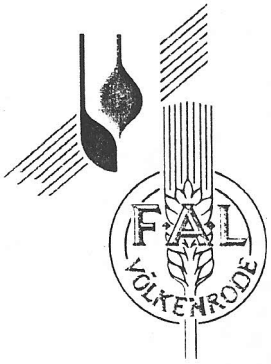

Food and Agriculture Organization
of the United Nations (FAO)
Rome, Italy

Society of Sustainable Agriculture
and Resource Management (SSARM)
Hisar, India

Federal Agricultural
Research Centre (FAL)
Braunschweig, Germany

International Conference

Sustainable Agriculture for Food, Energy and Industry

Book of Abstracts

Braunschweig, June 1997

Recultivation of cleared and abandoned sites in the Amazon by agroforestry system, a shift-project

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In the Amazon there are approximately 40 million hectares of cleared land available which could be used for agriculture. Today, the greater part of this land has been abandoned. The Research Center for Agroforestry in the Western Amazon (CPAA/Embrapa), Manaus-AM, Brazil, and the University of Hamburg, Germany, supported by BMBF (Germany) and CNPq/IBAMA (Brazil), are carrying out studies in cleared and abandoned areas. The objective is to develop agroforestry systems which are ecologically, socially and economically viable for the humid tropics by rising the productivity of these areas and, consequently, by using the areas for a long period of time. This would reduce the clearing and burning of primary forests and the rural-to-urban migration. In the first half of 1993, four experimental agroforestry systems were installed on a former secondary forest site, composed of the following species: Hevea spp; Theobroma grandiflorum, Bactris gasipaes, Bertholletia excelsa, Bixa orellana, Cocos nucifera, Citrus sinensis, Schilozobium amazonicum, Swietenia macrophylla, Carapa guianensis, Carica papaya, Zea mays and Manihot esculenta. Additionally, monoculture systems of C. sinensis, B. gasipaes, Hevea spp and T. gradiflorum were planted. The mixed culture systems were treated in different ways, applying two levels of fertilization and inoculation of mycorrhiza fungi or not. Plots of 32m x 48m were used, and the plantation systems and treatment groups were arranged by chance in 5 blocks (= repetitions). The experiment is carried out by a team of scientists from different disciplines, especially from biology and agriculture. The plants inoculated with mycorrhiza showed a much better growth in the nursery and a much better rate of survival after planting out into the field than the control group. After the end of the first year, the mycorrhizal inoculum was not any more detectable but after three years of cultivation the mycorrhiza treated variant of the perennial crop Theobroma grandiflorum revealed significantly higher fruit production. In general, the crops in the agroforestry systems behaved better than in the monoculture systems. The incidence of plagues was much lower compared to farmland in the region.

Sustainable land use systems in central amazon rain forests

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Slash and burn based production systems destroy actually about 500,000 ha per year of primary Amazonian rain forest. Loss of soil fertility after burning, excess of water or unequal distribution of rainfall, low cation exchange capacity of oxisols and ultisols, high aluminium ion concentration in the soil and very low availability of phosphate for plants are characteristic factors which limit agriculture in Amazonia.

The most important mechanisms which lead to a biomass of 500 t/ha of primary rain forest are the highly effective nutrient recycling systems of the plants. Solid root mats cover the mineral soil layer and root-microbe interactions - most of them so far not known in detail - guarantee a rapid binding and re-uptake of minerals from rain water and stem flow. These recycling systems are far from being understood, but successful plant production systems in the Amazon basin must be based on them.

In a bilateral Brazilian-German research and development approach, SHIFT, supported by BMBF (Germany) and CNPq/IBAMA (Brazil), a project was started which offers opportunities to study land use systems which may serve as alternatives to slash and burn strategies.

The aim is to develop cropping systems which give rise to permanent low input field cultivation, using perennial and shortliving plants in combination. Besides the abiotic conditions of the experimental area, especially plant-plant interactions and plant-microbe interactions are studied.

The function of new, primary selected crop plants of the Amazon area and of secondary vegetation, their ability to store mineral elements and to enhance the recycling efficiency are evaluated as well as the soil microbial diversity.