

TIMBER SPECIES (NATIVE AND EXOTIC) FOR DEFORESTED AREAS OF TERRA FIRME

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INTRODUCTION

The rising demand for the use of wood has caused, in the last decades, devastation of large areas of tropical forest. This rising demand has been due to many factors, among them: population growth, wood as an energy source, road construction, and for the generation of foreign currency by many of the developing countries. In Brazil and specifically the Amazon, between 6 and 10% of the forest cover has already been removed.

The management of these areas with agroforestry systems which utilize components of forest tree species, offers a promising alternative, seeking not only to restore productivity but also to minimize deforestation. There is still very little information, however, about the majority of native and exotic species which could be used. Starting in June 1991, EMBRAPA/CPAA, initiated a series of comparative trials of native and exotic tree species, seeking to increase the amount of information on the subject.

The objectives of the trials are: 1) to evaluate the silvicultural behaviour of native and exotic forest species selecting the most promising for agroforestry systems on "terra firme"; 2) to verify the correlation between the potential of the species for cultivation in full sunlight and for the enrichment of secondary forests.

MATERIAL AND METHODS

The experimental area is located in the state of Amazonas at KM 30 along the AM-010 Highway which links Manaus with Itacoatiara. Its geographic coordinates are 3°8' South latitude, 59°52' West longitude, at an altitude of 50m above sea level. The

climate according to Koppen is AFI with an mean annual temperature of 26.0° Celsius and an annual precipitation of 2525.30mm (Figure 1).

According to Rodrigues *et al.* (1972) the soil is a dystrophic, yellow latosol, with a clay-like texture, whose chemical characteristics are shown in Table 1. The area was originally Primary Equatorial Rainforest, which was cleared about ten years ago for the planting of rubber trees and *Puerária phaseoloides*. After 1989, the rubber trees were removed and only *puerária* was left as a soil cover.

Table 2 shows some of the species being studied. These are evaluated as to their rate of survival, phyto-sanitary aspects, height and DBH - diameter at breast height. During the first year these evaluations are carried out every six months and after this period, every 12 months. In all the experi-

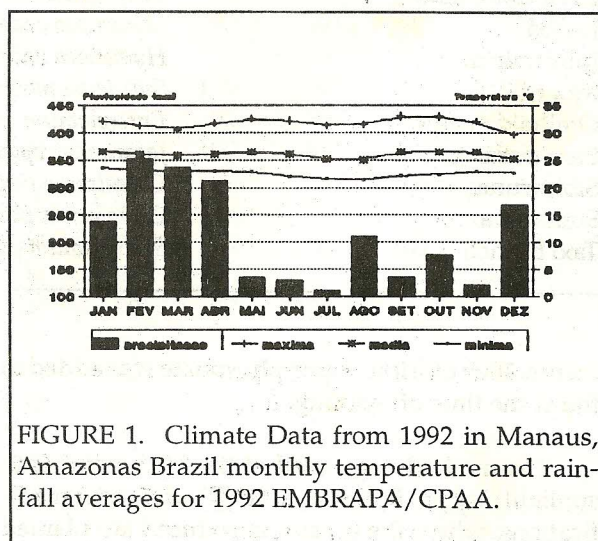


FIGURE 1. Climate Data from 1992 in Manaus, Amazonas Brazil monthly temperature and rainfall averages for 1992 EMBRAPA/CPAA.

TABLE 1. Soil chemical characteristics in the experimental areas.

| Experimento | Depth (cm) | pH (H ₂ O) | N % | P | K - ppa | Ca - | Mg mq/100g solo | Al - |
|---|------------|-----------------------|------|---|---------|------|-----------------|------|
| Arboretum (all sun) | (0-20) | 4.8 | 0.17 | 9 | 72 | 1.25 | 0.35 | 1.4 |
| Comparative species trial (a pleno sol) | (0-20) | 4.3 | 0.17 | 1 | 20 | 0.26 | 0.11 | 1.7 |
| Envolment (line) planting trial (under shade) | (0-20) | 4.4 | 0.17 | 1 | 30 | 0.39 | 0.21 | 1.8 |

Source: Soils analysis laboratory-EMBRAPA/CPAA.

