

SHIFT-Projekt ENV-23

Rekultivierung degradiertes, brachliegender
 Monokulturflächen in ausgewogene Mischkulturflächen
 unter besonderer Berücksichtigung
 bodenbiologischer Faktoren

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Meteorological observations at the EMBRAPA-site near Manaus-AM in 1993, compared to the average of 1971-1993

Oswaldo M.R. Cabral & Carlos Doza

Zusammenfassung:

Meteorologische Beobachtungen auf dem EMBRAPA-Gelände bei Manaus-AM im Jahr 1993 im Vergleich zu langfristigen Mittelwerten der Jahre 1971-1993

Mit Hilfe der Wetterstation der EMBRAPA, die sich etwa 2 km von der SHIFT-Versuchsfläche entfernt befindet, wurden die folgenden meteorologischen Parameter gemessen: Niederschlag, Lufttemperatur, relative Luftfeuchte, Sonnenscheindauer, Verdunstungskapazität der Luft, Windgeschwindigkeit und Bodentemperaturen in unterschiedlichen Bodentiefen. Mittelwerte dieser Parameter für die Jahre 1971-1993 wurden mit dem Jahr 1993 verglichen. Danach war 1993 ein Jahr mit vglw. gleichmäßig verteilten Regenfällen. Dieses spiegelt sich in den Lufttemperaturen wieder, die leicht niedriger als im Mittel waren. Die relative Feuchte war während der feuchtesten Monate höher als im Mittel der Jahre 1971-93, während der trockenen Jahreszeit dagegen niedriger.

1 Material and methods

The experimental area of the SHIFT-project is located in the EMBRAPA main campus (2° 51' south and 59° 52' West), 28 km north east of Manaus. A weather station was installed approximately 2 km away from the experimental field in 1971. The parameters listed below have been measured three times a day, and the daily and monthly averages and totals were calculated:

1. Precipitation
2. Air temperature
3. Relative humidity
4. Sunshine hours
5. Evaporating power of the air
6. Wind speed
7. Soil temperature (soil surface and 2cm, 5cm, 10cm, 20cm, 30cm above ground).

2. Results and discussion

2.1 Precipitation

Precipitation is responsible for the pattern of the weather, defining two distinctive seasons (wet and dry periods). The monthly average for 1971-1993 and the 1993 totals of precipitation (see fig. 1) show the wet season (October to April) and the dry season (May to September). The peaks occur in March (Fig. 2), when the daily amounts were recorded up to 85mm, and August respectively. In spite of the large difference recorded between the average and the 1993 totals during the wet season (table 1), they are within the standard errors range ($\pm 200\text{mm}$) of the average, as a consequence of their high temporal variability. The daily distribution of the rainfall (see fig. 2), and the comparison of the precipitation totals for 1993 (= 2962mm) and 1971-1993 (= 2503mm) are indicators of a year showing a well distributed rainfall, although the amounts observed during the dry season were slightly lower than the average observed for May and June, which can be verified by an analysis of other weather elements.

2.2 Air temperature

The average monthly air temperature (24-26 °C), as well as the maximum (30-33 °C) and the minima (21-23 °C), are presented in fig. 3. The maximum values reflect the uniform distribution of the rainfall, which was slightly below the average, as the precipitation has a convective origin occurring mainly in the afternoon, but the minimum air temperature is not affected. The differences in the daily amplitudes, and consequently the averages, were more pronounced during the beginning of the 1994 wet season (October-November 1993), due to the increase of rainfall.

2.3 Relative humidity

In 1993 a monthly average of 80-90% relative humidity was observed. The values recorded during the wettest months were higher than the average of 1971-1993, but during the dry season the situation changed, and consequently a lower humidity was measured.

2.4 Sunshine hours

The CPAA climatological station does not own a solar radiation sensor, but a Campbell-Stokes sunshine recorder. Its records indicate the amount of energy which reaches the soil surface. The amount of sunshine hours in 1993 varied from 107 hours in February to 226 hours in August. This reflects clearly the cloud cover present throughout the year. Despite the rainy days, values above the average were recorded in May and June. The reasons can be found in short periods of very high precipitation during daytime.

