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Biodiversity Agroforestry System: Syntropic Agriculture

Biodiversidade Em Sistemas Agroflorestais: Agricultura Sintrópica

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biodiversidade, sucessão, SAFs e agricultura orgânica.

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Resumo

A agricultura sintrópica vem encontrando desafios de implementação de forma viável, apesar de se ter várias informações sobre seus benefícios alguns fatores ainda devem ser abordados. O objetivo do experimento foi implantar um sistema sustentável, que permitirá pesquisa a longo prazo, para avaliar o comportamento produtivo de hortaliças, frutas e arbóreas, além de observar questões relacionadas a compactação e teor de umidade do solo. Com base nas metodologias de implantação agroflorestais, se adotou sistema agroflorestais que permitam uma maior escala de produção, iniciando-se com a implantação de um SAF para produção de feijão (Phaseolus vulgaris), manga (Mangifera indica L), ipê (Tabebuia chrysotricha), mandioca (Manihot esculenta Crantz), banana (Musa spp.), e abóbora (Cucurbita spp.). Formando um sistema com linhas de espaldeira alternadas com linhas de outras fruteiras arbóreas, espécies madeireiras e adubadoras como capim braquiária (Brachiaria decumbens), crotalária (Crotalaria juncea L.). As culturas adotaram o número de plantas/espaçamento nas respectivas dimensões: ipê/1/7,5x5, mandioca/1,20x1,20, manga/1/7,5x5, banana/1/7,5x5, feijão/2/5x5, abóbora2/5x5. O comportamento produtivo de hortaliças: abóbora (Cucurbita spp.) estão em fase de desenvolvimento como também a mandioca (Manihot esculenta Crantze); frutas: manga (Mangifera indica L) e banana (Musa spp.) e a arbórea: ipê (Tabebuia chrysotricha) necessitam de mais tempo para ser avaliadas devido ao seu ciclo de desenvolvimento ser longo.

Abstract

The experiment aims to implement a sustainable system that will allow long - term research to evaluate the productive behavior of vegetables, fruits and trees, as well as to observe issues related to compaction and soil moisture content. Based on agroforestry implantation methodologies, agroforestry systems were adopted to allow a greater scale of production, starting with the implementation of a SAF for the production of bean (Phaseolus vulgaris), mango (Mangifera indica L), ipê (Tabebuia chrysotricha) , manioc (Manihot esculenta Crantz), banana (Musa spp.), and pumpkin (Cucurbita spp.). Forming a system with lines of alternating lines with lines of other fruit trees, timber species and fertilizers like brachiaria grass (Brachiaria decumbens), crotalaria (Crotalaria juncea L.). Cultures adopted the number of plants / spacing in the respective dimensions: ipê / 1 / 7,5x5, manioc / 1,20x1,20, mango / 1 / 7,5x5, banana / 1 / 7,5x5, beans / 2 / 5x5, pumpkin2 / 5x5. The productive behavior of vegetables: pumpkin (Cucurbita spp.). Are in development phase as well as manioc (Manihot esculenta Crantze); fruits: mango (Mangifera indica L) and banana (Musa spp.) and arboreal: ipê (Tabebuia chrysotricha) need more time to be evaluated due to their long development cycle.

INTRODUCTION

The environmental and health problems associated with the conventional system of agriculture are considered highly dependent on external inputs, such as chemical fertilizers and pesticides (ADL et al., 2011), which can, when improperly used, promote contamination of soil, water and air, as well as causing pest resistance and increased greenhouse gas emissions (TSCHARNTKE et al., 2012).

According to the problems of conventional agriculture model, and the necessity to search models of food production in a harmonic and sustainable way with environment, the syntropic agriculture can solve these problems.

Miller (2009) analyzed the recent congresses on agroforestry systems (SAFs) in Brazil, indicating the existence of two main lines of thought for SAF implementation, that seek forest reconstitution analogous to the local ecosystem, with high biodiversity and acceleration of the natural succession of plant species: one is the conventional SAF, with the characteristic of implementation of few species in the same area; and the second one, encompasses the design of biodiversity and successional SAFs (GÖTSCH, 1997).

