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Productivity the Brachiaria Forage Intercropping with Eucalyptus in a Silvopastoral System in the Brazilian Savannah Biome

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ABSTRACT

The major difference between agroforestry and other agricultural production systems is the greater possibility of managing the agroforestry system or its components to facilitate increased rates of nutrient turnover or transfer within different compartments of the system (NAIR, 1993; NAIR et al., 1995). The objective of this study was to estimates of means of leaf area index (LAI) , height and forage production (FP) in the three periods of collectings in a silvopastoral system in the Brazilian Cerrado Biome. The experiment was conducted in a silvopastoral system, located in a farm called Fidalgo in the county of Confins in Minas Gerais, Brasil. The geographic coordinates of the experimental area of this typical Cerrado biome. The experimental area consists of 1.5 hectares. *Brachiaria brizantha* cv. Marandu productivity was measured quantitatively and qualitatively for three distinctive periods: the beginning of the drought (May 15th, 2009), the middle of drought (July 25th, 2009), period of greatest drought stress, and after the drought (November 23rd, 2009). In the implantation of the experiment was done a cut for standardization of forage at 30 cm above soil. Twelve random points were selected in each system (SPS and pasture), with a total of 24 points. One meter squared collectors made of steel grids were used to prevent animal interference and were placed at each identified location for forage evaluation. Was performed to evaluate bromatologic compositions of dry matter (DM), Leaf area index (LAI). The test was conducted in a completely randomized design, arranged in a split plot, with six repetitions. This study suggests the presence of the tree species *Eucalyptus* did not interfere in forage dry matter production. Periods of climatic

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variations observed promoted differentiation in forage production, leaf area and height of the pasture.

Keywords: Tree species, fodder, degraded areas, shading, sustainability

1. INTRODUCTION

The Brazilian Cerrado (savanna), has approximately 49.6 million hectares of cultivated pastures, mainly Brachiaria, and is home to about 41% of the cattle in Brazil; more than half of the bovine meat of the country, which is approximately 10.5% of gross national agriculture revenue (MARTHA JÚNIOR et al., 2002). However, due to poor management, these areas are becoming increasingly less productive with an estimated 80% of the pastures in some stage of degradation (PERON et al., 2004). Inappropriate management often results in soil degradation, silted rivers and destruction of the remnant native vegetation (SERRÃO *et al*., 1998).

Pasture degradation can be reversed by soil conservation, appropriate management of pastures, reduction of burned pastures and the implantation of silvopastoral systems (SPS's) (STEINFELD *et al*., 2006). Within the agroforestry (AFSs) is the silvopastoral system (which is defined as systems involve the intercropping of trees with pastures with cattle often a component within the unit. The presence of the tree component in pasture can reduce the negative effects of climate on forage production. The area under trees will have a microclimate which will favor moisture retention and nutrient enrichment, promoting an extended period of green forage availability, benefiting tropical pastures, which normally have low nutritional value (SANCHEZ, 2001). The major difference between agroforestry and other agricultural production systems is the greater possibility of managing the agroforestry system or its components to facilitate increased rates of nutrient turnover or transfer within different compartments of the system (NAIR, 1993; NAIR et al., 1995). The objective of this study was to estimates of means of leaf area index (LAI) , height and forage production (FP) in the three periods of collectings in a silvopastoral system in the Brazilian Cerrado Biome.

2. MATERIALS AND METHODS

The experiment was conducted in a silvopastoral system, located in a farm called Fidalgo in the county of Confins in Minas Gerais, Brasil. The geographic coordinates of the experimental area of this typical Cerrado biome are 19º54'32" South and 43º58'18" West and the average maximum daily temperature in the SPS was 31.4ºC and relative humidity averaged 42%. The pasture in the SPS and in the adjacent control area, were planted at the same time as the silvopasture establishment. This SPS was established in 1994, without the use of fire.

The land was cleared, and eucalyptus seedlings were planted at a density of 150 trees/hectare.The trees used in the experiment were15 to 25 meters high, with diameter at breast height (DBH) of 40 to 60 cm. The soil in the SPS is classified as a Latossolo Vermelho Amarelo (Oxisol), with 651 g/kg of clay, 211 g/kg of silt and 138 g/kg of sand.

The experimental area consists of 1.5 hectares. Cattle grazing practices depended on forage production during the seasons. The animals grazed for three days followed by a 30-day rest period.

Brachiaria brizantha cv. Marandu productivity was measured quantitatively and qualitatively for three distinctive periods: the beginning of the drought (May 15th, 2009), the middle of drought (July 25th, 2009), period of greatest drought stress, and after the drought (November 23rd, 2009).

In the implantation of the experiment was done a cut for standardization of forage at 30 cm above soil. Twelve random points were selected in each system (SPS and pasture), with a total of 24 points. One meter squared collectors made of steel grids were used to prevent animal interference and were placed at each identified location for forage evaluation.

After collection, the forage was weighed, dry mass in an oven at 60ºC for 72 hours, and then ground to pass through a1 mm sieve. All bromatologic compositions of dry matter (DM) (COMPÊNDIO…, 1998). Leaf area index (LAI) was determined with the equipment LI 3100 (LI-COR, USA) model. The test was conducted in a completely randomized design, arranged in a split plot, with six repetitions.

