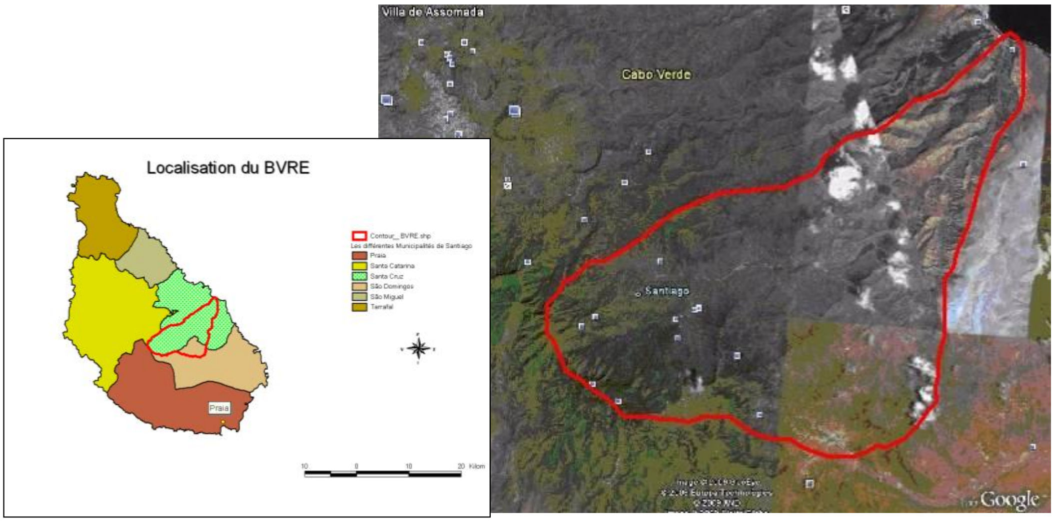
Ribeira Seca, Cape Verde

Study site details

Ribeira Seca is a catchment on the east side of the Santiago island.

- **Coordinates:**
  Latitude: 15º07'40''N - 15º01'55''N
  Longitude: 23º32'05''W - 23º38'40''W
- **Size:** 71.50 km²
- **Altitude:** 0-1394 m (Pico d´Antónia)
- **Precipitation:** 200 mm downstream to 650 mm at the upper limit of the basin.
- **Temperature:** 16.6ºC – 28.1ºC
- **Land use:** 83% subsistence rainfed agriculture (corn and beans), 5% irrigated; 4% forest
- **Inhabitants:** 14,343 (2000 Census)
- **Main degradation processes:** on-site: water erosion, off-site: sedimentation
- **Major drivers of degradation:** population growth, deficient information, insecure land tenure, lack of institutional mechanisms



Catchment location within the Santiago Island

Overview of scenarios

1. Baseline Scenario: PESERA baseline run
2. Technology Scenario: Terraces with Pigeon Pea (CPV01)
3. Policy Scenario: Subsidising terraces (CPV01)
4. Global Scenario: Food production