The relationship dynamics between species contradicts classical agronomic concepts, species of different ecosystems, which belong to different successional groups present synergistic relationships (MILLER, 2009). According to Götsch (1997), agricultural plants perform functions in the natural ecosystems of origin and occupy different niches and extracts in the consortia in succession.

The choice of species to be used in SAFs will determine the success of the enterprise, since it can act synergistically or antagonistically. Species such as mango and ipê have a deep aggressive root system that helps soil physics, and their flowers are attractive insects for pollinators, and their leaves may be covering the soil.

Cassava roots is used for both animal and human feeding, its roots are used for the next planting. Bananas can use their fruits and the crop itself helps to hold moisture in the soil. The bean, pumpkin, crotalaria and brachiaria crops were planted to help with soil cover and straw formation.

The objective of this work was to evaluate the initial development of plants and the physical characteristics of the soil after the SAF installation.

MATERIAL AND METHODS

The experiment was installed on the campus of the University of Rio Verde (UniRV), in the municipality of Rio Verde Goiás, with latitude 17°47'08.6"S and longitude 50°57'54.1"W. The area used is the result of fires degradation.

In the experimental area were planted: manioc (*Manihot esculenta*), banana (*Musa* spp.), Ipê (*Tabebuia chrysotricha*) and mango (*Mangifera indica* L.). The maniocs were planted in spacing of 1.20m between rows and 1.20m between plants. The planting of ipê and mango in rows with spacing of 2.5x5m totaling 3 main rows.

On the day of planting mango, its seedlings presented height average of 9.05 cm, ipê of 5.35 cm and banana was planted with rhizomes, with depth of approximately 50 cm. Beans and pumpkin were planted between these seedlings of the main lines and between the lines, crotalaria and brachiaria.

200 g of limestone and yoorin were added to each main lines, since the species being chosen with the local adaptation and acceptance demand in the region. The yoorin master 1 S has a total chemical P205 of 17.5%, P205 Sol. Citric acid 2% (1: 100) of 16,0%, water insoluble P205, calcium 18%, magnesium 7%, boron 0, 10%, copper 0.05%, manganese O, 30%, silicon 10%, zinc 0.55%, granulometry in sieve ABNT No. 100 0.15 mm 75%, physical nature powder, mixed mineral fertilizer contains thermophosphate.

For soil resistance to penetration, it was used the PenetroLOG, Falker model, and the soil moisture was measured by the weighing method (EMBRAPA, 1997), in 0 to 60 cm layer, being the witness the initial evaluation, and the second evaluation for comparison.

RESULTS AND DISCUSSION

The implanted cultures present slow development due to the site being originated from fires (Figure 1).

Figure 1. Feijão (Phaseolus vulgaris - a) e Ipê (Tabebuia chrysotricha - b).

(a) (b)

The development of implanted crops in relation to the vegetative development, according to the morphology and germination of each culture is presented in figure 2.

