Brazil: animal production in semi-arid regions

Background and Justification

Some 90 million hectares of Brazil's northeastern region are classed as 'semi-arid' and periodically suffer from prolonged droughts. Although the region's characteristic *caatinga* brushwood flora survives well in the shallow, infertile soil, the regular droughts severely damage the local economy.

Caatinga vegetation is a rich complex of deciduous woody and annual herbaceous species. Many of these provide forage to herds of goats and, as a result, valuable species are being overgrazed and becoming replaced by less desirable herbs and shrubs. As forage for goats becomes more scarce, local farmers are switching to raising cattle, which is having an even more devastating effect on the environment as the animals eat what they can and trample much of the rest. In some of Brazil's northeastern states, 15 percent of the *caatinga* has already become desert.

The current situation, therefore, with some 26 million head of cattle, 10.4 million goats and 7.5 million sheep, is unsustainable as it is destroying biodiversity and the natural environment. It is also very low yielding for the farmers. Cattle reproduction rate is around 40 percent, 30 percent lower than what should be achievable, calf mortality rate is 15 percent, and animals reach a weight of about 340 kilograms in four to five years compared to the goal of 420 kilograms in three years. For goats, the interval between pregnancies is often more than 300 days, and kid mortality is 35 percent. Farmers' dependency on the very *caatinga* that their herds are destroying is the main reason for these poor yields, especially in periods of drought when *caatinga* forage becomes particularly scarce. Although *caatinga* may support animals during the rainy season, during the annual six to eight months of drought, vegetation is reduced by 60 percent.

The situation is exacerbated as only about one-third of the area's 1.5 million farm properties have sufficient water resources to see them through these droughts. Another third are at risk of collapse if the regular rains arrive a month later than expected. The final 500,000 farmers are completely dependent on regular rains for their water and so are the worst hit by drought, which often forces them to walk up to 6 kilometers to collect water or, in some cases, to abandon their homesteads altogether. Migratory farmers also burn forest and brushwood in order to create fields for the production of subsistence crops. As the area's population grows and the existing landownership system forces more and more people to move into new areas, this practice is increasing. Wood extraction for industrial use, fuel or charcoal-production is also having a devastating affect on the area's biodiversity.

Maps drawn up using the latest satellite technologies reveal the extent of the environmental degradation that has occurred in the area. Using these maps and other resources, the scientific community implemented an awareness-raising and information-sharing campaign and has encouraged local people to appreciate the importance of sustainable economic development that does not damage natural habitats. Worldwide concern over the issue has also helped focus attention on this area of Brazil.

There have also been failed attempts to introduce alternative sources of fodder for the animal herd. Among the reasons for their failure are: the small size of farms, the legal system that governs farmers' ownership of the land, the absence of farmers' associations, and the lack of access to bank credit and government technical support.

In contrast, the Caatinga–Buffel–Leucaena (CBL) farming system makes use of native forages derived from *caatinga* vegetation and other ecosystems. When implemented correctly, it has the potential to increase herd yield statistics and, hence, the sustainability of farming in the region by increasing the economic returns on livestock production.

Description

The CBL system was developed by scientists at Embrapa (the Brazilian Agricultural Research Corporation), with technical support from the French *Institut de Recherché pour le Développement* (IRD). It has five basic features:

- A major component is *caatinga* vegetation, which covers at least 30 percent of the total area.
- It utilizes drought-tolerant pastures, which are cultivated under a rotational system in order to provide animal feed during the drought season.
- It produces hay and silage for supplementary feeding during critical periods.
- It sets aside a reserve area of drought-tolerant forage species for use during particularly harsh years.
- It operates as a subsystem within other components of the local farm production system, and is based on the area's agro-ecological and socio-economic diversity.

In the CBL system, animals forage in the *caatinga* for two to four months of the year. For the rest of the time, they graze on buffel grass (*Cenchrus ciliaris*), which research has shown to be particularly tolerant to drought. The third part of the CBL system is leucaena (*Leucaena leucocephala*), also known as the lead tree or white popinac, a leguminous tree, originally from Mexico, that is widely used as a forage in dry regions of Australia and in south-east Asia. Leucaena is used to boost dietary protein and is cut and dried or ensiled to be used as hay or silage during the dry period. It also re-grows after cutting, providing extra grazing for animals.