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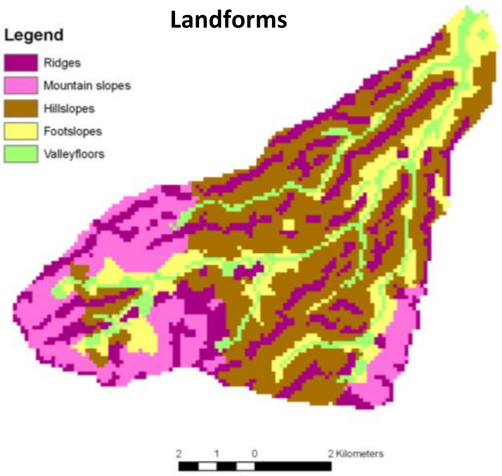
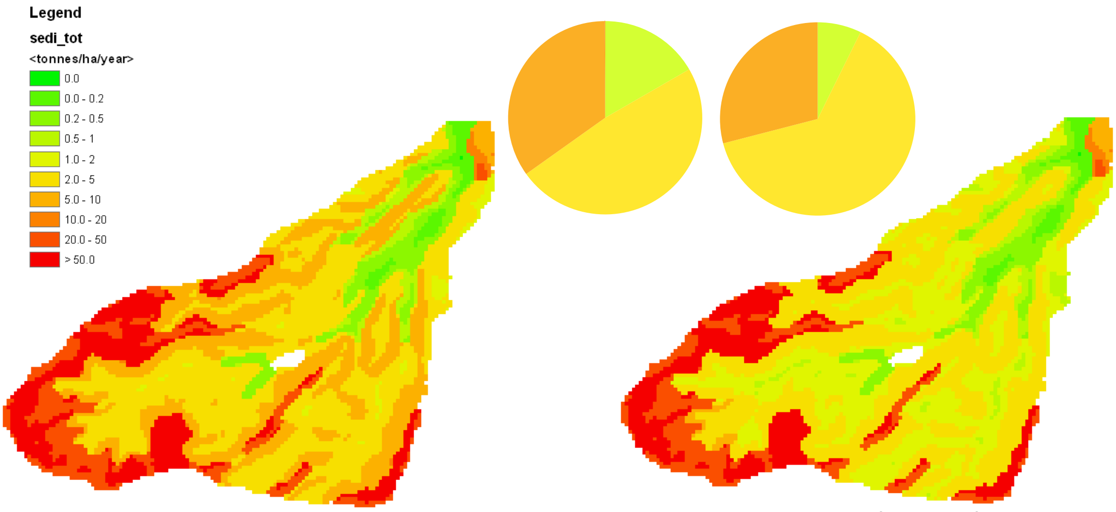
Baseline Scenario

PESERA baseline run

Two erosion baselines are produced, one assuming no existing SWC structures (A) and one with terracing (B). Very steep mountain slopes in the upper catchment coincide with highest erosion rates in both cases. Available climate data did not fully reflect the range of agro-ecological conditions, and as a consequence baseline biomass production mainly shows the difference between areas under irrigation and rainfed crops.



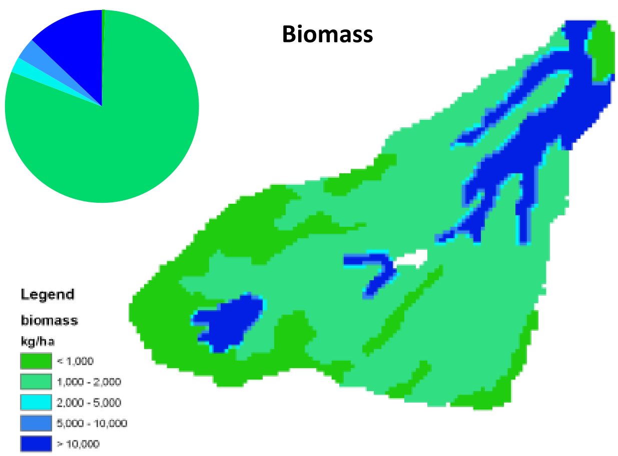
Soil erosion



A. Soil erosion (no terraces)

B. Soil erosion (terraces)

Biomass production



NB. The pie charts on this page pertain to the areas for which technology CPV01 is applicable (see this scenario for further details). Erosion rates under 2 tonnes/ha/year are not broken down.

