Negotiation-support toolkit for learning landscapes

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6 | Land-use profitability analysis (LUPA)

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Land-Use Profitability Assessment (LUPA) is an analysis framework for economic assessment of land-use systems, conducted at landscape level. LUPA estimates monetary surplus (profitability) for each land area as result of investment allocated by the operator, both smallholders or large-scale.

Introduction

The most important source of livelihoods for most people living surrounding forests comes from land use. Understanding the characteristics of existing land-use systems is important to develop interventions to improve people's livelihoods. LUPA can be used to identify which one of the land-use systems generates the most economic benefit. This tool also analyzes labour engagement in land-use systems.

Within the context of low-carbon development strategies it is important to identify the economic performance of each land-use system and to analyze the trade-off between reducing greenhouse gas emissions and increasing economic benefits. LUPA generates a figure of economic performance of land-use systems, allowing the creation of a set of low-carbon development intervention options with estimated economic benefits.

Objectives

LUPA is designed to provide key characteristics of economic performance for each land-use system in a landscape.

Steps

1. Identification

This step is done by analyzing land-cover information from spatial imagery combined with secondary data on land uses as well as commodity production figures. This step generates early information on major land-use systems and indicative locations where the system exists. It can build on the RAFT appraisals and be aligned with ALUCT.

2. Field verification

The verification confirms land-use systems 'on the ground' and the typology or variation of each system. Using the land-use system list from Step 1, the researchers directly observe in the field before collecting data.

3. Data collection

This step involves interviews with key informant (include focus-group discussions) and gathering secondary literature. Data is categorized as follows: 1) macro-economic data; 2) input and output quantities; 3) prices. The macro-economic data set consists of real interest and exchange rates. Input data means all items used in the production process that consist of tradable purchased inputs (planting materials, chemicals, tools etc) and labour use. All input items are quantified using a common unit. Labour use is estimated both for family and hired labour. The output data consist of all products generated by the systems during the period of estimation. Agroforestry systems usually produce several products, from the beginning to the end of the period. Prices attributed to all items of input and output should be 'farmgate'.

4. Analysis

In this step, the researchers develop two important tables: input-output table and farm budget. The first table shows quantity allocations of purchased inputs, non-tradable inputs, capital and also labour into a range of time (usually 30 years for timber-based systems). The input-output table also provides the annual quantity of production. Each item of input and output has a unit compatible with the market price.

Farm budgets are developed by valuing the input-output table using gathered price data. All item units, both for input and output, use the same currency. All input items for a farm budget are attributed as 'cost' while the output items are 'revenue'. The profitability is found by summing all revenue then subtracting all costs.

Depending on the aim of the study, the analysis can be done at different levels of depth. Two common profitability indicators used are 'return to land' and 'return to labour'.

Profitability indicators

Net present value (NPV) is the most common indicator used for comparing the profit of different types of investment. The NPV of an investment is defined as the sum of the present values of the annual cash flows minus the initial investment. The annual cash flows are the net benefits generated from the investment during its lifetime. These cash flows are discounted or adjusted by incorporating the uncertainty and time value of money (Gittinger 1982). NPV is one of the most robust financial evaluation tools to estimate the value of an investment. The investment for one specific land use is labelled profitable if the NPV is higher than 0. The formula to calculate the NPV is:

$$NPV = \sum_{t=0}^{t=n} \frac{B_t - C_t}{(1+i)^t}$$

where B_t is benefit at year t, C_t is cost at year t, t is time denoting year and i is discount rate.

The measure of return to labour is reached by adjusting the wage rate until the NPV reaches zero. This proxy can be used since the calculation converts the surplus to a wage rate. The value of return to labour indicates the attractiveness of the system: if the return to labour is higher than the average wage rate then it is attractive for people to work in the system (Tomich et al 1998, Vosti et al 2000).

Policy analysis matrix (PAM)

The Policy Analysis Matrix (PAM) is a matrix of information about agricultural and natural resources policies and factors of market imperfections that is created by comparing multiple years of a land-use system's budget calculated at financial prices (reflecting actual markets) and economic prices (reflecting efficiency). The matrix is designed to analyze the pattern of incentives at the microeconomic level and to provide quantitative estimates of the impact of polices on those incentives.

