lower rates of capital turnover for producers. Producers are less able to manage risks on degraded pastures, and are more vulnerable to the impacts of severe droughts or floods. Degraded pastures also lead to more transhumance—seasonal migration between different areas—forcing younger family members to periodically leave their households for longer periods to bring their cattle and small ruminants to areas where they can feed.

OTHER FACTORS LIMITING LIVESTOCK DEVELOPMENT IN THE GUTAH HILLS

Access to markets is an additional limiting factor in the Gutah Hills. Because the local cattle market at Acha-Tugi has no weighing scale, prices are negotiated based on animals' appearance rather than on their body weight. Farmers negotiate the price of each animal individually. The middlemen who purchase the cattle take them to larger markets such as the one in the provincial center of Bamenda, where they are able to capture a significantly higher proportion of the margin than the producers they buy the animals from. Pastoralists who raise cattle also face a serious risk in the form of cattle rustling and the possibility that their best animals—or even their entire herd—may be stolen in a single night. Poor roads and the high costs of transporting animals to markets affect livestock producers in general, but smallholders who rely more on small ruminants tend to be disproportionately affected. The effects of these shortcomings on profits combine to undermine the incentives for producers to invest resources in improving production systems.

Access to technology information and services is another limiting factor, one that is exacerbated by the lack of farmers' organizations and the limited presence of government officials and extension agents at the village level. There is only one Veterinary Technical Assistant (VTA) based in Tugi, and his sole responsibility is to administer vaccinations to prevent transmissible diseases. The VTA offers farmers no practical recommendations or advice on pasture and natural resources management, feeding, breeding, or other technical issues.

STRATEGIES FOR THE REHABILITATION OF DEGRADED PASTURES

The majority of the grazing land in Tugi and the rest of the Gutah Hills is currently classified as severely degraded - less than 40 percent of the available plants consist of edible species. The generally prescribed course of replacing standing vegetation in its entirety before planting new seeds is untenable in the Gutah Hills owing to the sloping topography and torrential seasonal rainfalls that are characteristic of the area. These make the prevention of soil loss through the maintenance of groundcover a practical imperative. The area also lacks machinery for land preparation, and extremely labor intensive hand weeding using a cutlass is required to reduce weeds that compete with forage plants.

A very different pasture rehabilitation strategy is therefore recommended, one based on principles of restoration ecology that purposefully minimize soil disturbance. Seeds and vegetative materials can be planted in the empty spaces left after removing weeds or where there is already bare soil, with minimal disturbance to topsoil. These types of measures will be instrumental in reducing the costs of pasture rehabilitation.

While protecting soils from erosion is a practical imperative, the most important measures for ensuring successful pasture rehabilitation involve preventing animals from defoliating edible grasses – both regrowth of existing grasses and newly planted grasses. Optimally, this is achieved by installing fences around the perimeters of fallow areas. The fences remain in place after the area returns to production in order to create a rotational system of grazing areas. Unfortunately, the cost of fencing is quite high. In TUSIP, the cost of a durable dead fence line was estimated at 107,000 Central African CFA francs (about US$215) per 100 meters – or $890 per hectare.[7] This cost is well beyond the means of many livestock farmers in the NWR and seriously compromises the economic feasibility of this sort of intervention. Financial analysis suggests that combined with other costs associated with rehabilitation, the cost of fencing would not be covered by the projected increase in the value of beef production (at least not within the 12 year period used in the analysis). Among these other costs of rehabilitation is the opportunity cost of foregone income from removing areas from production for about one year – a measure that is essential to restoring areas under rehabilitation. Finally, when a given area is excluded from grazing, the carrying capacity of the surrounding pasture is proportionately reduced. To prevent overgrazing on these areas, two general options are available. The first is to sell off a number of animals to

TABLE 1. Potential Effects of Pasture Rehabilitation, with and without the Use of Fodder Banks, on Livestock Productivity, Methane Emission, and Nitrogen Excretion in Tugi Village

Parameter	Pasture/Feeding Strategy		
	Degraded	Rehabilitated	Rehabilitated + Cut & Carry
Stocking rate, animals/ha	0.50	1.75	2.00
Time required to reach 400 kg body weight, years	6.3	4.3	3.6
Average live weight gain from 200 to 400 kg, kg/day	0.185	0.287	0.495
Beef production per hectare from 200 to 400 kg, kg/ha/year	33.7	183.1	361.1
Animals between 200-400 kg body weight			
Methane emission, kg/animal/period	118.1	105.3	90.4
Manure excretion, kg/animal/period	2201	1839	1368
Total nitrogen excreted, kg/animal/period	67.5	60.4	48.0

provide up-front income to cover the costs of rehabilitation. The second is to precede rehabilitation with the establishment of a fodder bank to complement grazing. While fodder banks require additional investment, the level of intensification they make possible would make such interventions economically feasible in the long run.