TABLE 2. Some species studied in different mals at CPAA.

| Commoun name | Scientific name | Family |
|-------------------|--------------------------------------|---------------|
| Acácia mangium | <i>Acacia mangium</i> | Leguminosae |
| Andiroba | <i>Carapa guianensis</i> | Meliaceae |
| Breu sucuruba | <i>Trattinickia burserifolia</i> | Burseraceae |
| Cedro vermelho | <i>Cedrela odorata</i> | Meliáceae |
| Canafístula | <i>Peltophorum dubium</i> | Leguminosae |
| Cumarú | <i>Dufterex odorata</i> | Leguminosae |
| Cobaíba | <i>Copaifera multijuga</i> | Leguminosae |
| Castanha doBrasil | <i>Bertholettia excelsa</i> | Lecythidaceae |
| Eucalypto | <i>Eucalypto urophylla</i> | Mirtaceae |
| Fava timbaúba | <i>Striphonedron guianensis</i> | Leguminosae |
| Jatobá | <i>Hymenaea courbaril</i> | Leguminosae |
| Jutai-mirim | <i>Hymenaea parviflora</i> | Leguminosae |
| Mogno | <i>Swietenia macrophylla</i> | Meliáceae |
| Orelha de negro | <i>Enterelobium contortisiliquum</i> | Leguminosae |
| Pará-pará | <i>Jacaranda copaia</i> | Bignoniaceae |
| Sibipiruna | <i>Caesalpinia peltoporoides</i> | Leguminosae |
| Sumaúma | <i>Ceiba pentandra</i> | Bombacaceae |
| Taxi branco | <i>Sclerolobium paniculatum</i> | Leguminosae |

ments, 1009 of triple super-phosphate was added to the at the time of planting.

The methodology used at the "Arboreta" (full sunlight) is from Burley *et al.* (1977) with some modifications, where the species introduced are planted

in rows of ten plants each, with a 3 meter space between trees and rows. The comparative species trial under full sunlight consists of parcels of 25 plants, spaced at 3m x 3m, distributed in random quadrants, with four repetitions. Only the nine central plants are evaluated.

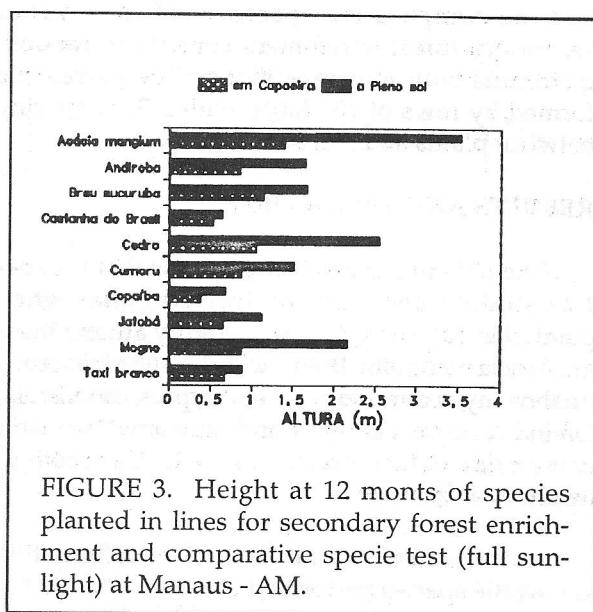
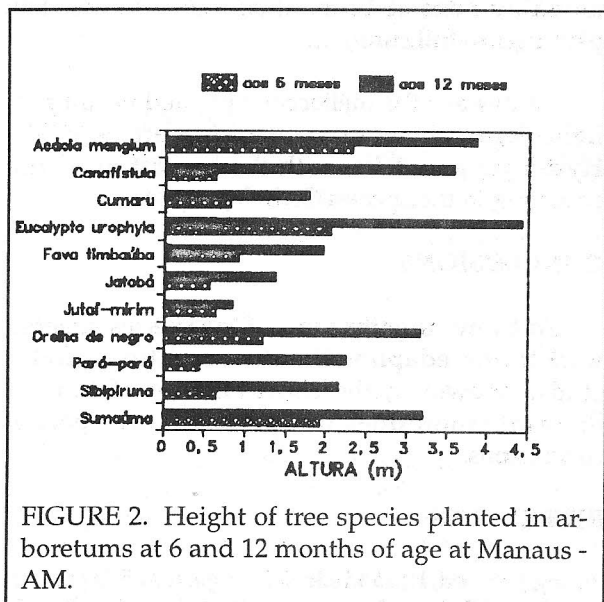


FIGURE 3. Height at 12 months of species planted in lines for secondary forest enrichment and comparative species test (full sunlight) at Manaus - AM.