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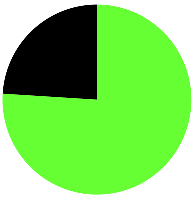
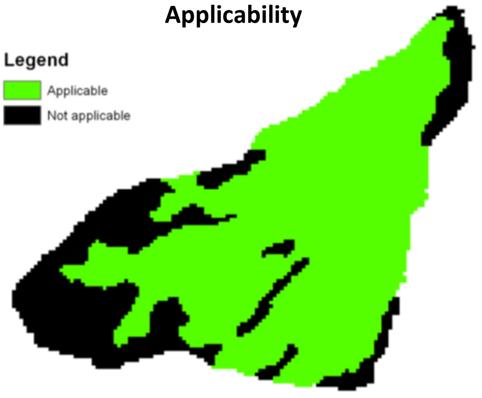
Technology Scenario:
Terraces with Pigeon pea (CPV01)

- Fixed investment costs of ECV 295,000 (€2675) are assumed.
- Transport costs of produce to market are considered; range ECV 17-2,500 per year.
- A discount rate of 13% has been applied
- A lifetime of 10 years has been set, with the first year no benefits.
- The baseline without terraces is taken as without case.

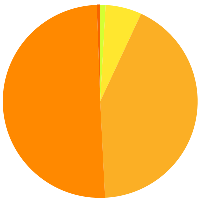
Applicability

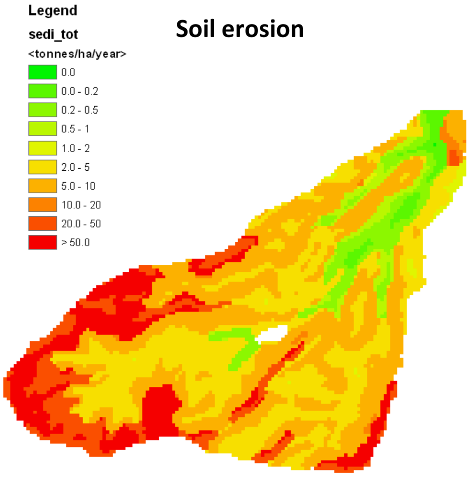
- The technology is not applicable in very steep and flat areas





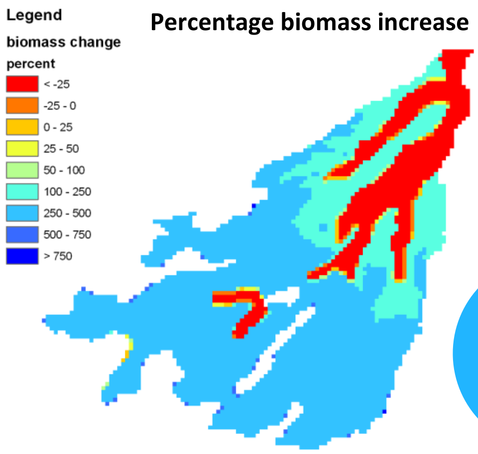
Biophysical impact: reduction of erosion



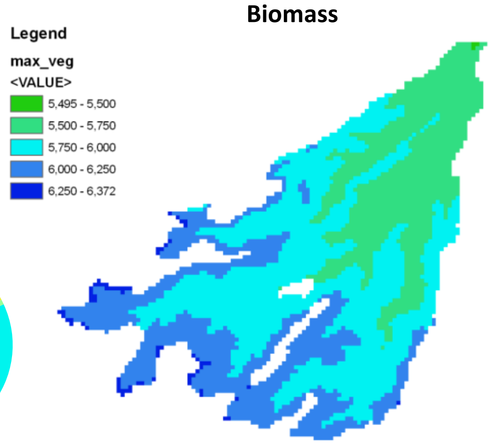


Biophysical impact: increase in biomass

Percentage biomass increase



Biomass

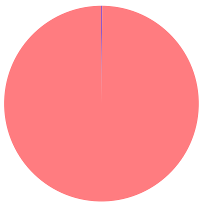


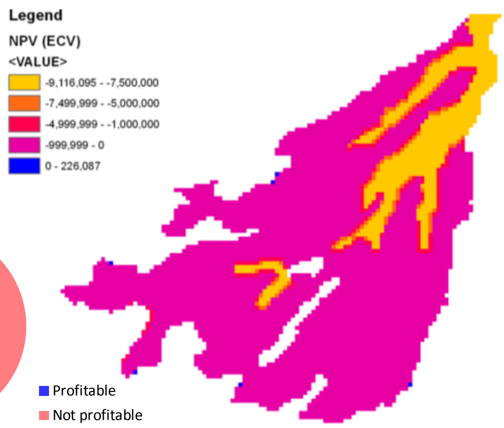
Economic viability

If economic viability is assessed assuming maize production in the without case, the difference in income is too low to justify the investment. There especially seems to be no scope for the technology where irrigated agriculture is applied, but even beyond those zones direct financial benefit is not apparent.

