

Characteristics of sustainable polyculture production systems on terra firme

Lieberei R.⁽¹⁾, Gasparotto L.⁽²⁾, Preisinger H.⁽¹⁾ and Schroth G.⁽¹⁾

⁽¹⁾ Universität Hamburg, Hamburg, Deutschland, ⁽²⁾ CPAA, Manaus, Brasil

Stable systems in tropical rain forest areas must possess regulatory factors similar to those of the primary forest: closed mineral recycling systems and efficient mechanisms for water and energy distribution. These features can not be achieved by a single species, but depend on a combination of species with various suitable, synergistic properties in root and canopy formation as well as in biochemical and biophysical factors adapted to the site.

The combination of soil science, forestry, agronomy and biology allowed an analytical comparison of various experimental mixed culture systems. From these studies, a descriptor system was developed which allows to understand the contribution of each plant species to nutrient cycling, water distribution, litter formation, overall biomass production and crop production. This knowledge allows to combine plants so that their properties interact to form a system, which minimizes mineral losses and which regulates air humidity and water distribution and thus leads to stable crop production.

The artificial planting systems are designed as production systems for small holders. They must deliver food crops as early as possible to maintain survival on a subsistence basis and they must rapidly produce cash crops in order to provide family income and to pay for various management steps. All systems undergo changes in time and space and consist of an installation phase, where only some annual production of maize, cassava, beans are available, followed by a transition phase with production of papaya, maracuja, palmito and a production phase with an increasing variability in market-relevant products.

The general conclusion which can be drawn after eight years of polyculture study is

- a) Stable production systems for smallholder families have been developed; they consist of a combination of plants for production and helper plants necessary for system stabilization.
- b) The systems are variable. They can be adapted to the respective site conditions
- c) The management of these plantations requires a deeper understanding of the cultivation systems and an intensive dissemination of knowledge and a well developed on-farm training system for farmers.