

Facing the deforestation process in the south of Ecuador from an economic point of view.

Linking the land use modelling to the theory of Sustainability

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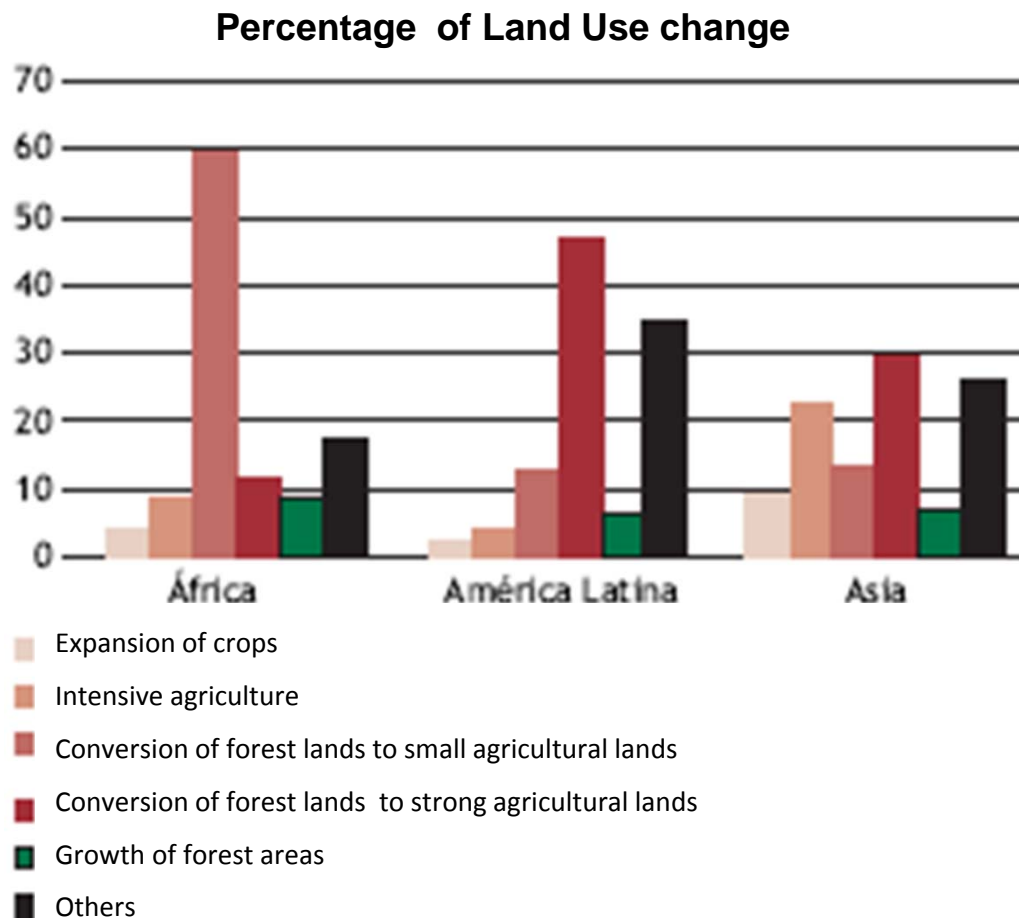
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1. Brief overview





The **expansion of pastures for livestock** has been one of the most important reason of the deforestation in the tropics in the South of Ecuador (1,7%) 2000-2005

LIVESTOCK
POLICY BRIEF

03



Photo: Rogério W. Mauricio/LEAD

Cattle ranching and deforestation

Over the past quarter century, forests have been cleared from an area the size of India.

During the 1990s, the portion of the globe covered by forests shrank by an estimated 94 000 square kilometres a year, an area roughly the size of Portugal. Most of the land that was cleared and burned was converted to growing crops and grazing livestock (graph 1). In Latin America, in particular, most of the deforested land ended up as pasture used to raise cattle in extensive grazing systems.

- Ecuador, located between 5 hotspots world biodiversity (Brummit & Lughadha, 2003).

