Participatory simulation to test incentives for provisioning ecosystem services in agroforestry systems. Costa Rica

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Introduction

Farming practices

Agro-ecosystems
Farms and watershed

Coffee provisioning ecosystem services and disservices

Instruments

Limit

Promote

Regulating and supporting ecosystem services
Introduction

Which instruments to foster adoption of agro-environmental practices rebalancing ecosystem services / disservices provision?

**H1:** Lack of instruments to support farmers to develop agro-environmental practices: little-known, technically more complicated and/or costly

**H2:** Actual instruments inaccessible and/or inappropriate to the agro-ecosystems and farmers’ situation

**Objective 1:** Characterize ecosystem services/disservices provision, agro-environmental practices and farmer’s strategic managements

**Objective 2:** Analyze the actual instruments and their effects

**Objective 3:** Identify and test instruments to trigger the adoption of agro-environmental practices
Study area

Costa Rica

ENVIRONMENTAL POLICY

Legal framework
Payment for ecosystem services
Ecolabel

Los Santos – Llano Bonito

COFFEE SECTOR

1rst area of national coffee production
High productivity and quality coffee
600 family farms
Shade grown Coffee
(but low shade diversity)

ENVIRONMENTAL ISSUES

Watershed with soil erosion,
Nitrogen contamination,
Biodiversity loss
Method

- **Bibliography** about instruments, role playing games, ecosystems services and coffee production

- **7 Institutional interviews**
  - 30 semi-structured interviews of coffee producers
  - Analyze the diversity of their production systems
  - Response to existing policies

- **Construction and test of a Role Playing Game**
  - with 13 farmers among the ones interviewed
  - Test instruments
Results \rightarrow Goal 1

Practices and ecosystem services analyze

Ecosystem services and disservices

- Fertilization
- Waterway protection
- Shade trees management
- Buffer zones (vegetal hedge)
- Drainage
- Weed management
- Terraces
- Nitrogen pollution of the water
- Watershed
- Coffee production

Biodiversity

Regulating erosion

Goal 1
Results → Goal 1

Identification of a livelihood typology

5 types according to:

- The type of economics activities in the household
- The part of coffee in the income
- The area of coffee in the farm
- The number of persons working in coffee production
- The type of workforce in coffee production
No Payments for environmental services (PES) in the area
• Constraints of land ownership
• Conditions about trees not adapted to the coffee production

All the producers certified by eco-labels
• Environmental criteria not precise • Without recurrent control

Law of protection of the waterway
• Generally not respected • No control
Results ➔ Goal 3

Construction of the model for the role playing game

Ecosystem services and disservices

- Fertilization
- Terrace
- Weed management
- Drainage
- Buffer zones (vegetal hedge)
- Shade trees management
- Waterway protection

Role of the gamer = simplified types of producers

Nitrogen pollution of the water

Watershed

Biodiversity

Coffee production

Regulating erosion
Results → Goal 3

Dynamic of one round in the role playing game

- Presentation of the scenario
- Choice of the practices and adoption or not of the instrument proposed
- Calculations of the individual and collective results
- Play on the collective card table
- Play on the individual card table
Results → Goal 3

Incentive rules in the game

1\textsuperscript{st} Turn: 
Enforcement of the law prohibiting coffee production on water line

2\textsuperscript{nd} Turn: 
Payment for Environmental Services (PES) 
for adoption of highly shaded coffee and protection of water line

3\textsuperscript{rd} Turn: 
Green credits for a reduce use of inputs and plots arrangement with terraces
Results → Aim 3

Ecosystem services compromises and disservices in the game

Evolution of the units produced in the watershed by the gamers

Evolution of the game units compared to the reference turn (without instruments)

In the game:
• PES and green credits are the most effective incentives to reduce environmental impacts without decreasing coffee production.
• Enforcement of the law impacts negatively coffee production.

We observed too different effects of the instruments depended on the role game of the gamers.
Conclusion

- Existing instruments are **currently not effective** in the region but farmers would be responsive to some of the new incentives.

- **Economics and voluntary incentives** (PSE and green credits) with **decentralized and inter-institutional governance** seem adapted to the farm’s local techno-economic constraints and the environmental issues of the territory.

- The sensibility of farmers to instruments would be dependent on the **socio-economic criteria** related to their household.

Some limits:
- The agro-ecosystem and the instruments were simplified in the game.
- Few simulation (Only 13 farmers participated).
- We didn’t simulate costs transactions and financing modalities.
Thank you for your attention