PAM's structure is composed of two set of identities. One set defines profitability and the other defines the difference between private price and social values, measuring the effect of divergence; as the difference between observed parameters and parameters that would exist if the divergence were removed (Monke and Pearson 1995).

Profitability as the first identity of the accounting matrix is measured horizontally, across the columns of the matrix. Profits, shown in the right-hand column, are found by subtraction of cost, given in two middle columns, from revenue, indicated in the left-hand column. This column constitutes profitability identities. There are two profitability calculations: private profitability and social profitability.

Private profitability calculation is provided in the first row. The term 'private' refers to observed revenues and costs reflecting market prices received, or paid, by farmers, merchants or processors in the agricultural system. Private profitability calculations show the competitiveness of agricultural systems at given current technologies, output values, import cost and policy transfer. Social profitability calculation is the accounting matrix utilizing social prices. These valuations measure comparative advantages or efficiencies in the agricultural commodity system.

Table 6.1. Policy Analysis Matrix (PAM)

	Revenues	Cost		Profits
		Tradable inputs	Domestic Factor	
Private prices	A	B	C	D1
Social prices	E	F	G	H2
Effect of divergences	I3	J4	K5	L6

Note: 1) Private profit, D, equals A minus B minus C; 2) Social profit, H, equals E minus F minus G; 3) Output transfer, I, equals A minus E; 4) Input transfer, J, equals B minus F; 5) Factor transfer, K, equals C minus G; 6) Net transfer, L, equals D minus H (they also equal I minus J minus K). Source: Monke and Pearson (1995, p.19)

Case study: Tanjung Jabung Barat

Existing land-use systems in Tanjung Jabung Barat district, Jambi province, Indonesia, were analyzed from available land-cover maps. Based on the spatial classification, eight types of land uses in the district were identified: natural forests, timber plantations, oil palm, coconut, rubber, coffee, betelnut and annual food crops. The verification step found that there were two types of land: mineral and peat. The land-use systems were further classified into large- and small-scale operations.

Table 6.2. Land cover of Tanjung Jabung Barat district and the main land-use systems

Land-cover type	Selected land-use system		Scale of operation
	On mineral soil	On peat soil	
Forest	Forest extraction. Logging (low density)	n/a	Large-scale enterprises
Acacia mangium	Industrial timber plantation (*Acacia mangium*) (and similar species)	n/a	
Oil palm	Oil palm (3000 ha)	n/a	
Oil palm (1–2 ha)	Nucleus estate and smallholdings (NES)	Independent smallholding	Smallholdings
	Oil palm		
Coconut (1–2 ha)	Coconut monoculture	Coconut-based mixed garden (with coffee and betel nut)	
Rubber (1–2 ha)	Rubber monoculture	Rubber monoculture rubber agroforest	
Coffee (1–2 ha)	n/a	Coffee-based mixed garden (with betel nut)	

Figure 6.1. shows profitability estimates for each land use.

