

Management of Leguminous Cover Crops to Improve Soil Fertility in Central Amazonia

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9371

The agricultural practices used in some Amazonian ecosystems are characterized by a continuous cropping which results in soil fertility decline over time. Experimental studies have been initiated in cropping systems near Manaus, Brazil, to evaluate the effect of legume mulch for recovery of soil fertility in a mixed plantation of coconut and cupuaçu perennial trees. Two leguminous shrub species (*Tephrosia candida* and

Flemingia congesta) and one prostrate species (*Pueraria phaseoloides*) are cultivated in form of alley cropping between the coconut and cupuaçu trees. Prunings of this species are applied to the soil as mulch near the perennial trees. Afterwards, variables such as input of organic matter and physical and chemical properties of the soil will be compared with areas where no mulch was applied.

Identification of Nutrient Limitation for Development and Yield of Cowpea (*Vigna unguiculata*) and Maize (*Zea mays*), in Intercropping System, on Two Representative Soils of Piauí

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Within the WAVES program, the working group "Plant Nutrition" has the objective to identify the limitation of mineral nutrients for plant development and production under the soil and climatic conditions of the semi-arid regions in Piauí. Therefore, two experiments using the intercropping maize x cowpea, with the following treatments were carried out in the growing periods of 1998 and 1999: (1) on a Alumi-Haplic Acrisol in the site called "Chapada" complete fertilization (N, P, K and lime), complete fertilization without nitrogen; complete fertilization without phosphorus; complete fertilization without potassium; complete fertilization without lime and control and complete fertilization (N, P, K); (2) on a Chromic Luvisol in the valley complete fertilization without nitrogen, complete fertilization without phosphorus, complete fertilization without potassium and control.

The results of the experiments and the simulations with EPIC/ALMANAC crop model show that on the Chapada Phosphorus was the most limiting nutrient in the growing periods of 1998 and 1999 for both maize and cowpea. The biomass accumulation in the treatment with phosphorus

omission was only superior to the control treatment. If P is supplied adequately, Ca and K, and in the second year N become most limiting for cowpea on the Chapada. The application of dolomitic lime seems to reduce K uptake by cowpea and maize on the Chapada, but dolomitic lime is necessary in order to supply sufficient Mg to the crops. On the Chapada, a decrease in nutrient availability is observed in the second year which affects maize yields and cowpea yield in the case of nitrogen. In the valley on a Chromic Luvisol, additional N application is not necessary for cowpea. For maize P is most limiting. An antagonism between K and Mg/Ca is observed only for maize in the valley. The soil nutrient availability for crop growth and yield is much higher in the valley than on the Chapada. Simulations of biomass production and yield in the maize/cowpea intercropping system on the Chapada, show, that the ALMANAC model does not adequately take into account the interaction between water and nutrients as limiting factors for biomass production. Adaptation of the ALMANAC model to the ecological conditions of the Chapada is necessary.