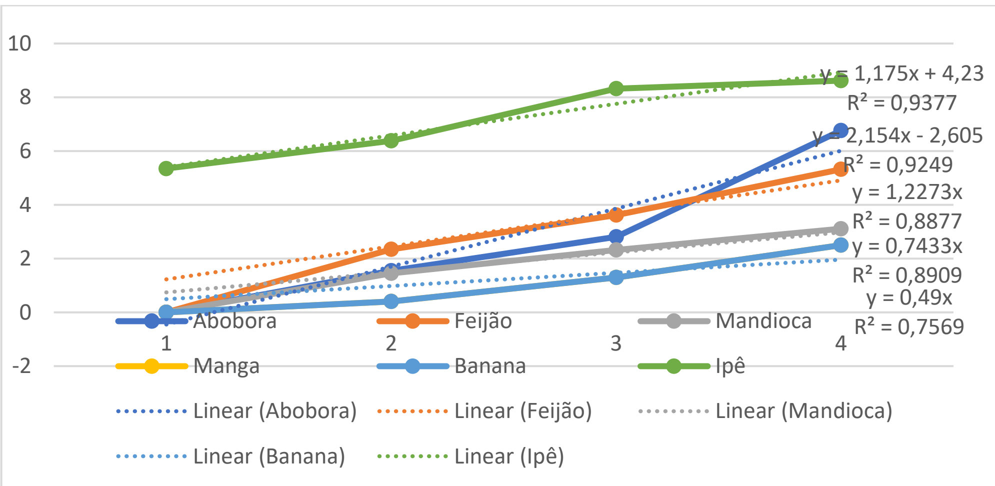

Figure 2. Development crops in cm

The vegetative development is characteristic of each of the cultures implanted, the highest values of the coefficient of determination were observed in the linear equations above 0.90 for Ipê and pumpkin. For Bilibio et al. (2010), the height of the plants presented linear response in relation to soil water stresses.

For the evaluation of soil resistance used Falker equipment, the purpose of this assessment is to monitor the development of this physical attribute along with others during the years of syntropic agriculture implementation.

Soil compaction is a limiting factor for the root system of any crop, for example for the banana crop would not be different because it can affect root growth of the same, and therefore did not reach enough size causing it tipping or even poor development.

The compaction plot was divided by layers, and the soil water content on collection day 1 was 12% and collection 16%. It can be observed, at Figure 3, the soil resistance in 84 days of crop development.

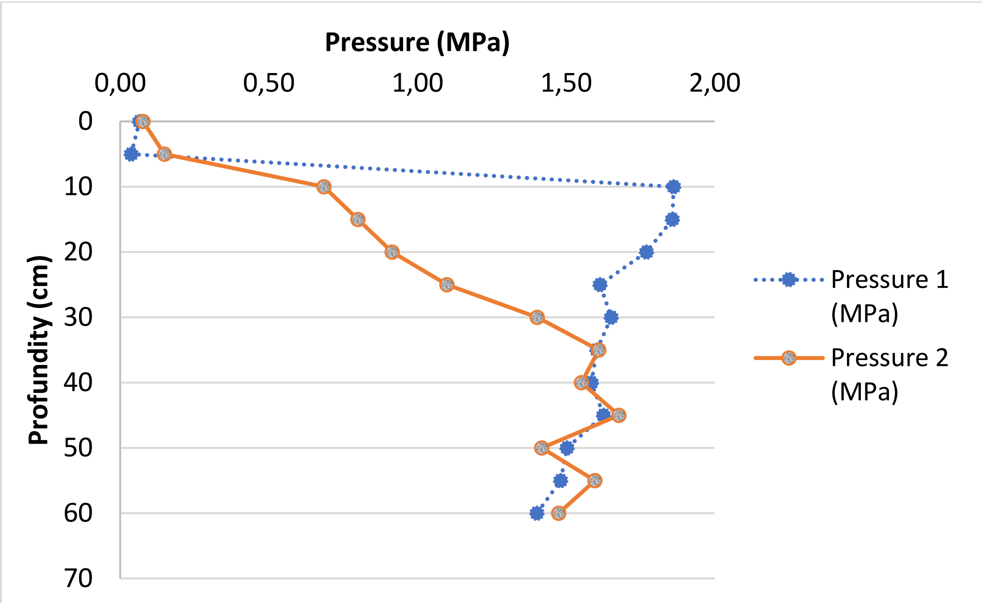

Figure 3. Resistance to soil penetration in the implantation.

Soil compaction is a limiting factor in the implantation of systems, but as in the case of the burning, a harvesting was carried out in order to contain the fire. This soil preparation assisted soil disintegration with values below 2 MPa, favoring roots development. Several studies have shown that soil scarification promotes the reduction of soil density and resistance to penetration, with the least possible soil mobilization (SEKI et al., 2015).

CONCLUSION

The productive behavior of vegetables: pumpkin (*Cucurbita* spp.) Are in development phase as well as manioc (*Manihot esculenta* Crantze); fruits: mango (*Mangifera indica* L) and banana (*Musa* spp.) and the ipe tree (*Tabebuia chrysotricha*) need more time to be evaluated because their development cycle is longer than the vegetables.

Soil compaction of study area is below 2 MPa, and with the development of the initial cultures the initial resistance decreased.

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