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The Economy and Environment Program for Southeast Asia (EEPSEA) was established in May 1993 to support training and research in environmental and resource economics across its 10 member countries: Cambodia, China, Indonesia, Lao PDR, Malaysia, Papua New Guinea, the Philippines, Sri Lanka, Thailand, and Vietnam. Its goal is to strengthen local capacity for the economic analysis of environmental problems so that researchers can provide sound advice to policymakers.

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Planting for the Future: Options for Upland Grasslands in the Philippines

EEPSEA POLICY BRIEF • No. 2003 - PB7

Many small farmers in Southeast Asia face an uncertain future as population pressure, climate change and other factors damage the profitability and sustainability of their smallholdings. One way forward for these farmers is to change the type of agriculture they practise to one that will guarantee a viable income and also keep the environment in good shape. A new report from the Philippines has shown how to assess which land use is best for a certain land type. It also gives advice on how to help farmers make the necessary changes. →

A summary of EEPSEA Research Report 2003-RR7, What Motivates Farmers? Tree Growing and Land Use Decisions in the Grasslands of Claveria, Philippines by Canesio D. Predo (National Abaca Research Center, Leyte State University, Visca, Baybay, Leyte, Philippines. Tel (63 53) 335 2653. Contact E-mail: cdpredo@philwebinc.com or cdpredo@yahoo.com)

Tree-based systems provide environment

Canesio D. Predo from the National Abaca Research Center at Leyte State University produced the report. Predo showed that it would make economic and environmental sense for farmers in the country's upland grassland areas to convert a large percentage of their farms over to trees. Predo also found that, although this would help halt the current slide into low productivity and environmental ruin, many of these farmers were reluctant to make the move because of the economic risks involved. Predo therefore suggested a number of policies that would help farmers make the switch.

Unsustainable uplands

Predo's research was carried out against a background of increasing environmental degradation in the upland grassland areas of the Philippines. In recent years, intensive cultivation has resulted in high rates of soil loss and has threatened the long-term productivity of local agriculture. This has happened to such an extent that many commentators feel that, unless the situation changes, many smallholder upland farms will cease to be viable. With upland grasslands making up more than one third of the country's land area, this problem has serious implications for both the growing upland population and the country as a whole. To find a way to deal with this challenge, Predo looked at which land use options would allow the farmers of the Philippines' upland grasslands to make a sustainable livelihood. He focused on tree planting which has been shown elsewhere to be both good for the environment and a viable economic alternative to other forms of agriculture.

The study site

Claveria Misamis Oriental, Mindanao, was chosen as the study site. It is located 40 km northeast of Cagayan de Oro and lies on an undulating plateau between the coastal escarpment and mountainous interior, ranging in elevation from 200 to 500 m above mean sea level. Claveria is an *Imperata*-dominated grassland area where there has also been some adoption of a number of tree-based agricultural systems. However, even here, tree farming still takes up less than ten percent of available land. The study made use of interviews with 192 farmer-respondents, 86% of whom practised some sort of tree-based farming systems alongside their main agricultural activity. This was generally the cultivation of short-term cash crops. Corn was the dominant crop. To find out if tree planting made sense, Predo investigated the economic and environmental impacts of different land use conversions. He then looked at why farmers made their choices about what to farm. He did this to identify which factors would make them more willing to change their current, unsustainable, way of farming.

From grassland to plantation

Predo modelled six land use systems in his study. These included:

- *Imperata*-dominated grasslands that have not undergone any burning or cultivation
- the farmers' current main practice of annual maize cropping
- timber trees with *Imperata* for

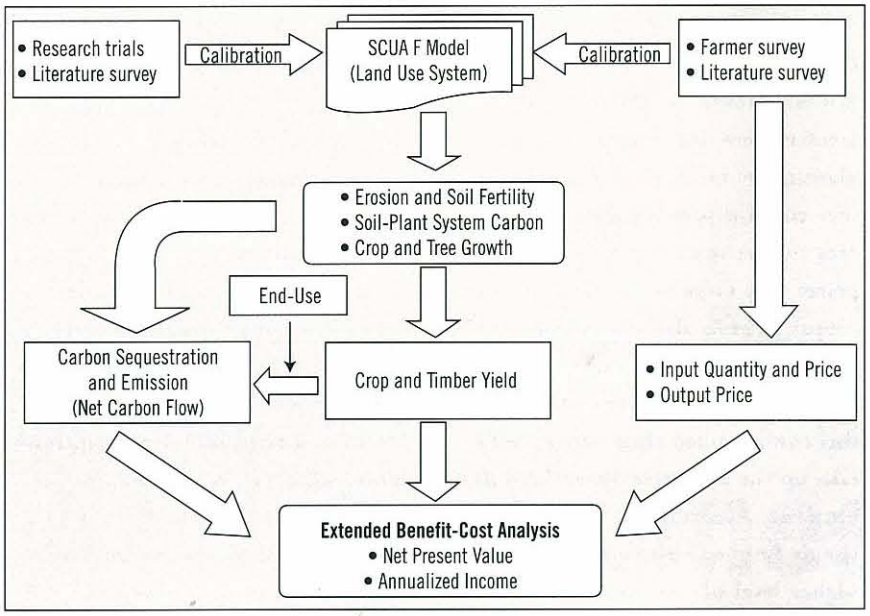
Net Present Value (NPV) of Land Use Systems

