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# Development of a Sustainable Abaca (*Musa textilis* Née) Production in a Diversified Multi-strata Agroecosystems in Leyte, The Philippines

**Master Thesis**

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## 6. Summary

The establishment of an agroecosystem, as exemplified by clearing and cultivation, is primarily intended to serve human needs for agricultural products (KOCH et al 1990 cited by DARGANTES 1996). Once established, the agroecosystem is then geared towards the attainment of high crop yields. According to DARGANTES (1996), stability, which may only be maintained in special and exceptional cases and only within short periods, usually assumes a subordinate role to the objective of producing outputs with immediate economic value. Under these conditions, the interactive influences of the ecosystem and the socio-economic system exert undue influence over the ecosystem and subdue the elements and processes which maintain this equilibrium. And in Leyte, this is manifested by the loss of 163,000 hectares of the islands' forest lands to agriculture (ACOSTA 1991 cited by DARGANTES 1996).

GROETSCHEL et al (2001) stressed that the amount of remaining forest cover can be used as an indicator of the critical situation regarding land access for the increasing number of people dependent on agriculture. The decreasing productivity and increasing instability of the island upland resource base is reflected in the increasing poor economic status of the upland population (STARK 2000). Therefore, a combined effort (i.e., government, research institutions and forest occupants) is required to propagate ecological technologies to stop environmental degradation (PASCUAL 1998) since the extent and severity of soil degradation upon clearing tropical forest for agriculture would depend on the cultivation system being imposed and how the soil is being managed (THENG 1991). Thus, a development of a sustainable environmentally sound agroecosystem must be in placed within the framework of a holistic community-based rainforestation farming in order to rehabilitate the degraded lands as well as to overcome the distinct economic inequalities of the upland population in Leyte.

Despite the importance of abaca to the national economy in general and to Leyte's economy in particular, its potential as a source of greater income to upland farmers while serving as a crop that may actually help in slowing down deforestation, is given little research and policy attention (LACUNA-RICHMAN

2002). Planting abaca give *de facto* rights to the land it is planted on, and reforestation efforts should take this into account as more families are forced by circumstances to settle on areas designated as forest land. LACUNA-RICHMAN (2002) reported that abaca is frequently the only source of cash income of poorer households in Leyte, who have only abaca as a single cash crop, and various subsistence crops as supplement of their household.

Hence, abaca is a very suitable crop for integration in both rainforestation farming system and monoculture coconut plantations, by creating a diversified multi-strata agroecosystem. The integration of abaca in the rainforestation farming concept will serve as a guide for transforming the actual subsistence-level single-species systems into a holistic community-based rainforestation farming. The produce from fruit and forest trees could allow abaca-producing households to earn an income when their abaca crops become less productive, or when harvesting the fiber become close to impossible for particular households, for example, due to the lack of able-bodied family members to maintain the plot and harvest the crop. Thus, helping to rehabilitate the degraded land as well as to overcome the distinct economic inequalities of the upland population in Leyte. On the other hand, utilizing the open space between monoculture coconuts (which is about 21.4% of the island's area) will minimize further forest encroachment and clearing of tropical forest for agriculture.

The objectives of this study are: a) to evaluate two multi-strata abaca production systems based on site and plant nutrient status, site adaptability and biological productivity and b) to identify possible pathways for a sustainable abaca production scheme in the Philippines. In addition, these objectives may point to possible areas of concern in promoting the use of abaca as an agroforestry crop for reforestation purposes.

In September 2003, two study sites were established at two different areas near Baybay, Leyte, Philippines. The first site (Barangay Caridad) is located about 14 km northeast of Baybay town at an elevation of 122 amsl. The second site (Barangay Mailhi) is about 23 km southwest of Baybay at 351 amsl elevation. The two research sites are comparable in terms of soil physiography and geology. This was accomplished by a very detailed survey using auger to

make sure that the soils were comparably similar as indicated for example, by morphological features such as color, texture and horizonation.

The data collection was carried out from September 2003 to June 2004 with the cooperation of the Institute of Tropical Ecology of the Leyte State University, Baybay, Leyte, Philippines. The study involved data collection on the following aspects: site nutrient status, plant nutrient uptake, and morphological and physiological performance of abaca plants.

In abaca –coconut integration, site nutrient status depends upon the type of land use, management practice i.e. periodic burning of coconut husk and soil type. While, in plant nutrient uptake, results show that nutrient concentration of abaca leaves are below the critical nutrient concentrations of banana and plantains. However, it is not enough and safe to conclude that the low nutrient concentration is in critical condition since the standard values for abaca is still unknown. Thus, using the results for diagnosing nutrient deficiencies is insufficient. Likewise, it is inadequate and insecure to bring into conclusion that the low concentration of nutrients in abaca leaves is due to low nutrient stocks in the soil solution. It may be due to some other factors like nutrient competition between the two crops or cation balance in the soil solution. All these factors has an effect on the morphological and physiological performance of abaca. However, in the case of this study, morphological and physiological performance of abaca depends mainly on the type of planting materials that exhibit fast recovery of its root system and increase in leaf emergence rate. Another is the farmer's practice towards the management of coconut plantation.

While, in abaca – rainforestation integration, results reveal that the trees planted under the Rainforestation concept plays a very significant role in the nutrient fluxes and the improvement of soil acidity in the surface horizon. This is due to the fact that trees function as "nutrient-pumps". Therefore, contributing to a high degree of nutrient uptake in the abaca leaves considering the negative properties (e.g. high exchangeable acidity and aluminium saturation) of the type of soil under such a system. However, the sustainability of the soil nutrient stocks depends also on the type of management practice that farmer will choose, either to cut or harvest the trees for more abaca or to

preserve them. Meanwhile, under such as system, topography is one of the major factors that affect nutrient availability in the soil and plant uptake leading to poor growth performance of abaca. Another factor is wind speed which has a direct impact on the physiological functioning and mechanical damage of the plant.

Therefore, it can be concluded that both sites are suitable for abaca production in terms of soil type and nutrient reserves. However, due to high planting density, additional inputs are needed to improve the crop's growth performance, like fertilizer and high quality planting materials that exhibit fast recovery of its root system and increase in leaf emergence rate. Likewise, topography and wind speed must be consider during site selection. Finally, integrating abaca into coconut monoculture maybe a good idea, but under such type of an acidic soil, integrating abaca into the Rainforestation concept is the best option. If sustainability of the whole agroecosystem functions is taken into account.