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FORAGE GRASS FERTILIZATION IN BRAZIL

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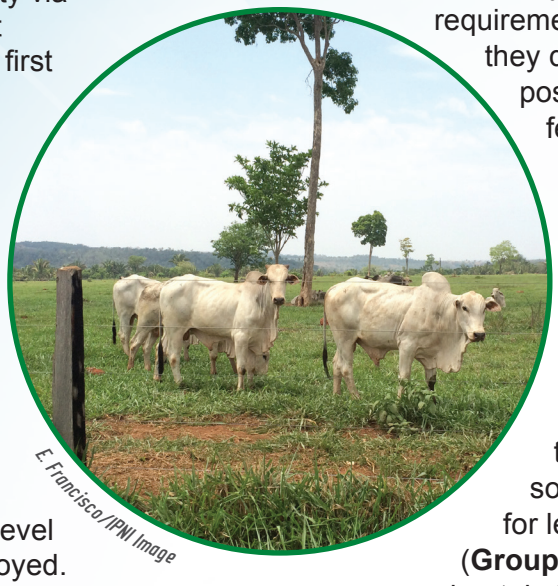
Brazilian agriculture includes about 180 million hectares of land in pastures, but about 50% are considered to be degraded to some degree due to excessive grazing, low technology input, and adverse soil conditions (low fertility, acidity, and compaction). Improving soil fertility via appropriate nutrient management is the first step for recovering degraded pastures and increasing dry matter yield and forage quality.



E. Francisco/IPNI Image

Fertilizer recommendations for forage grasses are based on soil analysis, species nutrient requirements, and level of technology employed. The classification of grasses according to nutrient requirements are:

GROUP 1 (HIGH DEMAND):

Panicum maximum (Panic grass), *Cynodon* sp., *Pennisetum purpureum* (Napier grass), *Digitaria decumbens* (Pangola grass), and *Chloris* sp.

GROUP 2 (MEDIUM DEMAND):

Urochloa brizantha (Palisade grass), *Andropogon gayanus* (Gamba grass), *Cynodon plectostachyus* (Giantstar grass), and *Paspalum guenoarum* (Wintergreen paspalum).

GROUP 3 (LOW DEMAND):

Urochloa decumbens (Basilisk signal grass), *Urochloa humidicola* (Amazonian kikuyu grass), *Paspalum notatum* (Bahia grass), and *Setaria anceps* (Golden bristle-grass).

Species of *Urochloa* grass, including those listed under Groups 2 and 3, represent the majority of forages used in Brazilian pastures. Some of these grasses are tolerant to soil acidity and have relatively low nutrient requirements. Nevertheless, they do respond positively to liming and fertilizer application (**Figure 1**). Liming recommendations for pastures are based on soil base saturation (BS) and vary according to species tolerance to soil acidity or low soil fertility: 60% BS for less tolerant grasses (**Group 1**), 50% BS for moderately tolerant grasses (**Group 2**), and 35% BS for highly tolerant grasses (**Group 3**).

Recommendations for phosphorus (P) and potassium (K) fertilizer rates for pastures are based on the nutrient requirement of grass and soil analysis. For grasses with low nutrient demand (**Group 3**), fertilizer rates may vary to supply 20 to 120 kg P_2O_5/ha and up to 20 kg K_2O/ha depending on soil availability, while for grasses with high nutrient demand (**Group 1**), rates vary from 40 to 240 kg P_2O_5/ha and up to 60 kg K_2O/ha. However, depending on the grass and level of intensification, K rates may need to be higher to support plant growth and quick recovery—up to 200 kg K_2O/ha yearly.

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"Complete and balanced plant nutrition and efficient grazing management are key to obtaining high yields of biomass and beef in livestock systems, reducing the pressure for land conversion from forest to agriculture."