The Lilliefors and Bartlett tests were performed to verify normality and homoscedasticity of data, respectively. Then an analysis of variance (ANOVA) model was fitted, and the means were tested. The Student Neuman Keuls (SNK) test was used to correct for the multiple testing problem. Statistical significance was determined at a familywise error rate at $\alpha = 0.05$.

3. RESULTS AND DISCUSSION

In Table 1 are the means of three months of collections, in both production systems. There was a significant effect of production system on leaf area index (LAI) and height.

Its noticeable that leaf area index (LAI) and height were superior in SPS, compared to Full Sun, forage production system (without trees) ($P<0.05$) (Table 1). Both variables are indicative of a higher production of leaves and stems.

TABLE 1: Estimates of means of leaf area index (LAI) and height in the three periods of collecting (beginning, middle or end of drought period), and two production systems. Confins, Minas Gerais, Brazil

Production System	LAI	Height (cm)
Silvopastoral	3.49[A]	18.77[A]
Forage production system (without trees)	2.95[B]	13.93 [B]
CV (%)	25.50	41.0

Means followed by different letters differ (P<0.05) by SNK test.

There was a significant difference in leaf area index (LAI), forage production (FP) and height variables among the three periods of collection (Table 2). The shift in biomass allocation, favoring aboveground structures in detriment of roots, is a common response to shade in grasses and broad leaf species (HODGE et al., 1997).

Leaf area index (LAI) was higher in the first two collections. Forage production (FP) was higher in May and November. The higher forage production in May and November is due to greater plant development in these periods compared to production in the drought period of July. This also explains the smaller forage height in July and taller height in November (Table 2).

Trees contribute to the conservation of soil heat and air, by protecting the area from winds that sweep the humid air Gregory (1995). Thus, the SSP increases absorption of nutrients by forage, resulting in a higher content of biomass and improving the bromatological quality of pastures. Beyond keeping the shade for the animals, the SSP increase the farmers profit and bring benefits for the local community.

TABLE 2: Estimates of means of leaf area index (LAI), forage production (FP) and height in the three periods of collectings (beginning, middle or end of drought period), and two production systems. Confins, Minas Gerais, Brazil

Collect	LAI	FP (g)	Height (cm)
May	3.7741[A]	591.4136[A]	16.1818[B]
July	3.2645[A]	191.5545[B]	6.7273[C]
November	2.6364[B]	639.5410[A]	26.1591[A]
CV(%)	25.50	45.61	41.0

Means followed by different letters differ (P<0.05) by SNK test.

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4. CONCLUSION

This study suggests the presence of the tree species *Eucalyptus* did not interfere in forage dry matter production. Periods of climatic variations observed promoted differentiation in forage production, leaf area and height of the pasture.

5. ACKNOWLEDGEMENTS

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6. REFERENCES

COMPÊNDIO BRASILEIRO DE ALIMENTAÇÃO ANIMAL: métodos analíticos. Brasília: Ministério da Agricultura e do Abastecimento, 1998. 199p.

GREGORY, N. G. The role of shelterbelts in protecting livestock: a review. New Zealand Journal of Agricultural Research, Wellington, v. 38, p. 423-450, 1995.

HODGE, A. et al. Effects of photon flux density on carbon partitioning and rhizosphere carbon flow of *Lolium perenne*. Journal of Experimental Botany, Oxford, v.48, p.1797-1805, 1997.

MARTHA JÚNIOR, G.B.; VILELA, L. *Pastagens no Cerrado*: baixa produtividade pelo uso de fertilizantes. Planaltina: Embrapa Cerrados, 2002. 32p.

NAIR, P.K.R., KANG, B.T., KASS, D.C.L. 1995. Nutrient cycling and soil-erosion control in agroforestry systems. In: Juo, A.S.R. and Freed, R.D. (eds), Agriculture and the Environment: Bridging Food Production and Environmental Protection in Developing Countries, pp. 115-136. American Society of Agronomy, Madison, Wisconsin.

NAIR, P. K. R. 1993, "An introduction to agroflorestry. Kluwer academic Publisher, wetherlands.

PERON, A.J.; EVANGELISTA, A.R. Degradação de pastagens em região de Cerrado. *Ciência agrotécnica*, v. 28, n.3, p. 655-661, 2004.

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SÁNCHEZ, M.D. Panorama dos sistemas agroflorestais pecuários na América Latina. In: CARVALHO, M.M.; ALVIM, M.J.; CARNEIRO, J.C. (Eds.). Sistemas agroflorestais pecuários: opções de sustentabilidade para áreas tropicais e subtropicais. Juiz de Fora: Embrapa Gado de Leite; Brasília: FAO, 2001. p.9-17.

SERRÃO, E.A.; NEPSTAD, D.C.; WALKER, R.T. Desenvolvimento Agropecuário e florestal de terra firme na Amazônia: Sustentabilidade, criticabilidade e resiliência. In: HOMMA, A.K.O. (Ed.) *Amazônia meio ambiente desenvolvimento agrícola*. Brasília. EMBRAPA. 1998. Cap. 14, p. 367-386.

STEINFELD, H. et al.Livestock´s long shadow: environmental issues and options [Roma, Itália], 2006. Disponível em <http://www.virtualcentre.org> Acesso em 18 de abril, 2010.