In addition to providing for higher carrying capacity and improved animal nutrition (and weight gain), rehabilitated pastures also benefit the environment. Animals that graze on rehabilitated pastures emit less methane and excrete less nitrogen than animals that graze on degraded pastures. Many of the improvements that are brought about by rehabilitation can be measurably enhanced through "semi-zero grazing"- in which animals remain in enclosures but are periodically let out to graze. Rehabilitated pastures can also be highly effective carbon sinks, particularly where tree plantations are planted or secondary forests are allowed to grow in areas formerly used for grazing. Table 1 presents the expected effects of pasture rehabilitation in Tugi, with and without the use of fodder banks to complement grazing.

The availability of funds for investing in pasture rehabilitation is the most significant constraint for livestock farmers in the Gutah Hills; therefore potential options to ease this are required. Given that fencing is the largest component of the total investment cost, subsidizing at least 50 percent of the costs of fence installation is proposed as a viable option (Table 2). Such a subsidy can be arranged in a number of ways. Providing cash to pay for the purchase of fencing materials is one possibility. However, providing materials such as barbed wire might be a better way to ensure that good quality materials are used. Another possibility is to link the subsidy to the planting of trees that protect water sources. Another is to provide credits with a subsidized rate of no more than 7 percent. Such credits would however only work if pasture rehabilitation is accompanied by planting fodder banks, in which case permitting grace periods on the loans is recommended.

TABLE 2. Net Present Value (NPV) and Internal Rate of Return (IRR) for Rehabilitation of Degraded Pastures and Use of Fodder Banks with Native Cattle in Tugi Village

Scenarios	No Subsidies		50% Fencing Costs Subsidized		100% Fencing Costs Subsidized	
	NPV, US$	IRR, %	NPV, US$	IRR, %	NPV, US$	IRR, %
Animals between 200 - 400 kg						
Degraded vs. rehabilitated pastures	(- 488.99)	(- 2.95)	(- 77.46)	5.50	334.06	30.68
Degraded vs. rehabilitated pastures + fodder bank	92.77	9.09	524.87	15.71	936.39	26.65

The environmental benefits of pasture rehabilitation are themselves a powerful justification for policies that are oriented towards improving incentives. These benefits include not only pronounced improvements in soil and water quality and availability and reductions in methane and nitrous oxide emissions, but also the prevention of pasture expansion into forest relicts.

Source: Authors.

OTHER MEASURES TO ENCOURAGE THE ADOPTION OF PASTURE REHABILITATION STRATEGIES

Strengthening knowledge sharing mechanisms. Cameroon's extension services have limited presence in the Gutah Hills. In areas where these services are available, extension workers lack awareness about pasture degradation, or technical knowledge about how to rehabilitate degraded pastures. The knowledge accumulated through the experience of the TUSIP should be valuable in filling in this information gap, although its usefulness relies on its dissemination. The establishment of farmer field schools has been used to effectively transmit this type of information and to apply it directly to participatory training and experimentation programs for farmers themselves. These are likely to be more effective in areas where farmers' groups already exist. This type of training initiative would need to be led by extension staff who are well-versed in participatory methods and silvo-pastoral techniques such as those promoted by TUSIP.

Preventing cattle rustling. Investment in surveillance to prevent rustling activities is an important area in which to improve incentives for pasture rehabilitation by directly addressing a serious source of risk that currently undercuts those incentives. Policing will be more effective with the active support of community or farmer organizations. Branding, tattooing, and other forms of animal identification are very effective in identifying stolen animals.

Improving marketing options. The purchase of animals is usually directly negotiated in the cattle market, but most of the time farmers do not get the right price because animals are sold based on body appearance instead of controlled weight. The municipalities own the cattle markets and charge a small fee to farmers who bring animals, and they could increase the fee to cover the cost of a scale to check each animal's weight to ensure that owners get a fair price for their animals.

Promoting livestock farmers' organizations. Pastoralists in the Gutah Hills operate individually and many have small herds, with little access to technology, market information, or government services. While their relative isolation from one another has militated against combining into groups that may be able to buy inputs and process and sell products at more favorable prices, a number of local cultural groups could potentially be instrumental in this capacity. Local authorities could play an important role in encouraging such a development. If a substantial number of smaller pastoralists is able to organize into producer groups, these groups would be more effective if they did not limit their purpose to primary production alone, but to agri-business development that would add value to their production. Processing quality dry meat products and arranging their sale in larger markets is one immediate option for cattle farmers in particular.

1 TUSIP Technical Adviser, Livestock and Environment Program, CATIE, Costa Rica. E-mail: dpezo@catie.ac.cr
2 Leader, Livestock and Environment Program, CATIE, Costa Rica. E-mail: mibrahim@catie.ac.cr
3 TUSIP Project Leader, President and Founder Akwi Memorial Foundation, Bamenda, Cameroon. E-mail: ajaga.nji@akwimemorial.org
4 TUSIP, The World Bank Task Team Leader- E-mail: Jagwe@worldbank.org
5 TUSIP Research Assistant, Akwi Memorial Foundation, Bamenda, Cameroon. E-mail: chick_azah@yahoo.co-uk

6 Animal Unit (AU) = A bovine weighing at least 400 kg.
7 The Tugi Silvopastoral Project is a south-south technology transfer collaborative project between CATIE, AMF, and the World Bank.