Source: Fao 2006

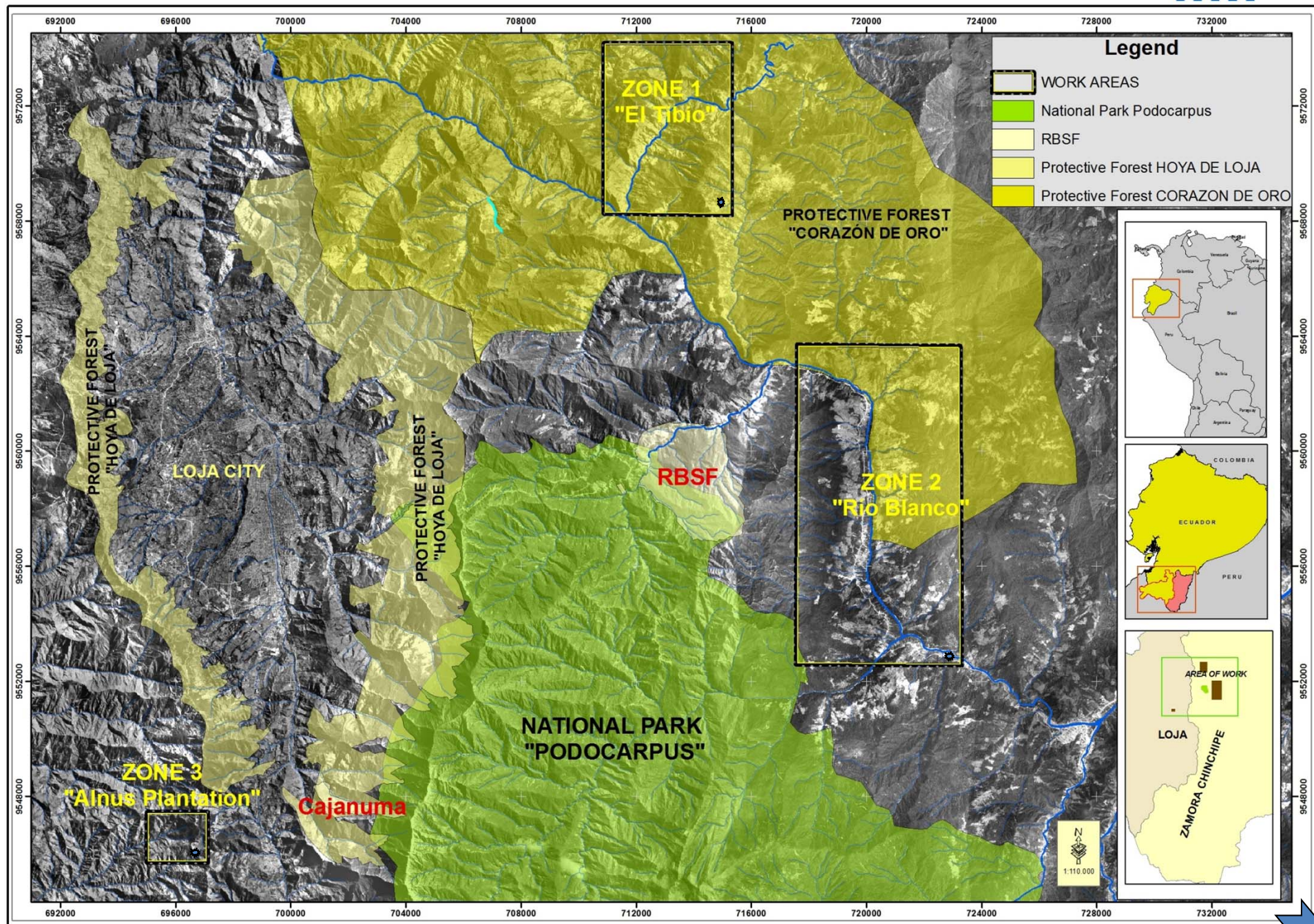




- Southern Ecuador, is one of the hottest "biodiversity hotspot" (Beck and Muller-Hohestein 2001)
- Africa and South America have the largest net loss of forests (UNEP, 2008)

- While conflicts is increasing: forest areas cleared by slash and burn practices, are utilized as pastures (Paulsch, et al 2001)





a. Risks: Loss of pasture land, failure of establishment
Fluctuating milk prices
Fluctuating productivity of cows

b. Accumulation of fallow land:

Inefficient utilisation of land resources

Hypothesis:

Increasing the financial robustness of land use helps mitigating the deforestation process