Saltbush (*Atriplex nummularia*) is also sometimes cultivated in the CBL system. This plant first came to Brazil from Australia in the 1940s and has the characteristics of being drought-resistant, high yielding, easy to propagate, resistant to pests and diseases, and high in calorie and protein contents. It can be used to make hay with such other plants as palm and leucaena and has the added advantage of leeching excess salt out of polluted soils or salinized water. It can be irrigated with residual water and requires sodium as a nutrient.

In addition, the umbu or imbu tree (*Spondias tuberosa*), which grows in the drought-affected areas of northeastern Brazil, is not only a source of animal fodder, but its fruit and tubers can be used by humans. Little research has yet been carried out into the yields and other features of this plant, but each plant is estimated to produce between 65 and 300 kilograms of edible fruit a year, while the tubers supply a drinkable water that is used to treat human diarrhoea and worm infestations. The harvesting, processing and commercialization of umbu fruits generates an estimated 6 million Reais (US$2 million) per year, and may have the potential to provide far more income to farmers in dry areas.

Finally, the reserve area of the CBL system is planted with prickly pear (*Opuntia ficus indica*) and the cassava-like *Manihot pseudoglaziovii*, which are highly tolerant to drought and can supply feed in very dry years when even the leucaena crop has failed. Together, the different foarges of the CBL system can be used by herds of cattle, sheep or goats, as well as mixed herds, throughout the year.

Along with these alternative forage crops, the CBL system also makes use of urea and mineral mixtures, especially for animals whose dry season feed is buffel grass rather than the more mineral- and protein-rich hay and silage. Daily urea consumption of at least 30 grammes per 100 kilograms of live weight helps to reduce weight loss in animals during critical periods. Between 20 to 40 percent of urea can be added to a mix of two parts of common salt and one part of triple superphosphate to produce a cheap and effective mineral mix.

The CBL system has also introduced new agricultural management practices, including: a mating season, which makes it easier to select cows that are particularly efficient at reproducing; a weaning system for calves, in order to reduce the periods between animal pregnancies; and a more

efficient system for selecting heifers, in order to ensure that they have reached their optimum weight before they are mated either for the first time or between subsequent matings.

Cattle are also vaccinated against foot-and-mouth disease, botulism and rabies, and young cattle are wormed at recommended intervals. Farmers are encouraged to keep records of their animals' reproductive performance and weight gain so that they can identify weak-points and take the necessary action to solve problems. Accounting records also make it possible to evaluate costs and to take decisions that increase both productivity and income.

Replicability

Survey results show that the CBL system could be applied to about 40 million hectares in the Brazilian semi-arid northeast – i.e. about 42 percent of the total area. In a joint agreement, the governments of Japan and Brazil have decided to implement the CBL system in productive farming units of between 50 and 200 hectares each in the Brazilian states of Bahia, Pernambuco, Alagoas and Sergipe. Brazil's Northeast Bank has created a special line of credit with an initial US$78 million to finance the establishment of drought-tolerant pastures, the acquisition of animals and the provision of access to water sources. The aim is to implement the CBL system in about 200,000 hectares, benefitting 2,000 producers and 110 communities.

Impact

Under the CBL system, steers reach weights of 420 to 450 kilograms within 30 to 36 months, compared with the traditional system's 340 to 360 kilograms after 48 to 54 months. Annual calving rates of 70 to 80 percent are almost twice the previous rate of 40 percent. Mortality is reduced, weaning weights increased and, in general, the system makes it possible to increase the total live weight of weaned calves per hectare per year by as much as 1,000 percent.

The CBL system includes a set of procedures that control the use of *caatinga* resources. As a result, and as *caatinga* has a high natural recovery capacity, the deterioration process is being halted and reversed. The limited *caatinga* foraging season helps to reduce overgrazing and, because it takes place after most plants have flowered and set seeds, does not threaten future *caatinga* growth. In addition, the size of the herds grazed varies from year to year, depending on rainfall, which, in turn, determines the amount of forage that the *caatinga* can supply.

Future plans

The main aspects for future research are the conservation of native plant species, ecologically-friendly management systems, and the expansion of the area covered by the CBL system. Due to the fragility of the *caatinga*, the whole ecosystem needs to be developed carefully in order for it to realize its potential as a tool for the sustainable development of the Brazilian semi-arid region.

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