Food and Agriculture Organization of the United Nations

SAVE AND GROW FARMING SYSTEMS
FACT SHEET 5

MAIZE/LIVESTOCK

Agro-ecological zone
Tropical savanna
Main cereal Maize
Other crops/products
Meat, milk, forage, rice, millet, sorghum

'Nutrient pumps' feed cattle, nourish maize

Livestock production is particularly important in smallholder farming systems on the savanna grasslands of Latin America. However, output per animal unit in tropical areas is far below that achieved in temperate regions. A major constraint is the quantity and quality of forage, a key feed source in ruminant systems. Overgrazing, farming practices that deplete soil nutrients, and a lack of forage species that are better adapted to biotic and abiotic stresses – all contribute to low productivity. Improving pasture forage quality and productivity would help to boost production of meat and milk.

Many livestock farmers in Latin America have adopted a sustainable livestock production system that integrates forages with cereals. A key component of the system is *Brachiaria*, a grass native to sub-Saharan Africa, which grows well in poor soils, withstands heavy grazing and is relatively free from pests and diseases.

Thanks to its strong, abundant roots, *Brachiaria* is very efficient in restoring soil structure, and helps prevent soil compaction, which reduces rainwater infiltration and stifles root growth. It also has the ability to convert residual soil phosphorus into organic, readily available forms for a subsequent maize crop.

Recent research has identified another special characteristic of *Brachiaria*: a chemical mechanism found in the roots of one *Brachiaria* species inhibits emissions from the soil of nitrous oxide, which is derived mainly from mineral fertilizer and is one of the most potent of the greenhouse gases causing climate change.

The versatile grass is now grown on an estimated 80 million ha of land in Latin America. While the adaptation of *Brachiaria* to low-fertility soils has led to its use for extensive, low-input pastures, it is also suitable for intensively managed pastures.

In Mexico and Central America, the productivity of animals feeding on *Brachiaria* pastures is up to 60 percent higher than those feeding on native vegetation. The value of the additional production has been estimated at Us$1 billion a year. In Brazil, annual economic benefits have been put at Us$4 billion.

Rotation of annual crops with grazed pasture is increasing in the Cerrados eco-region of Brazil, where beef cattle are a major

KEY POINTS

Zero-tillage, organic soil cover, crop rotation and improved pastures underpin **integrated crop and livestock systems**.

A key component of maize-livestock systems is ***Brachiaria* grass**, which restores soil structure and is far more nourishing than native vegetation.

Mulch-based, direct-seeding cropping systems grow three cereal crops a year, intercropped with forage species.

In Brazil, more than **4 million ha are under direct-seeding**, which has replaced inefficient, tillage-based soybean monoculture.

Relay cropping *Brachiaria* with maize reduces intercrop competition, leading to **optimal use of land resources** and less land degradation.

source of income for many farmers. Years of poor herd management, overgrazing and lack of adequate soil nutrient replacement have led to declining productivity and reduced profitability in traditional livestock production systems.

Where natural ecosystems have been replaced by intensive soybean monoculture, much of the soil is compacted and susceptible to erosion from heavy rainfall. Under those conditions, traditional techniques of soil erosion control, such as contour planting, have proved to be ineffective.

In response, many farmers have adopted zero-tillage systems, which increase soil cover and bring other environmental benefits. In the early 1990s, less than 10 percent of the Cerrados was under zero-tillage; by 1996, it had risen to 33 percent. Including expansion of the harvested area, the total area under zero-tillage in the Cerrados increased 17 times over.

It has been estimated that around 50 percent of the total cropped area in Brazil is under direct-seeding, mulch-based cropping (DMC) systems, which usually support three crops a year, all under continuous direct-seeding. In the Cerrados, more than 4 million ha are cultivated using diversified DMC systems, which have replaced inefficient, tillage-based soybean monoculture. A typical sequence is maize (or rice), followed by another cereal, such as millet or sorghum, or the grass *Eleusine*, intercropped with a forage species such as *Brachiaria*.

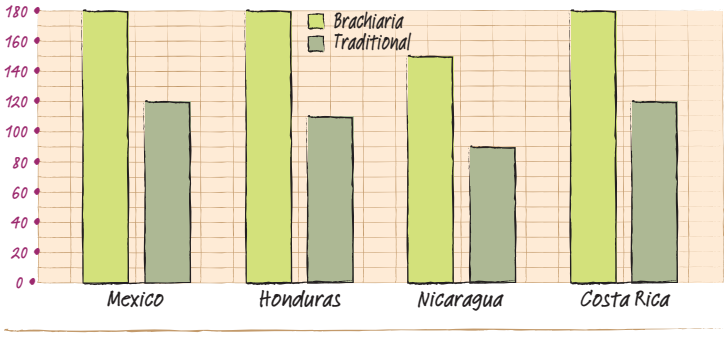
The forages function as 'nutrient pumps', producing large amounts of biomass in the dry season that can be grazed or used as green manure. Combining maize and *Brachiaria* at the end of the rainy season taps soil water from levels deeper than 2 m, and promotes active photosynthesis later during the dry season. It results in vigorous vegetative re-growth after the first rains of the following season, or after rain during the dry season, thus ensuring permanent soil cover.

Because *Brachiaria* provides excellent forage, farmers can then choose to convert the area into pasture, or keep it in grain production for another year. Such systems are found under irrigation and in wetter regions with frequent, heavy rains that recharge deep water reserves. In the best DMC systems, total annual dry matter production, above and below the soil, averages around 30 tonnes per ha, compared to the 4 to 8 tonnes found under monocropping.

To reduce crop competition, novel intercropping systems have been developed. In the 'Santa Fé' system for maize and *Brachiaria*, developed in Brazil, the grass is made to germinate after the maize crop, either by delaying its planting or by planting it deeper. The young *Brachiaria* plants are shaded by the maize and provide little competition for the cereal. At maize harvest, however, shading is reduced and the established pasture grows very quickly over the maize residues.

The integration of forage and grain crops leads to a better use of the total farm area and a more intensive use of the pastures, with less pasture degradation. Similar DMC systems are being tested in other parts of the world, including sub-Saharan Africa.

Levels of beef productivity on traditional and *Brachiaria* pastures
(kg/ha/yr)



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