2. Objectives

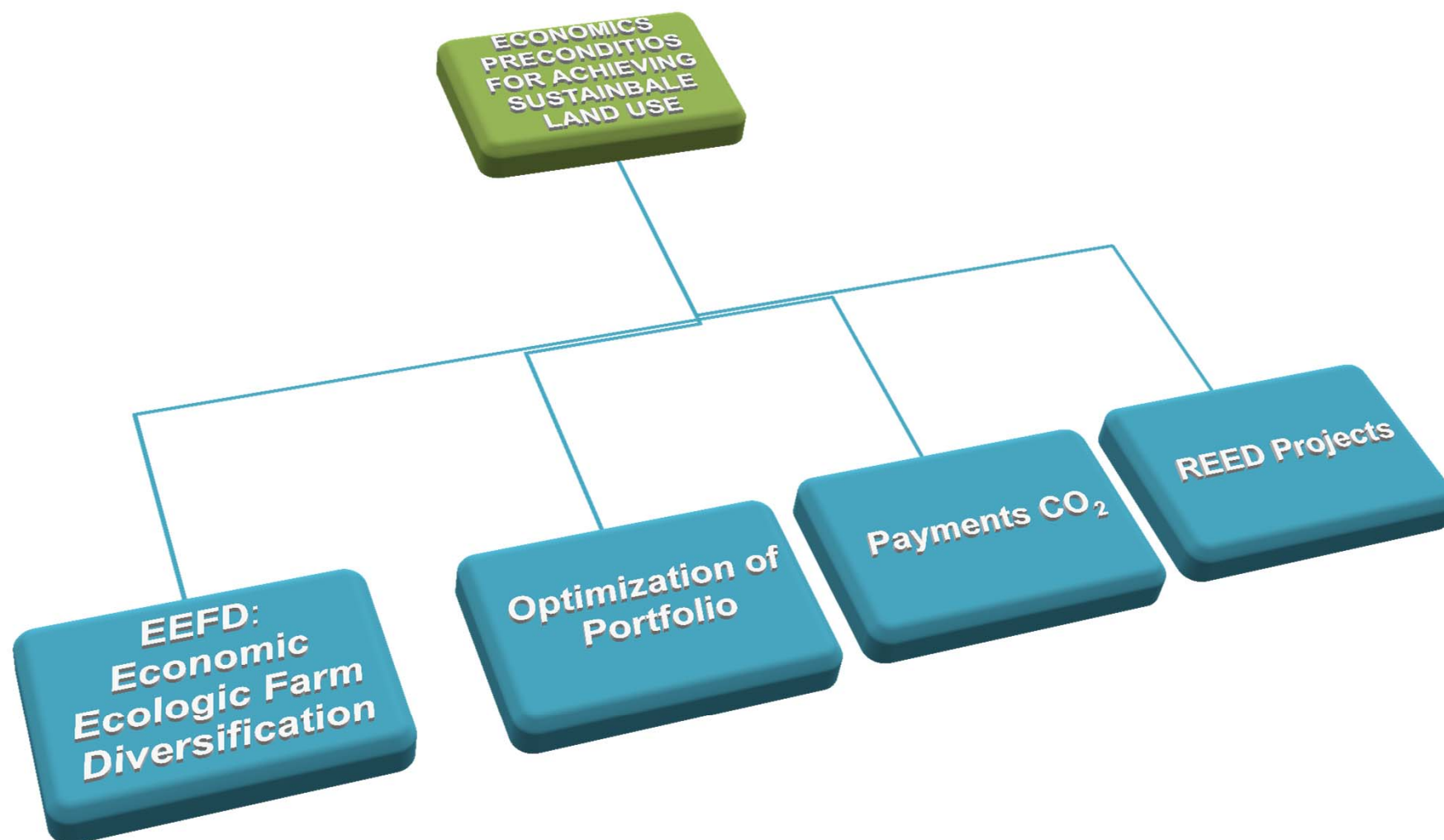


- Contribute to the sustainable land use in the South of Ecuador, by finding economically desirable alternatives for farmers
- Evaluate the financial decision in the long term, like including native species that help to restaure degraded areas
- Explore the financial conditions under which a sustainable, biodiversity maintaining land use would be possible.