As pastures are perennial crops, P application in furrow or broadcasted followed by incorporation is recommended prior to pasture establishment. For maintenance, a single broadcast application of P fertilizers (20 to 40 kg P_2O_5/ha) at the beginning of rainy season is recommended. Soluble sources of P are recommended for their prompt availability, but phosphate rock or partially acidulated fertilizers may be an option in some regions. If phosphate rock is to be used, it is recommended that application occurs at the establishment of pastures and be incorporated into the soil.

Potassium fertilizers may be broadcast on the soil surface at pasture establishment and at the beginning of rainy season (< 40 kg K_2O/ha). For maintenance of more intensive production systems demanding higher K rates, split broadcast applications in 30-day intervals are recommended.

The tropical grasses listed above are very responsive to N, because of their C4 photosynthesis as compared to the C3 temperate grasses. The recommended rate for N fertilizer will vary widely depending on soil conditions, plant demand, technology adoption by the farm, and irrigation. For the establishment of pastures, 50 kg N/ha along with 30 kg S/ha are recommended for livestock systems using moderate technology, but 100 to 150 kg N/ha for farms using more advanced technology are preferred. For their maintenance, 100 to 150 kg N/ha for medium-tech farms and 200 kg N/ha in higher-tech farms should be applied in split rates into three applications of at least 50 kg N/ha during the beginning, middle, and end of the rainy season. The use of ammonium nitrate or ammonium sulfate to avoid potential N losses due to volatilization is encouraged. Urea may be used if soil and weather conditions are monitored to ensure adequate soil moisture, mild temperatures, and an application just prior to a rain if possible. For highly intensive livestock systems, N rates may also be adjusted according to other parameters (e.g., grazing efficiency, level of farm management). Recent studies show positive results for balanced applications of 1:1 for N:K, and 10:1 for N:S.

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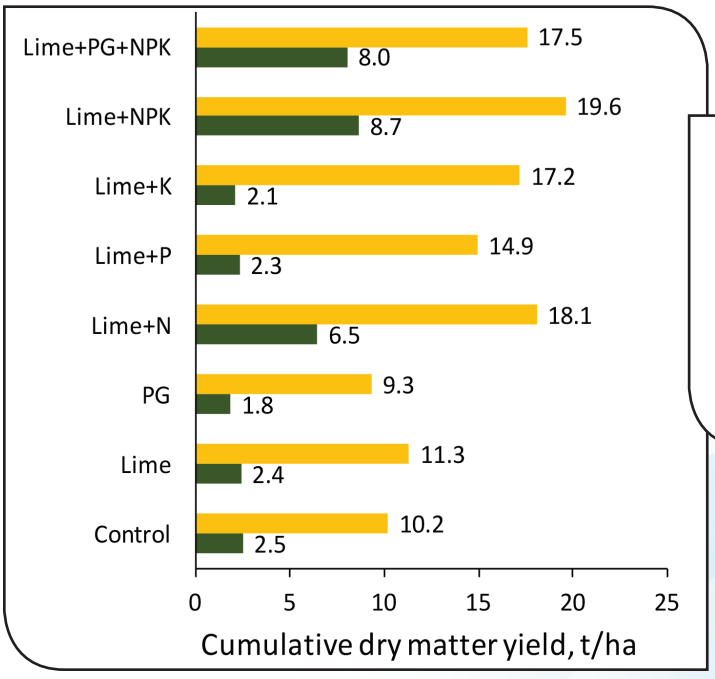

- Itiquira, Mato Grosso
  Ultisol: pH 5.5; 2 ppm P; 46% Base saturation
  Grass: *U. brizantha* cv. Marandu
  (Group 2: Medium nutrient demand)
- Dracena, São Paulo
  Oxisol: pH 5.3; 4 ppm P; 53% Base saturation
  Grass: *U. decumbens* (Group 3: Low nutrient demand)

Figure 1. Cumulative dry matter yield of grass in response to liming, phosphogypsum, and nutrient applications within demonstration plots at two locations (Rates: 2 t lime/ha, 2 t phosphogypsum/ha, 100 kg N/ha, 45 kg P/ha, and 50 kg K/ha).

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