2.5 Evaporating power of the air

The evaporating power of the air was recorded with an atmometer (Piche), which gives an estimate of the evaporative power of the air. The amounts of "evaporation" observed follow the precipitation totals. They were in a range between 45 and 85mm per month, or 1,5 and 2,8 per day respectively, which underestimate the real evaporation rates in a Terra Firme forest (forests: 3,4mm per day, pastures: 3,5mm per day, after Shuttleworth et al. 1984 and Wright et al. 1992).

2.6 Wind speed

The wind speeds observed in cleared areas are usually lower than those measured above a natural forest, mainly during the night and afternoon hours (Batable et al. 1993). The 1993 wind speed observations were lower than the average, probably because of the effect mentioned in Chapter 2.1, with respect to the maximum air temperature.

2.7 Soil temperatures

The average soil temperature for 1971-1993 is not available yet. Therefore a comparison to 1993 is not possible. The temperatures at the soil surface were between 26,7 and 32 °C, decreasing as a function of depth. The values at a depth of 30cm are higher than those recorded at a depth of 20cm, which is not a normal pattern to observe. An explanation might be the distribution of rainfall in 1993. Approximately 73 % of the days were rainy days, as discussed in Chapter 2.1.

CPTA-MONTHLY AVERAGES

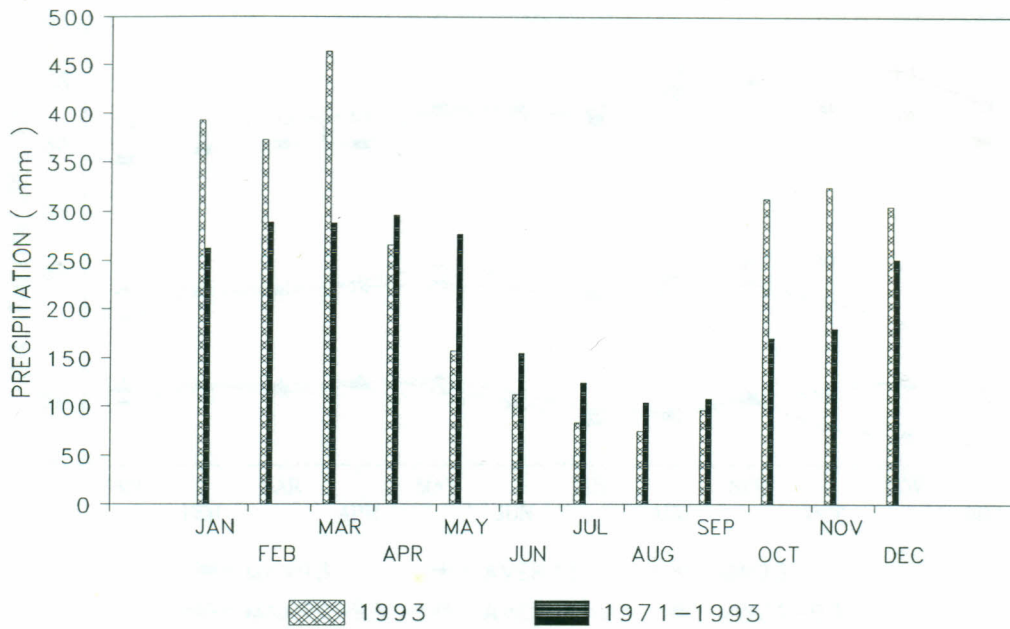


Fig. 1: Monthly average of precipitation in 1993, compared to the long term averages (1971-1993)