3. Facing the problem



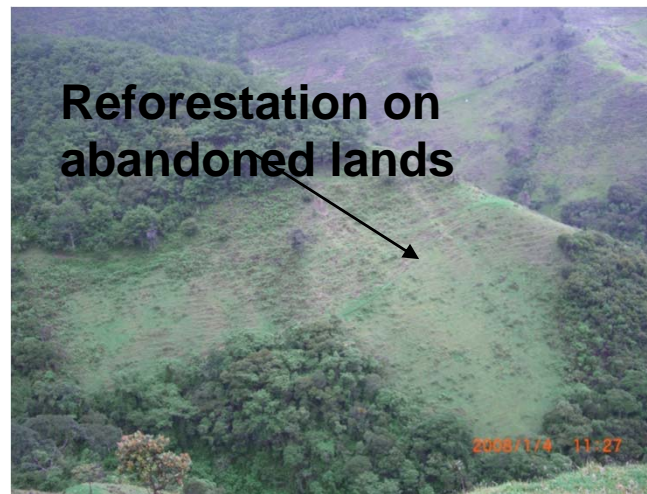


3.1 EEFD

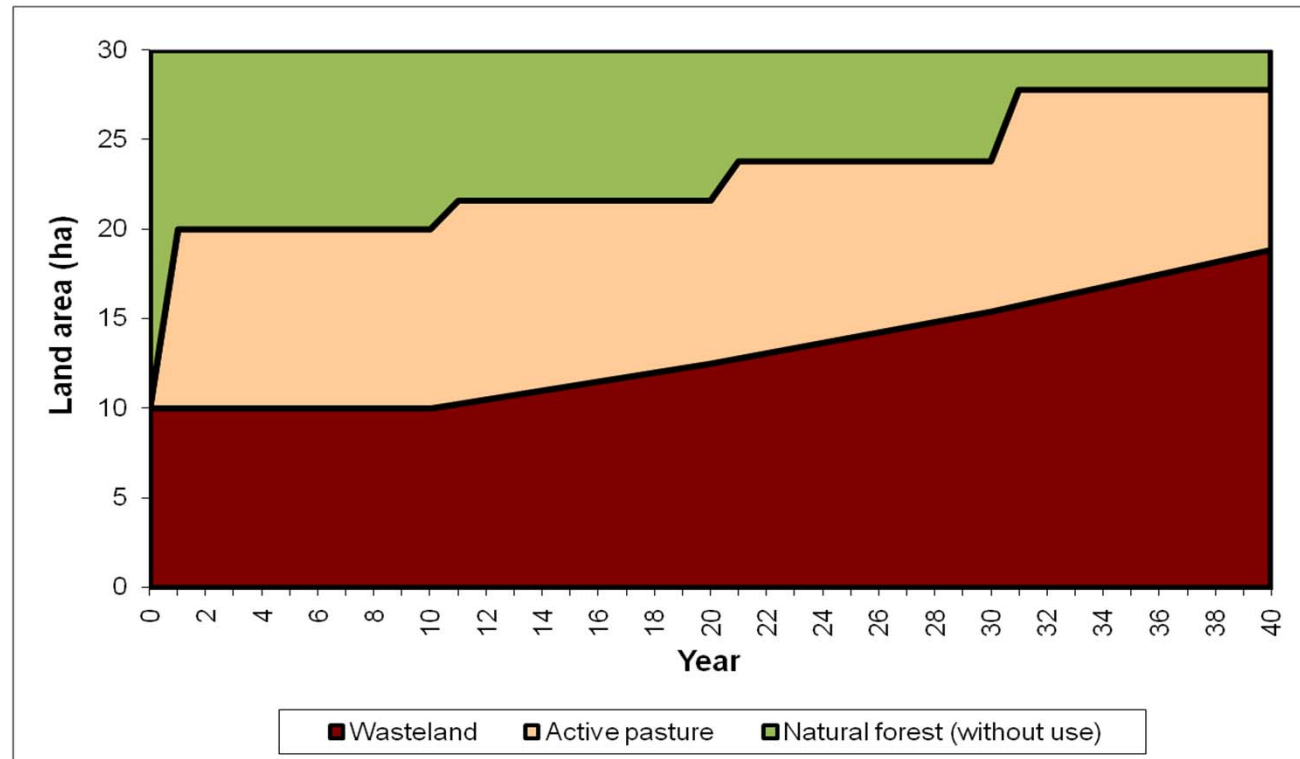


Ecological– economic farm diversification (EEFD) concept

- We considered that overused and degraded wastelands **can** be reintroduced into the economical system, and thus diversify land management

