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DEVELOPMENT OF SUSTAINABLE TREE CROP PRODUCTION SYSTEMS FOR HILLSIDES IN HIGH RAINFALL AREAS IN THE CARIBBEAN

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ABSTRACT. The paper describes a project being undertaken by the Faculty of Agriculture and Natural Sciences, University of the West Indies, aimed at developing commercially viable tree crop production systems to sustain soil fertility on locations prone to erosion in the Caribbean. Major emphasis is being placed on intensified use of tree crops to achieve year-round soil cover. A multidisciplinary approach which embraces crop management practices including integrated pest management, and improve systems for post-harvest handling and commodity utilization will be applied.

INTRODUCTION

One of the major concerns for the sustainability of future development in the Caribbean is that of the appropriateness of land use systems. Most territories in the region are characterised by a very limited land space from which to derive national wealth, therefore, there should be a very small margin if error for improper use of land since mistakes are neither cheaply nor quickly corrected. The major activities from which national income is derived include agriculture, tourism and mining all of which require serious land use planning because of the impact which they have on the environment. The project which will be described in this paper will address problems of soil erosion arising from improper use of hillside land.

Soil erosion on hillsides usually arises from the deforestation for agricultural activity, mining or land development including housing. In the agricultural sector the practices of slash and burn land clearing technique and shifting cultivation used by small farmers has been cited as a major reason for soil degradation in the region. Wilson (1976) cited Blume who suggested that a major fraction of land rendered useless for reafforestation or for further agricultural use has been made so by these practices which were first used by the Amerindians (Giguere, 1982) and subsequently exacerbated after Emancipation by a peasantry which had access only to marginal hillside lands. Sheng, cited by Wilson (1976) estimated soil loss of 100 to 125 ton/ha/yr. Under traditional cultivation systems in comparison with 5 to 12.5 ton/ha/yr. Under dense forest. However, substantial erosion and land degradation also occurs under monocrop and plantation-scale agriculture, cultural practices including use of heavy machinery, land cultivation, and burning of canes in sugar-cane production, long-term cotton monoculture, and clean weeding of banana plots are all major causes of land degradation to which minimal attention has been paid.

Whereas the negative effects of farming activities are often insidious, deforestation for land development and mining can have dramatic, disastrous results such as landslides and floods. For example, landslips and / or floods wreaked havoc Barbados in 1936 and 1966, in St. Lucia in 1938 and 1994, in Puerto Rico in 1985 and in Trinidad in 1993. Among the other undesirable effects of deforestation are:

- a) Lower recharging of aquifers which causes ground water levels to fall and water shortages

during the dry season.

- b) Deposition of silt and gravel in water courses which have to be cleared annually at substantial cost.
- c) Destruction of flora and fauna, sometimes including indigenous species.
- d) Deprivation of the wider society and future generations the social, environmental and aesthetic benefits of forested hillsides.

Agroforestry systems, with tree crops as major components have been recommended as an approach to achieving the dual objectives of environmental conservation and income generation for farm families (Nair, 1985). Tree crops have an advantage over forest species in that income is derived much earlier to meet the farm's cash needs. Nevertheless, there are several constraints which must be addressed if farmers, especially those with small holdings, are to be persuaded to implement tree crops production systems. These constraints include:

- a) Large tree size which leads to competition with lower storeyed, short season, cash crops.
- b) Longer maturation period than annual crops.
- c) Seasonal bearing and low, unreliable yields.
- d) Lack of information on proper management techniques for tropical tree crops.
- e) A high level of pre- and post-harvest losses; also poor quality fruit limit market opportunities.
- f) Limited utilization opportunities due to weak linkage with agro-industry. The project activities described below are addressed to meeting some of these challenges.

THE PROJECT

Major objective:

To develop sustainable tree crop based production systems for hillsides in high rainfall areas in the Caribbean.

Specific objectives:

- a) To conserve or improve the long-term food production capability of hillside land through soil conservation.
- b) To develop commercially viable tree-crop based production systems.
- c) To encourage greater utilization of under-exploited perennial fruit crops.

PROJECT ACTIVITIES

- A review of studies on soil erosion in watersheds in the Caribbean, conservation methods including the use of tree crops, hillside cropping systems, tree crop production and food and fruit crop marketing and utilization.
- A survey of the current status of hillside farming systems, key production and utilization constraints and farmers' goals in respect of the performance of farm operations.

- Design establishment and evaluation of cropping systems consisting of tree crops or mixtures with annual crops which will achieve year-round soil cover. These systems will be based on current agroforestry principles and will be established on selected farms and on field research sites.
- Collection of baseline data on soil erosion and nutrient and physical status and evaluation of the effects of the cropping systems on these parameters.
- Employment of integrated nutrient supply and integrated crop management strategies and evaluation of the effects of the cropping systems on crop health.
- Development of improved harvesting and post-harvest handling techniques for selected commodities to enhance marketability.
- Development of processed foods from selected commodities to promote greater utilization.
- Evaluation of economic viability of the systems.
- Workshops / seminars and short training courses for extension officers, farmers, traders, processors to facilitate technology transfer.
- Establishment of an advisory services on the management of cropping systems of hillsides in high rainfall areas.

RESEARCH TEAM

As the above list of activities indicate, a multidisciplinary approach is being used in this project because it is recognized that design, management and evaluation of successful cropping systems require proper coordination of several factors, including those of concern to farmers, consumers, and researchers. The team therefore, consists of academic staff with experience in the following areas:

- Rural sociology and extension
- Engineering geology
- Agronomy and horticulture
- Crop Protection
- Post-harvest handling
- Food Processing
- Biometrics

Expertise in soil sciences and in agricultural economics particularly as it pertains to the evaluation of environmental conservation projects is also available to the project.

PROJECT LOCATION

The project will be conducted in Trinidad and St. Lucia. In both territories, farmers' holding for on-farm trials, and U.W.I. managed sites for more controlled studies and trials with potentially important crops will be used.

PROJECT DURATION AND IMPLEMENTATION

The first phase of the project, consisting of the initiation of the activities identified above, began in November, 1996 and will continue to April, 1998. Research and commercial activities are expected to continue at least until 2006.

PROJECT BENEFITS

This project can be justified on the basis of the anticipated benefits which can accrue at the regional and institutional levels. These include:

1. Income generation for farmers, traders and processors in the region. Income derived directly by UWI will contribute to future funding.
2. Contribution to the broadening of the economic base in the Caribbean by supporting regional efforts at agricultural diversification within the context of limited arable land.
3. Strengthening of linkages among farmers, extension officers and researchers.
4. Strengthening teaching and research capability and capacity within the region not only through provision of appropriate physical facilities and equipment but more importantly, through the enhancement of academic performance at an individual and institutional level which the multidisciplinary approach will foster. The relevance of training offered at both the undergraduate and postgraduate levels will be enhanced.
5. Expansion of the body of scientific knowledge relevant to the Caribbean in several disciplines and more so on the impact of various tree crop production systems on the physical and biological aspects of upland sites. Furthermore, these studies will highlight areas which need further investigation of development of better technologies.

PROJECT FUNDING

This project is being funded by the University of the West Indies / Inter-American Development Bank Research and development Fund until 1998. Additional funding is being sought for its continuation over the next eight years.

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