CPTA-1993

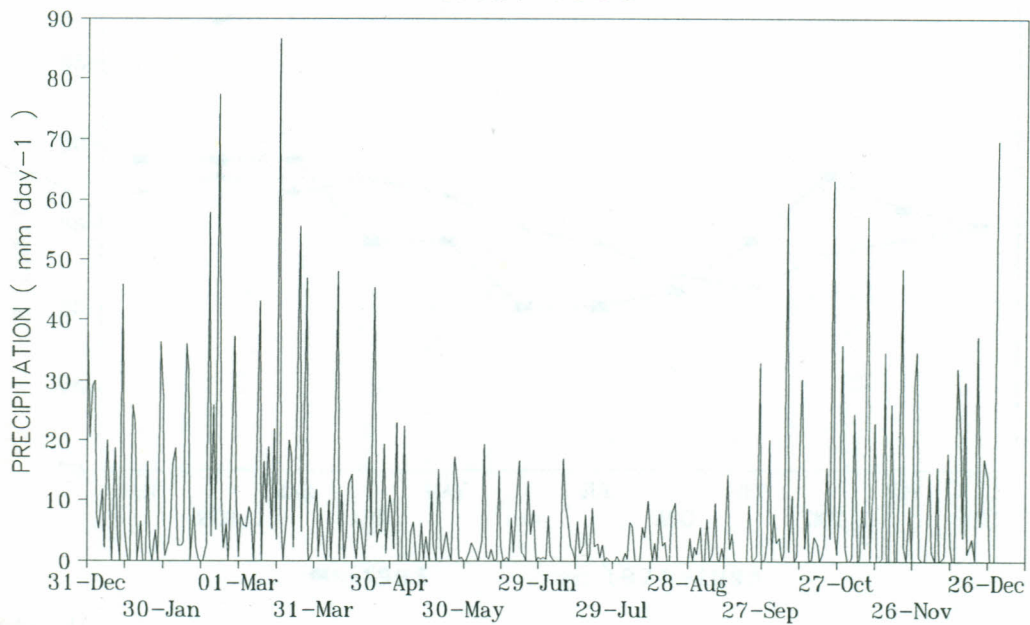


Fig. 2: Precipitation events in 1993

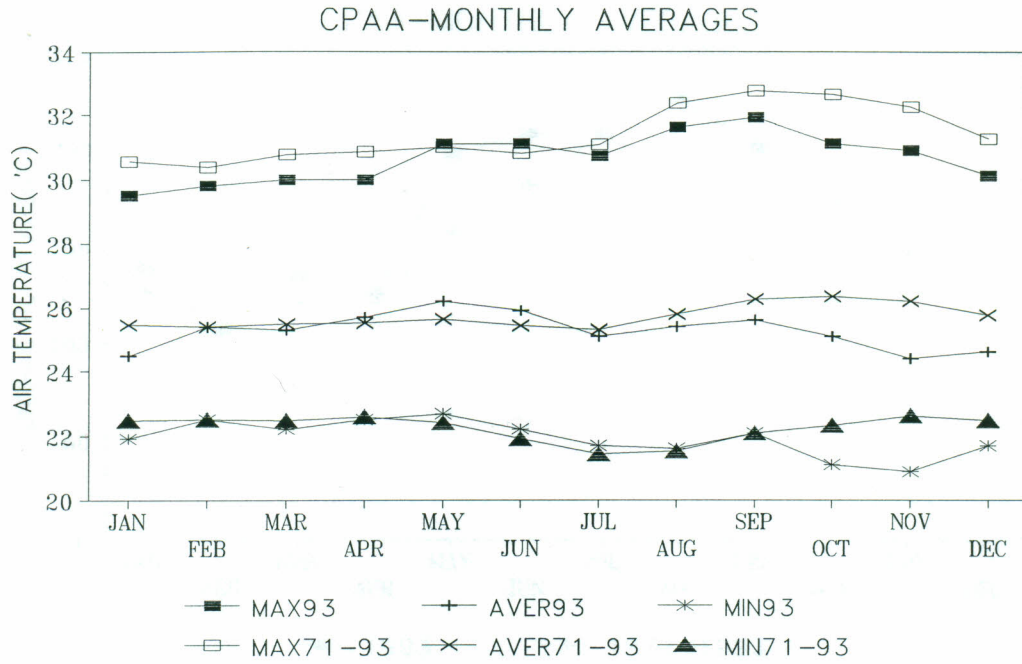


Fig. 3: Average, minimum and maximum of air temperature in 1993, compared to the long term averages