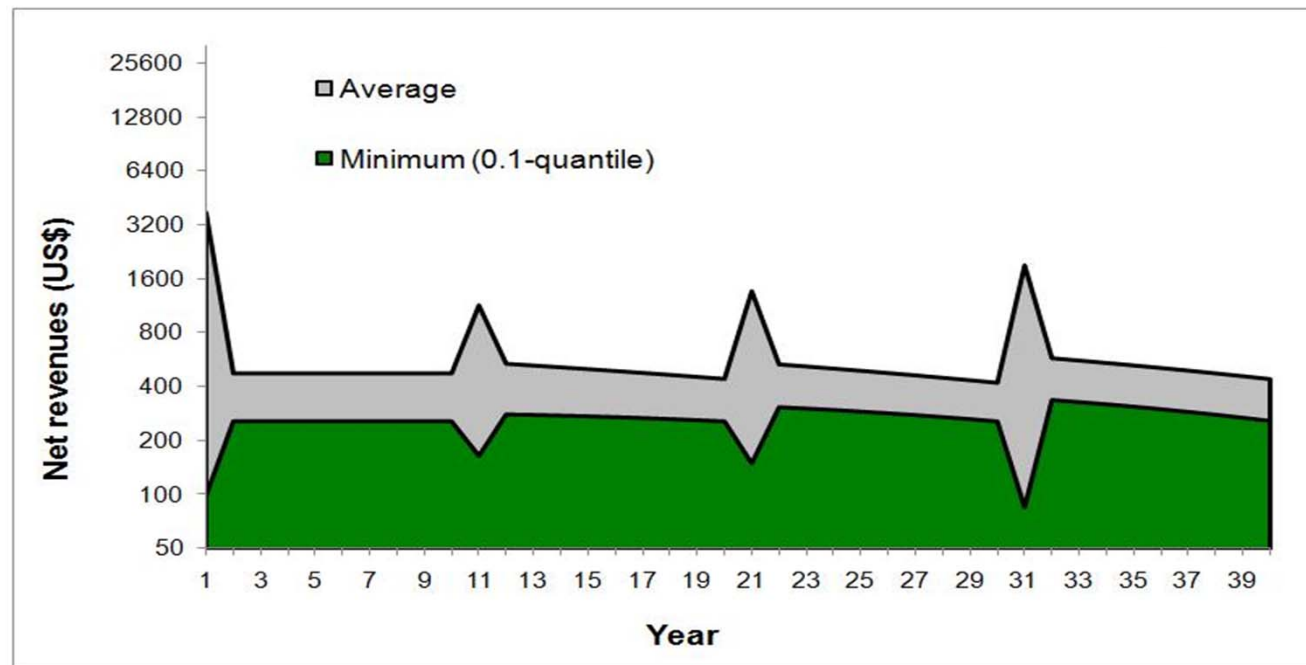


Single use pasture management



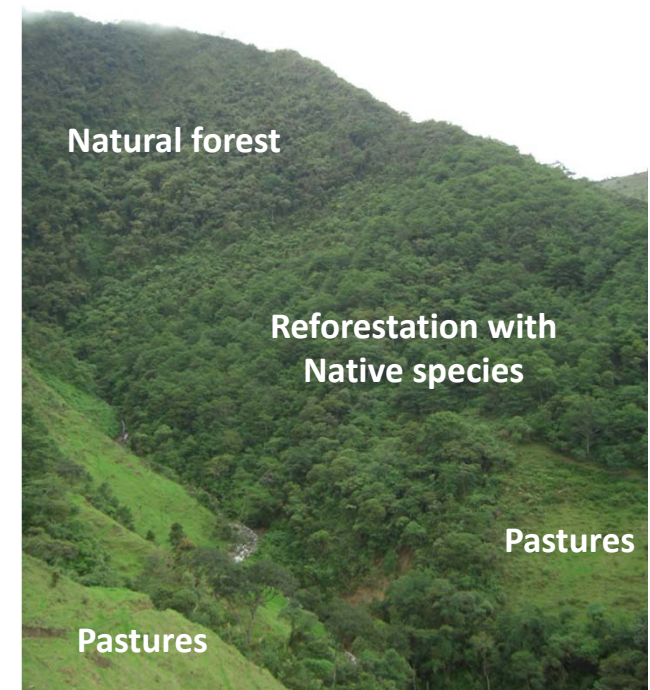
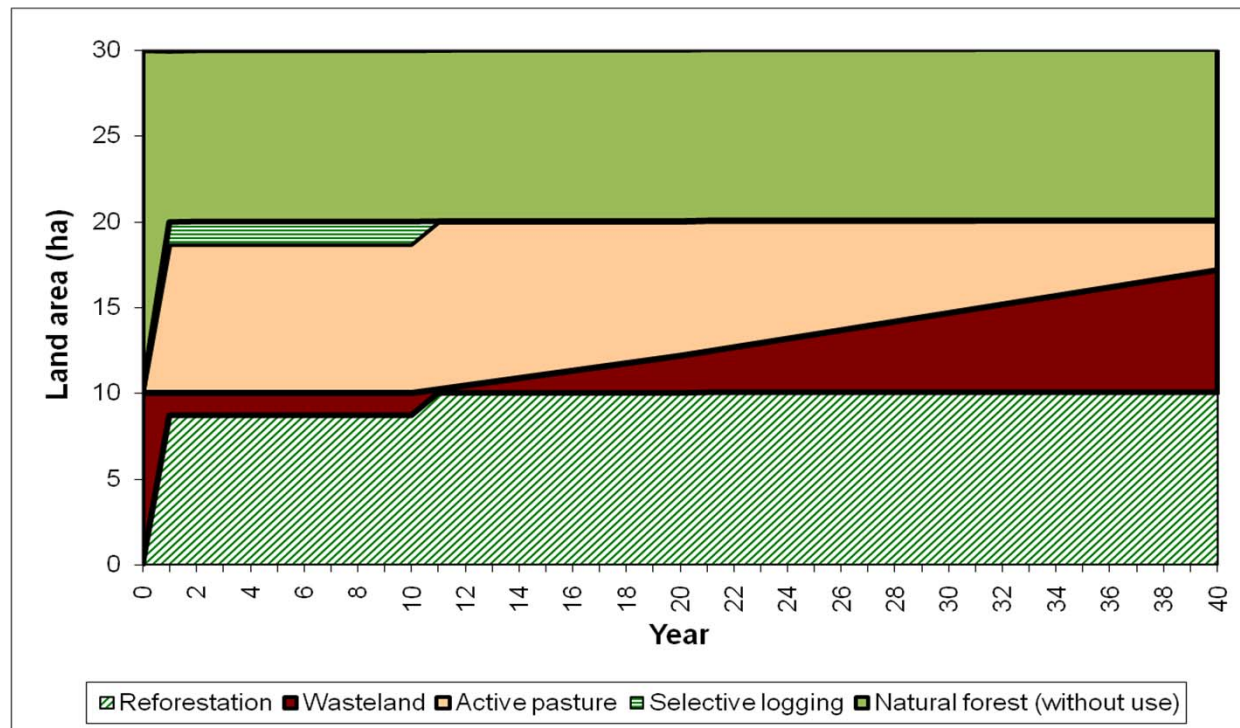
Would lead to deforestation of 18.3 ha over the course of one generation of farmers (40 years)

The risk of future yield losses due to pasture degradation promotes further deforestation