(This is the scenario with biomass pruning; in absence of pruning worse results)

Net Present Value (without case: maize)

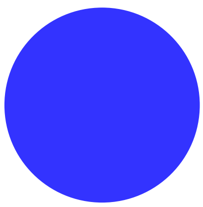


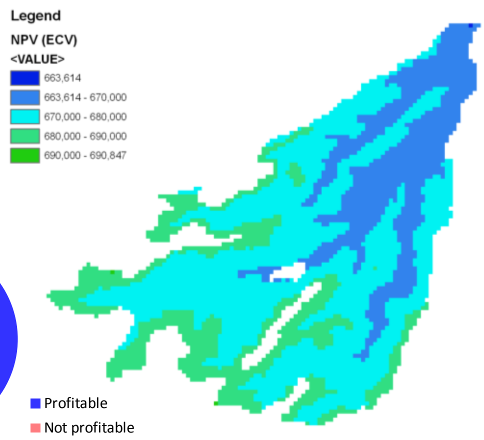


This analysis assumes no benefits will be obtained in the without case. If the technology works on unproductive land, It could be an attractive investment.

In both cases, off-site effects have not been considered.

Net Present Value (w/h case: unproductive)





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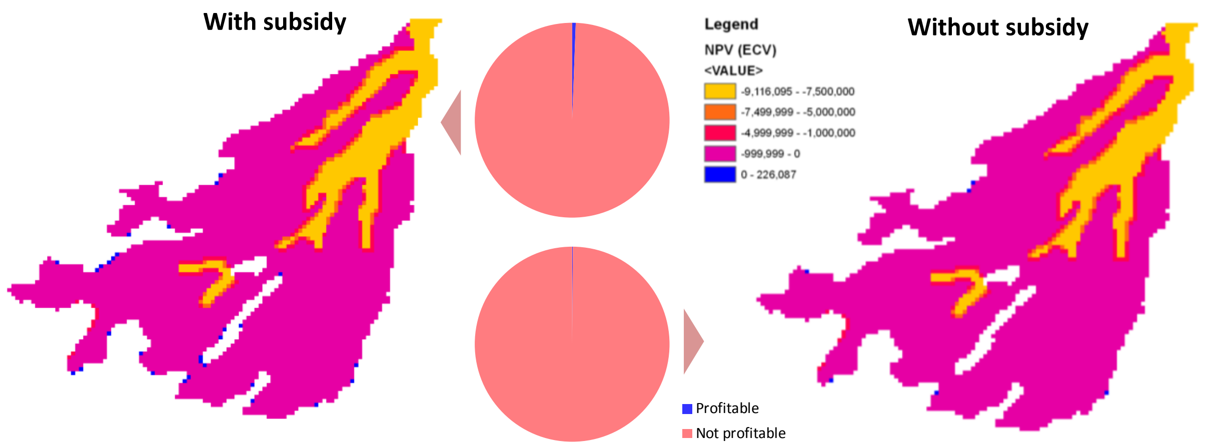
Policy Scenario:
Subsidising terraces (CPV01)

The technology ‘Terraces with Pigeon Pea’ requires heavy upfront investment. If implemented on unproductive (unused) land, the technology can be profitable. However, it is more likely that most land is already in use, in which case the technology has negative present value almost universally. A governmental Payment for Ecosystem Services (PES) scheme could go some way to incentivise farmers to adopt the technology. In this policy scenario we assess the effect of a subsidy of 50% of the investment cost.