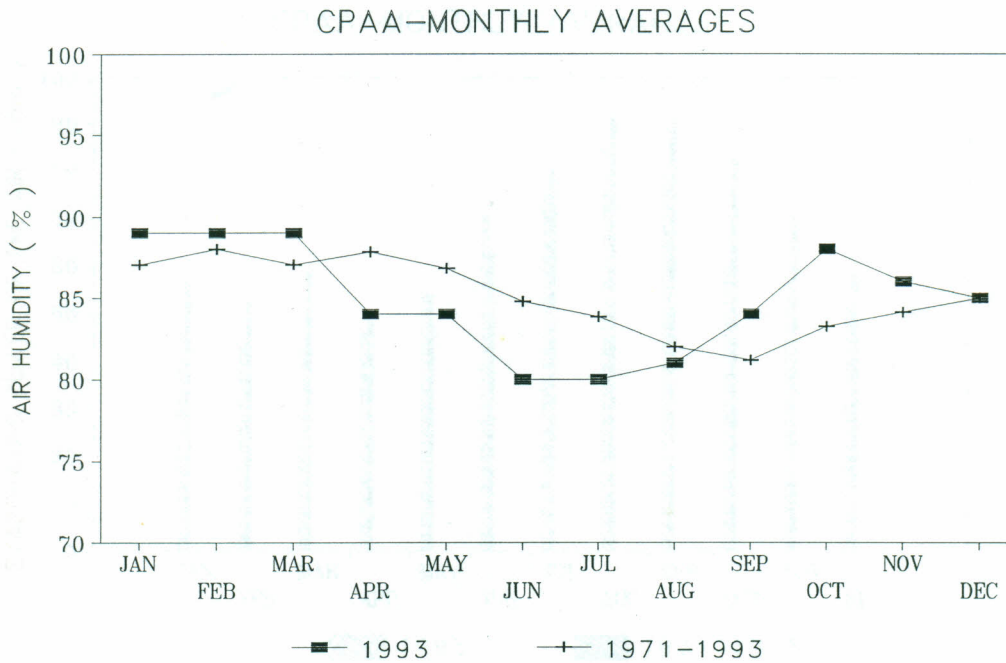


Fig. 4: Average air humidity in 1993, compared to the long term average humidities (1971-1993)