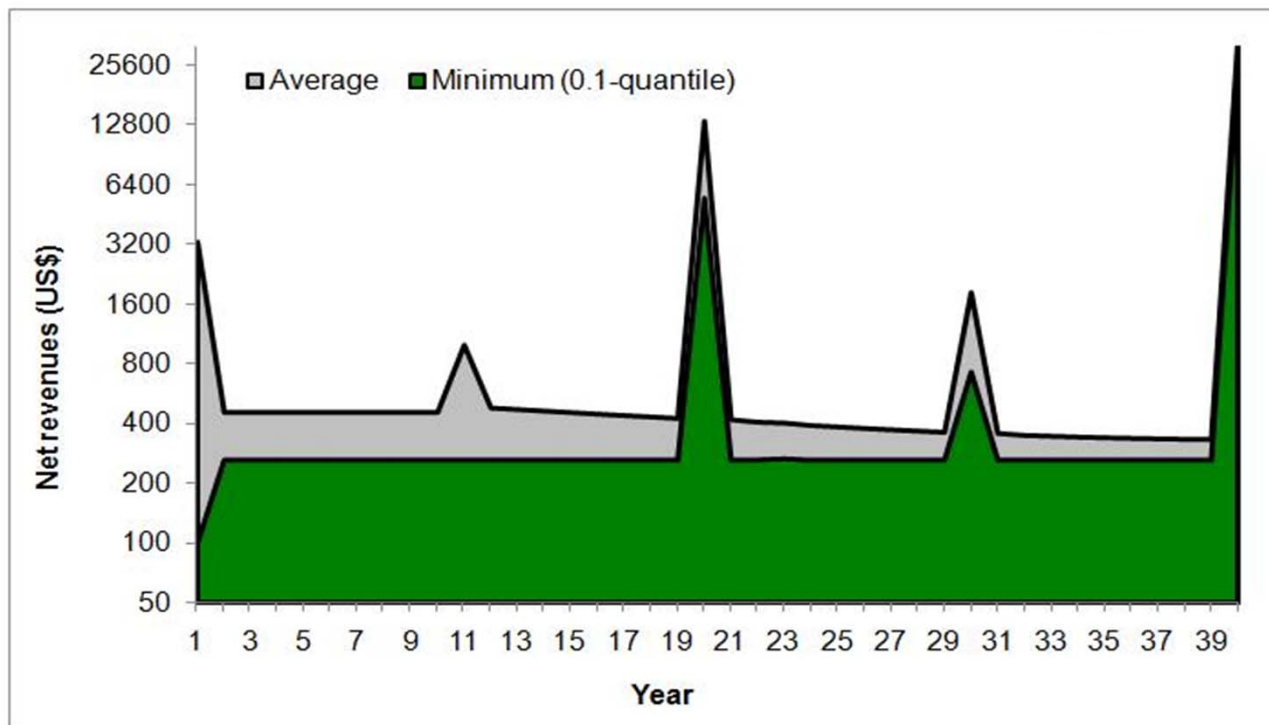


This type of land management provides relatively constant net revenues when a specific probability of pasture abandonment is given

Land use mix



- EEFD model suggests an immediate land-use diversification that provides multiple products, i.e. agricultural commodities and timber obtained by selective logging
- The key is the accumulation of “new” natural resources through wasteland reforestation, and new incomes from reforestation

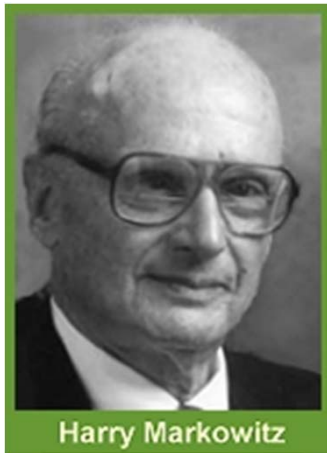


The combination of pasture and selective logging produces higher minimum net revenues per year than the single pasture system

3.2 Portfolio Theory

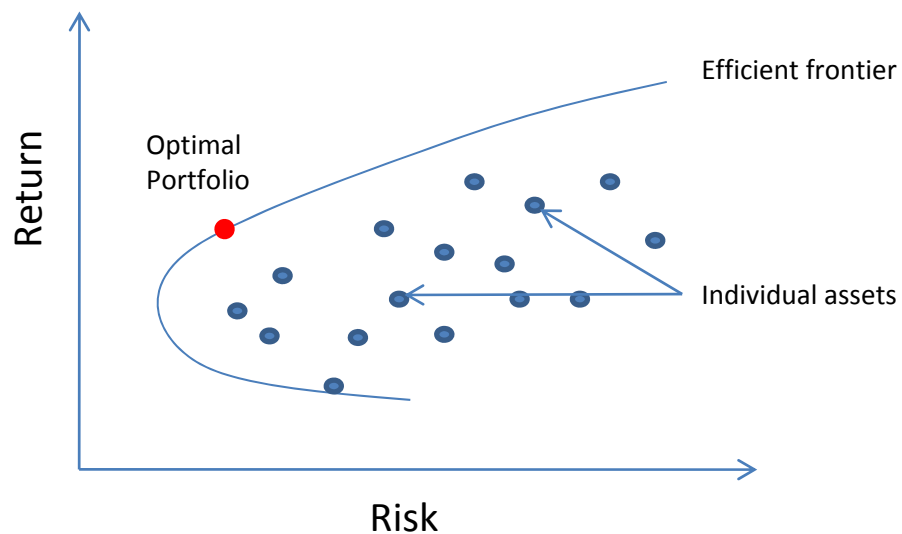


Modern Portfolio Theory (MPT)