50%

Profitability:



Cost-effectiveness indicators:

This PES scheme, although subsidising 50% of the investment cost, would have very marginal effect on profitability of terraces with pigeon pea. A total of 0.6% of the area where the technology is applicable would see NPV rise above 0. Accordingly the cost-effectiveness of the policy will be low. On unused land the technology would be profitable anyway and the subsidy would be ‘perverse’.

Cost of the policy if perverse use on unused land is avoided: ECV 4.77 million (€38,800).

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Global Scenario:
Food production

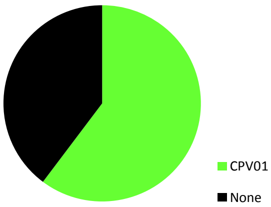
The food production scenario selects the technology with the highest agricultural productivity (biomass) for each cell where a higher productivity than in the baseline scenario is achieved. The implementation costs for the total study area are calculated and cost-productivity relations assessed. To facilitate comparison between different study sites, all costs are expressed in Euro.

+2568 kg/ha

+1218 kg/inhabitant

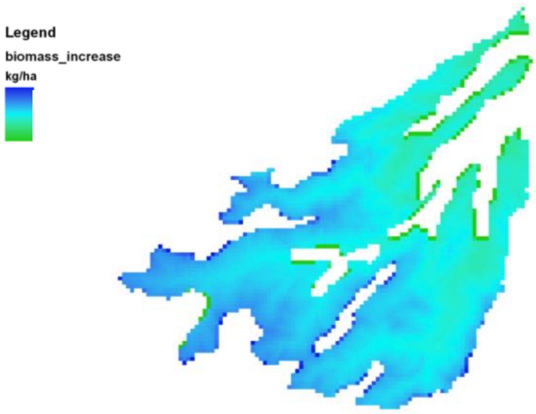
Scope for increased production

- Technology CPV01 can lead to increased productivity in 60% of the area



Biophysical impact: biomass increase

- Yield increase in 83% of applicable area
- Average yield increase: 115%



Economic indicators

Average costs:
- Investment cost: 2675 Eur/ha
- Unitary cost year 1: 628 Eur/ton(yr)
- Unitary cost lifetime: 63 Eur/ton

Aggregate indicators:
- Study site: 10.9 million Euro
- Augmented annual production: 17,470 ton
- Augmented total production: 0.175 million ton

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Concluding remarks

- Baseline simulations show a clear relation between soil erosion and slope. The steep mountain areas have high erosion rates (in excess of 10 ton/ha/yr). However, as much of the study site is under terraces, actual erosion rates may be much lower than the baseline scenario run suggests.
- Terraces with pigeon pea (CPV01) were selected by scientists and local stakeholders as it appears to be the simplest, most accessible, least expensive, socio economically acceptable technique, with great impact on soil cover and land rehabilitation and reducing vulnerability to water erosion. The technology scenario shows that a considerable increase in biomass production is possible, but not in the valley floor where irrigated agriculture is practiced. Despite of this, the technology appears to be positive only when implemented on unproductive land. Where benefits are already derived from the land, the high investment cost and high discount rate applied (13%) come into play.
- Evaluating the results in a workshop, stakeholders reaffirmed their preference for the technology, based on high productivity in agronomic trials and multiple uses of pigeon pea.
- A policy scenario reducing costs by 50% made the technology profitable in only 0.6% of the applicable area if a without case of maize monocropping is assumed. This again stresses the high cost of the measure.
- The global scenario for food production shows that the technology can achieve very significant yield increases, both per area (2568 kg/ha) and per capita (1218 kg). Costs per ton of increased food production are €628 if only the first year is taken into account, and €63 when the total economic life of 10 years the investment is considered.
- Terraces with pigeon pea lead to higher yields and better soil cover, with positive impacts on soil conservation. For unproductive land it can be recommended with little risk. If terraces are present already and require maintenance only, a reduced cost would result which might help build resilience to climate change.