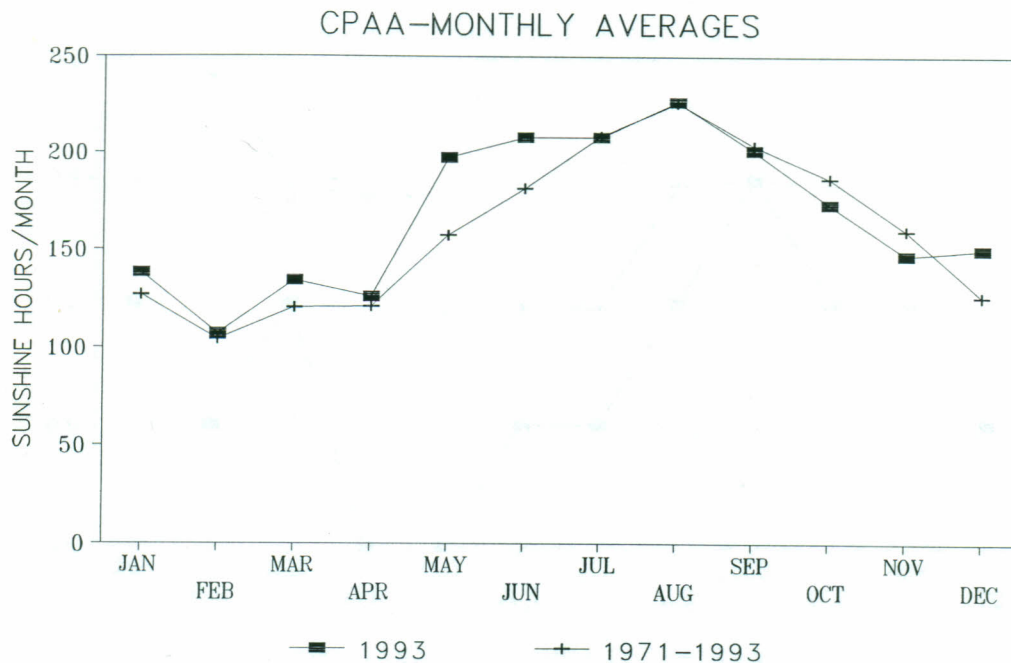


Fig. 5:
Averages of monthly sunshine hours in 1993, compared to the long term average (1971-1993)

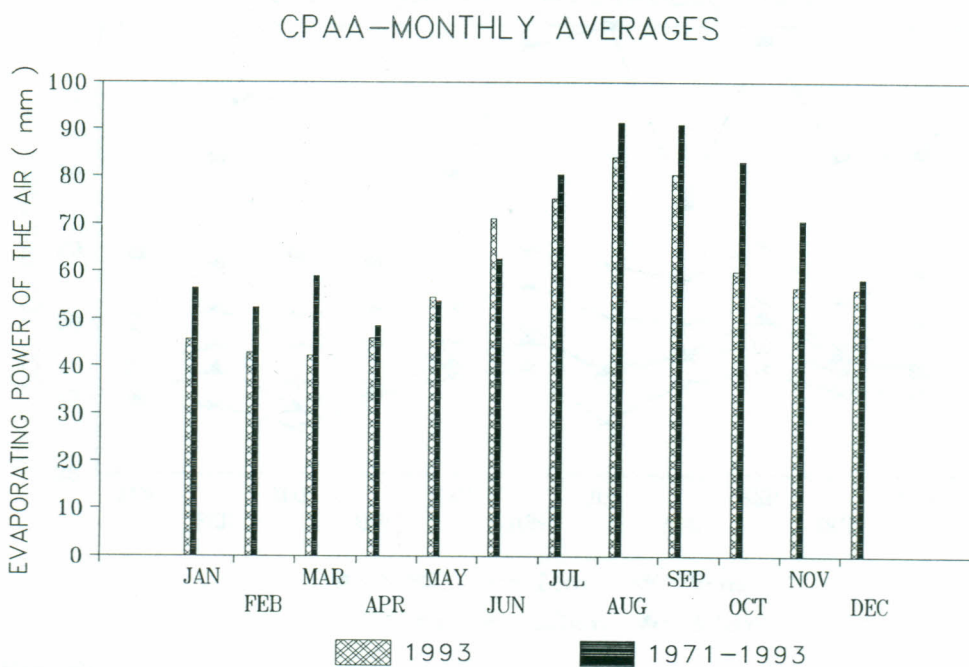


Fig. 6:
Monthly averages of evaporating power of the air in 1993, compared to the long term average (1971-1993)