TABLE 3. Survival percentages for species studied at 6 and 12 months in trials.

| Common name | Scientific name | Arboretum (all sun) | | Species trials (all sun) | | Line envidiment planting (under shade) | |
|--------------------|--------------------------------------|---------------------|-----|--------------------------|-----|--|-----|
| | | 6m | 12m | 6m | 12m | 6m | 12m |
| Acácia mangium | <i>Acacia mangium</i> | 100 | 100 | 97 | 97 | 85 | 85 |
| Andiroba | <i>Carapa guianensis</i> | 100 | 100 | 100 | 100 | 100 | 95 |
| Breu sucuruba | <i>Trattinickia burserifolia</i> | 100 | 90 | 72 | 72 | 82 | 55 |
| Cedro vermelho | <i>Cedrela odorata</i> | - | - | 97 | 97 | 97 | 92 |
| Canafístula | <i>Peltophorus dubius</i> | 100 | 100 | - | - | - | - |
| Cumarú | <i>Dypterex odorata</i> | 100 | 100 | 100 | 97 | 90 | 90 |
| Cobaíba | <i>Copaifera multijuga</i> | - | - | 92 | 86 | 95 | 90 |
| Castanha do Brasil | <i>Bertholettia excelsa</i> | 100 | 100 | 100 | 89 | 90 | 92 |
| Eucalypto | <i>Eucalypto urophylla</i> | 100 | 100 | - | - | - | - |
| Favia timbaúba | <i>Striphonedron guainensis</i> | 40 | 40 | - | - | - | - |
| Jatobá | <i>Hymenaea courbaril</i> | 100 | 70 | 100 | 100 | 100 | 97 |
| Jutaí-mirim | <i>Hymenaea parviflora</i> | 90 | 90 | - | - | - | - |
| Mogno | <i>Swietenia macrophylla</i> | 100 | 90 | 97 | 86 | 95 | 87 |
| Orelha de negro | <i>Enterolobium contortisiliquus</i> | 100 | 100 | - | - | - | - |
| Pará-pará | <i>Jacaranda copaia</i> | 90 | 90 | - | - | - | - |
| Sibipiruna | <i>Caesalpinia peltoporoides</i> | 100 | 100 | - | - | - | - |
| Sumaúma | <i>Ceiba pentandra</i> | 100 | 100 | - | - | - | - |
| Taxi branco | <i>Sclerolobium paniculatum</i> | - | - | 97 | 97 | 80 | 55 |

The comparative species trial in rows for secondary forest enrichment consists of random quadrants with four repetitions. The parcels are formed by rows of 10 plants, with a 3.5m spacing between plants and 7 m between rows.

RESULTS AND DISCUSSION

The data in Figures 2 and 3 show that the species studied generally performed better when planted in full sunlight. Noteworthy among these are *Acacia manguim*, *Breu sucuruba*, the Meliaceae (mahogany, cedar, andiroba, eucalyptus, canafístula, Orelha de negro, Para-pará and sumauma** use latin names) due to their excellent growth rates, both in height and diameter.

As to the survival rate (Table 3), both the native and exotic species performed satisfactorily. Of the native species only *Striphondendrom guianensis* showed a poor survival rate (40%). The species *Acacia manguim*, *Breu sucuruba* and *Scherolobium paniculatum*, when planted in enrichment rows in secondary forest, however, presented slightly higher

mortality rates at 12 months, much higher than plantings in full sunlight.

At this age the meliaceous planted in full sunlight began showing signs of the attack of the *Hypsipyla grandella*, with the highest incidence occurring in the species *Cedrela odorata*.

CONCLUSIONS

At twelve months most of the species adapted well to the edapho-climatic conditions under study. However, the short amount of time of the evaluation does not permit more specific conclusions.

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