- "Portfolio Selection," 1952 *Journal of Finance*, has the merit of development the **mean-variance** model
- [Diversification](#) in investing, with the aim of selecting a collection of investment assets that has collectively lower risk than any individual asset
- To maximize [return](#) and minimize [risk](#) by carefully choosing different [assets](#)

Opportunity set of Investment



**Expected Return
(Mean)**

Correlation

**Risk
(Standard deviation)**



3.2.1. Selection of assets



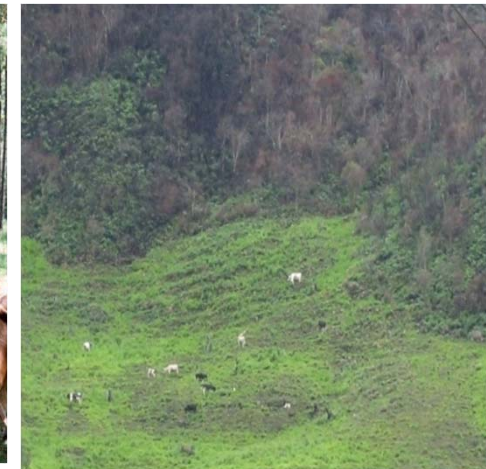
Plantation trees



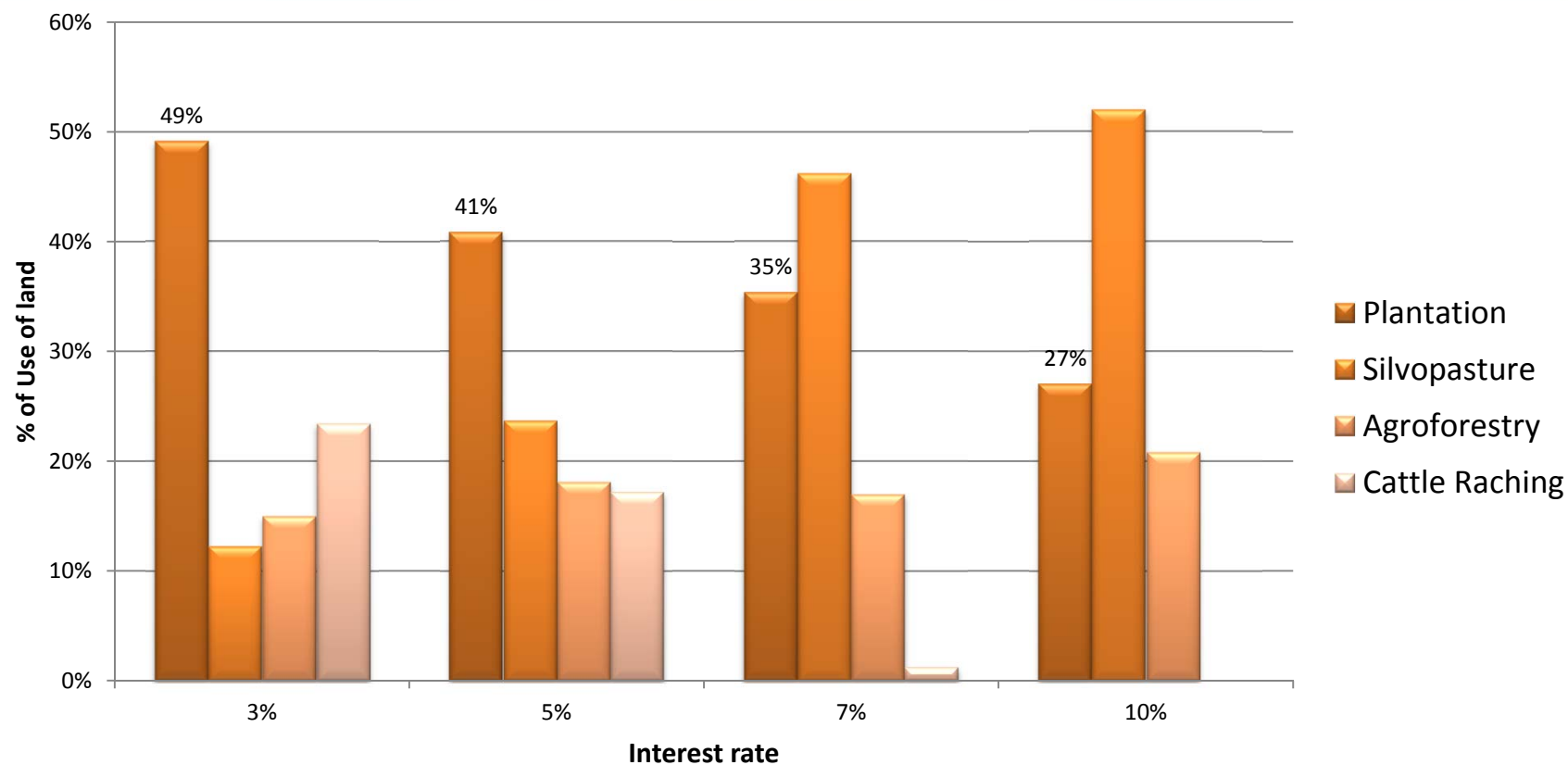
Intercropping



Silvopasture



Cattle Ranching



Interest rate	Plantation	Silvopasture	Agroforestry	Cattle Raching
3%	49%	12%	15%	23%
5%	41%	24%	18%	17%
7%	35%	46%	17%	1%
10%	27%	52%	21%	0%