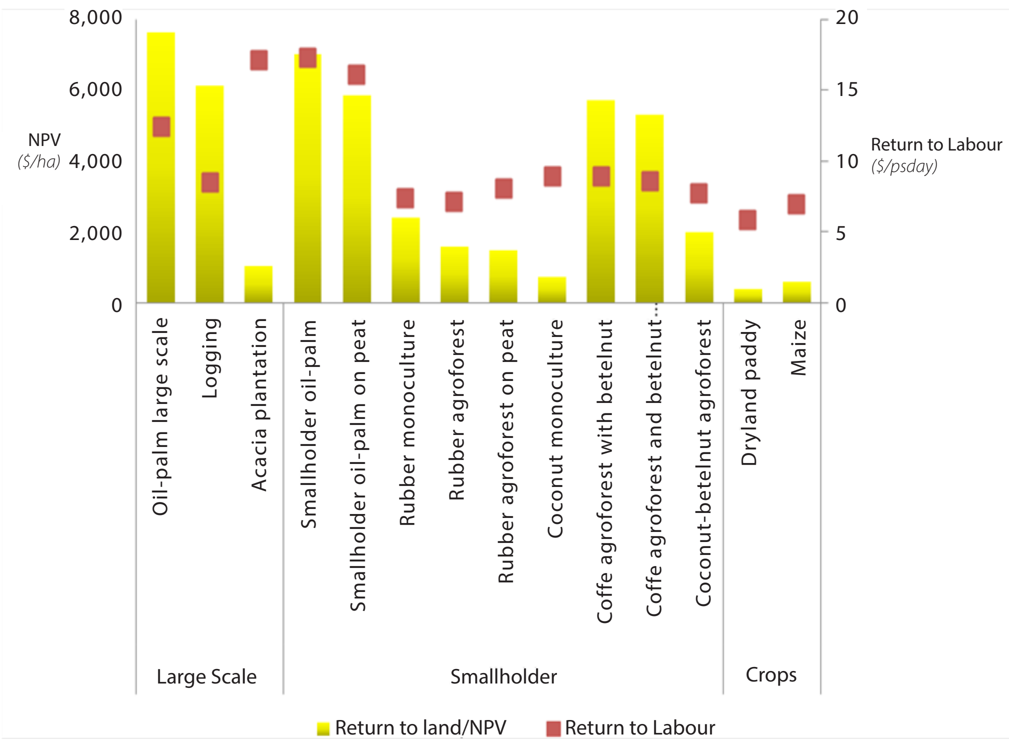

Figure 6.1. Net present value and return to labour for major land-use systems in Tanjung Jabung Barat

Note: i= 8%, exchange rate= IDR 9084/USD 1

Interpretation

Oil palm is the most profitable land-use system in Tanjung Jabung Barat district for both large- and small-scale operations. Oil palm on peat has lower profitability compared to that on mineral soil because of the additional costs of development and maintenance of drainage.

With high return to labour, oil palm is the most attractive for people compared to working in another land-use system.

The competitiveness of agroforestry systems is high, with the profitability rate almost as high as oil palm. The threat of conversion of these systems to oil palm is higher on mineral than on peat soil.

References to other recent case studies include Ekadinata et al. (2010), Rahmanulloh et al. (2012) and Sofiyuddin et al. (2012).

Key references

Monke E, Pearson SR.1989. *The Policy Analysis Matrix for agricultural development*. Ithaca, NY: Cornell University Press.

Tomich T, Noordwijk M, Budidarsono S, Gillison A, Trikurniati K, Murdyaso D, Fagi A. 1998. *Alternatives to slash-and-burn in Indonesia: summary report and synthesis of phase II*. Bogor, Indonesia: ASB Partnership for the Tropical Forest Margins; Central Research Institute for Food Crops.

The landscape scale is a meeting point for bottom–up local initiatives to secure and improve livelihoods from agriculture, agroforestry and forest management, and top–down concerns and incentives related to planetary boundaries to human resource use.

Sustainable development goals require a substantial change of direction from the past when economic growth was usually accompanied by environmental degradation, with the increase of atmospheric greenhouse gasses as a symptom, but also as an issue that needs to be managed as such.

In landscapes around the world, active learning takes place with experiments that involve changes in technology, farming systems, value chains, livelihoods' strategies and institutions. An overarching hypothesis that is being tested is:

> Investment in institutionalising rewards for the environmental services that are provided by multifunctional landscapes with trees is a cost-effective and fair way to reduce vulnerability of rural livelihoods to climate change and to avoid larger costs of specific 'adaptation' while enhancing carbon stocks in the landscape.

Such changes can't come overnight. A complex process of negotiations among stakeholders is usually needed. The divergence of knowledge and claims to knowledge is a major hurdle in the negotiation process.

The collection of tools—methods, approaches and computer models—presented here was shaped by over a decade of involvement in supporting such negotiations in landscapes where a lot is at stake. The tools are meant to support further learning and effectively sharing experience towards smarter landscape management.

World Agroforestry Centre
ASB Partnership for the Tropical Forest Margins
AARD
Federal Ministry for Economic Cooperation and Development
Norad
IFAD
Enabling poor rural people to overcome poverty
CGIAR
Research Program on Forests, Trees, and Agroforestry