LAND USE SYSTEM	NPV @10% discount rate (PHP/ha)
Imperata land use for animal pasture or grazing system	498
Farmer's current practice of annual maize cropping system	30,913
Timber trees with *Imperata* for animal pasture or silvopastoral system	149,459
Timber trees planted in hedgerows with annual maize cropping system at the alley areas	185,762
Social forestry: agroforestry with larger area planted with timber trees in hedgerows with annual maize cropping in the alleys	381,466
Timber plantation	1,019,206

al and economic benefits to smallholders

animal grazing or silvopastoral system
- timber trees planted in hedgerows with annual maize cropping at the alley areas
- a social forestry model where a larger area is planted with timber trees in hedgerows, with annual maize cropping at the alley areas, and
- a timber plantation.

To do the necessary biophysical modelling Predo used the Soil Changes Under Agroforestry (SCUAF) model, which crop yields to soil carbon, nitrogen and phosphorus content. Data from research trials, farmers and literature survey were used to calibrate the model with major inputs including soil characteristics and soil erosion parameters, plant growth and plant composition. Each land use system was evaluated economically based on two criteria: net present value (NPV) and annualized income. The NPV measured the discounted value of all the net benefits from any land use system. The annualized net benefit (ANB) indicated how the NPV translated into yearly income.



Economic Valuation Framework Used to Quantify the Impacts of Alternative Land Use Systems for Grassland Areas

Timber comes out on top

Modelling and economic analysis showed that tree-based land use systems had significantly higher financial profitability than the others. Overall, the timber plantation system obtained the highest NPV (PHP 241,170/ha or USD 4,544/ha). The lowest NPV (PHP 271/ha or USD 5/ha) was realized by the *Imperata*-grassland system. Timber plantations and other tree-based systems gave the best environmental benefits. These included higher carbon sequestration values and a higher level of soil nutrients relative to maize cropping. Reduced soil erosion was a major benefit of all tree-based systems. In fact Predo found that incorporating timber trees would help reduce soil erosion even in the most eroded farmlands.

Measuring motivation

In light of these findings, Predo set out to find out why so little tree farming is done in the research area. He began by analysing why farmers might decide to plant trees. He found that farmers had three main objectives: financial security, recreational & aesthetic considerations, and environmental protection. Of these, he found that monetary and other economic-related objectives were most important. Predo also found that tree-growing investment decisions were significantly influenced by how much smallholders knew about the economic and environmental benefits of tree-based systems. Current and expected timber prices positively and significantly influenced tree growing decisions of farmers. Membership in land care associations was another positive influence.

Risk assessment

Predo then undertook a risk analysis of the various farming systems and found that while timber-based systems earned the highest NPV, they were also the most risky options. This was shown by the high

coefficient of variations of their NPVs which ranged from 164% to 205%. Moreover, Predo found that farmers were deterred from tree planting by the high price variability they could expect for their timber crops (relative to the more stable prices they enjoyed for their current crops). Predo also found that farmers were, in general, very cautious in their business dealings; this compounded their reticence to take up the risky tree-based land use options. According to Predo, this simply implied that, with their higher level of risk aversion, farmers were hesitant to trade the income they had become accustomed to receive from maize farming for the chance of higher future profits from tree growing.

Policies for tree planting

In light of his findings Predo concluded that tree-based land use systems could provide greater environmental and economic benefits to smallholders and society than current farming practices. He therefore recommends that there should be wide promotion and adoption of these systems. According to Predo, this could be done in a large number of upland grassland areas in the Philippines and should help reduce poverty among smallholders and lead to sustainable resource management in the uplands.

Predo also argues that, since price risk appears to be the major deterrent to any expansion of tree farming, measures should be taken to reduce the risk that farmers would have to take to start planting more trees. He advised that farmers should be provided with relevant and timely crop price information and also with subsidized crop insurance. As the long-term nature of tree planting requires security of land tenure, Predo also argued that policies should be put in place that would provide smallholders with this assurance. In a wider context, Predo concluded that, since tree farming produces net benefits to society in terms of carbon sequestration services, farmers should be paid for the environmental benefits that their tree planting brings.

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