4. CONCLUSIONS

- Risk integration into the model leads to realistic results and acceptability for the farmers
- The economic diversification of farmlands has the potential to reduce land demand
- The mixture between different activities in the farm could improve the profits
- We can apply economic tools to help farmers (investors) making profitable choice, with a good relation between profit and risk

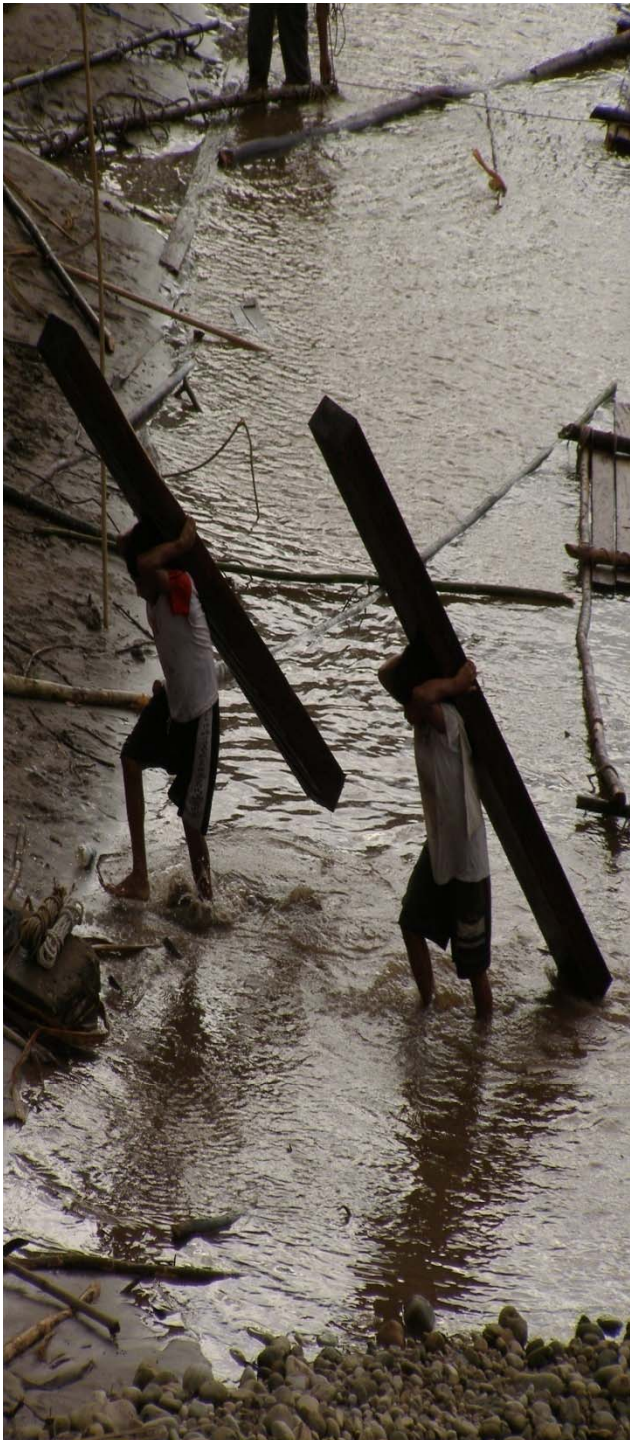


- The key activity in halting deforestation is the accumulation of “new” natural resources through wasteland reforestation.
- Pastures represent short-term gains with long-term loss
- By applying optimization, we can choose the best option from an economic point of view, but fulfilling the goals of conservation and to be attractive option for farmers.
- Among the limitations of our EEFD compared to the single use pasture, is the requirement of investing in biological capital stocks at the same time as converting natural forests



- Portfolio theory applied to the Ecuadorian case allows to determine attractive scenarios for farmers, like intercropping and silvopasture, in this way to harmonize the human needs and the tropical forest conservation
- A reconciliation of farmers and conservation is only possible if those can make decisions about productive activities on their lands.





THE CHALLENGE


- *Is to apply the concept to local realities.*
- To influence our results in the decision-making as a political strategy for change
- Design a set of economic strategies from the focus farmer, and can be applied by them

Publications:

- Knoke T, Calvas B, Aguirre N, Román-Cuesta RM, Günter S, Stimm B, Weber M, Mosandl R (in press) Can tropical farmers reconcile subsistence demands with forest conservation? ***Frontiers in Ecology and the Environment*** 2009; doi:10.1890/080131.
- Knoke T, Stimm B, Weber M, 2008. Tropical farmers need productive alternatives. Correspondence in ***Nature*** 452: 934.
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- Knoke T, Steinbeis E-O, Bösch M, Román-Cuesta RM (submitted) The impacts of economic carbon values and uncertainties on ecosystem distribution.

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