

Shade Effects on Moisture Relations of Agroforestry Systems.

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Although competition of shade trees for water with shaded crops has been a major argument in favor of the removal of shade trees in agroforestry systems, experimental results do not always confirm that shade trees increase water consumption and reduce soil moisture. Soil moisture was shown to be much higher under coffee shaded with the dense canopied *Erythrina poeppigiana* (Walp.) O.F. Cook than the more open canopied *Eucalyptus deglupta* Blume. Soil moisture decreased with increasing distance from trees when *Giricidium sepium* (Jacq.) Steud. or *E. poeppigiana* were associated with *Phaseolus vulgaris* L. Increased competition for moisture when crops are associated with shade trees can often be offset by reduced evaporation at the soil surface due to reduced soil temperatures under shading.

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Effect of Management on Selected Soil Quality Indices.

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Soils of the Sahelian region of West Africa are inherently low in fertility and have poor physical attributes. This study investigated the long-term effect of organic and inorganic fertilization, cereal/legume rotation and tillage on selected soil quality indices on a Psammentic Paleudalf in Niger. While use of fertilization, rotation and tillage did not significantly influence surface bulk density, these practices significantly increased water infiltration rate of the soil. Use of organic and inorganic amendments increased total N, and SOM over the traditional cropping system. Cowpea/millet rotation did not significantly influence any of the indices studied. However, introduction of tillage into the system resulted in a significant increase in microbial respiration (150 kg/ha/d), total N (152 mg/kg, and SOM (0.33 kg/ha). The implication of this study in the socioeconomic context of the Sahelian farmer will be discussed.

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Qualitative and Quantitative Descriptions of Farmer Selection of Maize in Oaxaca, Mexico.

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Farmers' selection goals, practices and genetic response to these in their maize populations were documented in two communities in Oaxaca, Mexico. Primary selection criteria focused on long, heavy ears with standardized selection differentials for these traits often close to or exceeding 1.0. Farmers clearly distinguished between traits of high and low relative heritability and their expectations for selection response reflect this. A field trial measuring response to farmers' selection in populations from six households found virtually no response to selection as practiced, confirming farmers' statements. Discrepancies between expected and actual response suggest selection criteria may be used because of their association with seed viability and seedling vigor rather than mature plant characteristics. A role for farmer and plant breeder collaboration to improve heritability of desirable traits under local selection is indicated.

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Effect of the Sahel Rainy Season on Inorganic Soil Nitrogen Availability.

S.J. Blanton-Knewton¹, L.R. Hossner¹, Z. Kouyate², and M. Doumbia², ¹Texas A&M Univ., ²Institute of Rural Economy. Crop yield in the semi-arid region of West Africa is constrained by soil fertility. Suitable crop management systems, including crop rotations and organic and inorganic fertilizers, are needed to increase food production. A study of the nitrogen dynamics during the 1998 crop season was conducted to provide background information for future nitrogen fertilizer programs. Inorganic nitrate and ammonium were measured in soil samples (0-10 cm depth) collected weekly from five cropping sequences, at the Cinzana Research Station, in Mali, West Africa. Samples were taken from sorghum (*Sorghum bicolor*) plots on a loam aquic Haplustalf soil and from millet (*Pennisetum glaucum*) plots on a loamy sand plinthaquic Haplustalf soil. Inorganic nitrogen was also measured to a depth of 100cm before planting and after harvest to evaluate seasonal leaching. Data from soil analysis, plant tissue analysis and crop yield were combined to depict seasonal nitrogen dynamics. Available inorganic nitrogen increased during the rainy season. Available soil nitrogen was greater in the loam soil than the loamy sand soil. In the loamy sand soil, the concentration of available ammonium was greater than that of nitrate, during most of the season. Nitrate decreased in the upper 10cm after large individual rainfall events.

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Agroforestry Systems for Rehabilitating the Productivity of Abandoned Pastureland in the Brazilian Amazon.

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There are at least 35 million hectares of abandoned pastures in the Brazilian Amazon. Meanwhile, local farmers and new migrants to the Amazon continue to clear and burn primary forest for short-lived food, cash crop, and pasture systems. The use of sustainable food and fiber production systems on abandoned pastures can turn them from sources to sinks of C, provide for the well being of local people and preserve the world's largest remaining area of tropical rainforest. An experiment near Manaus compares four agrosilvopastoral systems established on abandoned pastureland. The systems were designed on the basis of intensive farmer surveys and the results of previous soil/plant research. In this paper, the impacts of the management practices on system establishment costs, soil nutrient dynamics, secondary plant species succession, soil macrofauna, and component productivity will be discussed.

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Approach and Achievements of the Alternatives to Slash-and-Burn Programme 1992-99.

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Slash and burn agriculture accounts for a large proportion of current tropical deforestation, combining high levels of poverty with major negative environmental consequences. The ASB Program operates at benchmark sites in the humid tropics of Brazil, Cameroon, Indonesia, Peru and Thailand where joint biophysical and socioeconomic research is being conducted by national and international institutions and NGO's as a systemwide program of the CGIAR. "Best-bet" alternative systems have been identified and the tradeoffs determined between agronomic sustainability, farmer profitability and global environmental benefits such as carbon sequestration and biodiversity.

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Farmer Participation in Conserving Crop Genetic Resources: Problems and Prospects.

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Farmer participation in plant breeding has been tendered as a method to develop crop varieties for small farms in marginal agricultural zones and to achieve in situ conservation of genetic resources. These goals may not be compatible. If conservation and development are to be achieved, attention to both crop population biology and farm budgets is required. Strategies for participation include variety selection and mass selection. These are reviewed against the ecological context of small farm agriculture in centers of genetic diversity. The nature of seed exchange and household labor budgets in traditional agricultural communities suggest that seed system development is a more viable route than more generalized participatory strategies. Case studies in Peru and Mexico are used.

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Agronomic sustainability of best-bet alternatives to slash and burn.

S. F. Weise, *IITA*, M. van Noordwijk, *ICRAF*, A. M. Mendes, *EMBRAPA* problems and potentially negative nutrient balances depending on the specific systems assessed. Simple tree crop systems are often linked with problems of soil structure, besides crop protection concerns. The long fallow/food crop systems with low cropping intensity in Indonesia and Cameroon are sustainable. However, unimproved short fallow/food crop systems can have a detrimental effect on soil structure, nutrient balance and crop health. Continuous annual cropping is problematic at all levels. Pastures, particularly with improved management practices, tend to have a medium level of impact on the natural resource base, but are clearly less desirable than forest extraction systems.

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Carbon Losses and Sequestration following Land Use Change in the Humid Tropics.

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Tropical deforestation results in a net flux of 1 to 2 Pg C y⁻¹ to the atmosphere. Uncertainty is due to inadequate estimates of rates of land use change, C stocks, and regrowth rates. C stocks were measured in three ASB benchmark countries, in forests; slash and burn; agroforests; plantations;