CPTA-MONTHLY AVERAGES

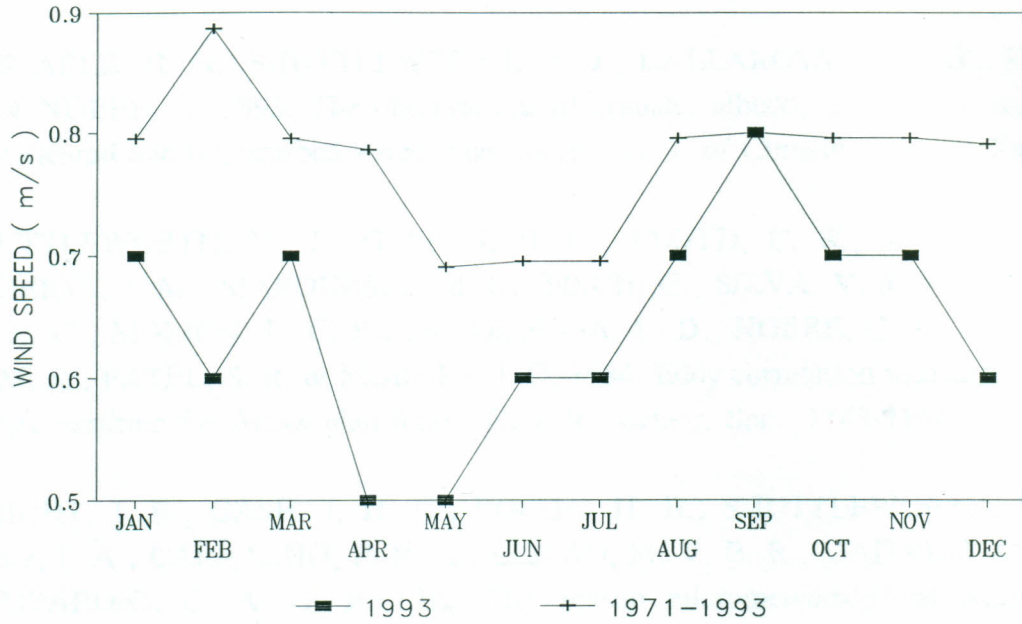


Fig. 7:
Averages of wind speeds in 1993, compared to the long term averages (1971-1993)

CPTA-MONTHLY AVERAGES(1993)

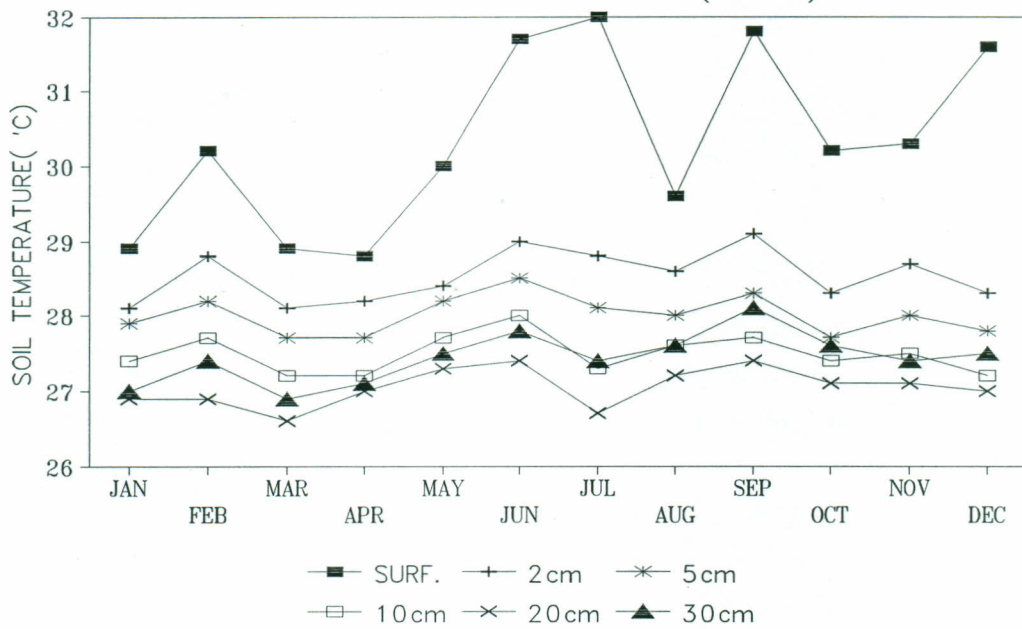


Fig. 8:
Monthly average of soil temperature in 1993 at soil surface and different soil depths

3 References

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