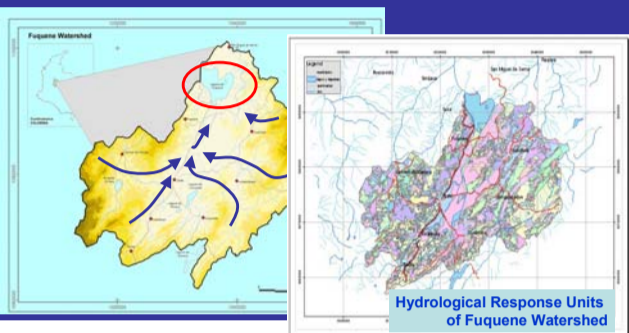


INTEGRATING ENVIRONMENTAL SERVICES TO AGRICULTURAL FINANCIAL MECHANISMS FOR PROMOTING RURAL DEVELOPMENT IN THE ANDES. The Case Study of Fuquene Watershed (Colombia).



Goal: To alleviate poverty and enhance sustainability in upper catchments by increasing the flow of resources from governments and civil society to poor rural producers, reducing the negative impact of environmental externalities and strengthening the competitive capacity of the poor through greater food security, higher incomes, and better administrative and organizational skills.

Identifying externalities: location, magnitude and who is causing them?

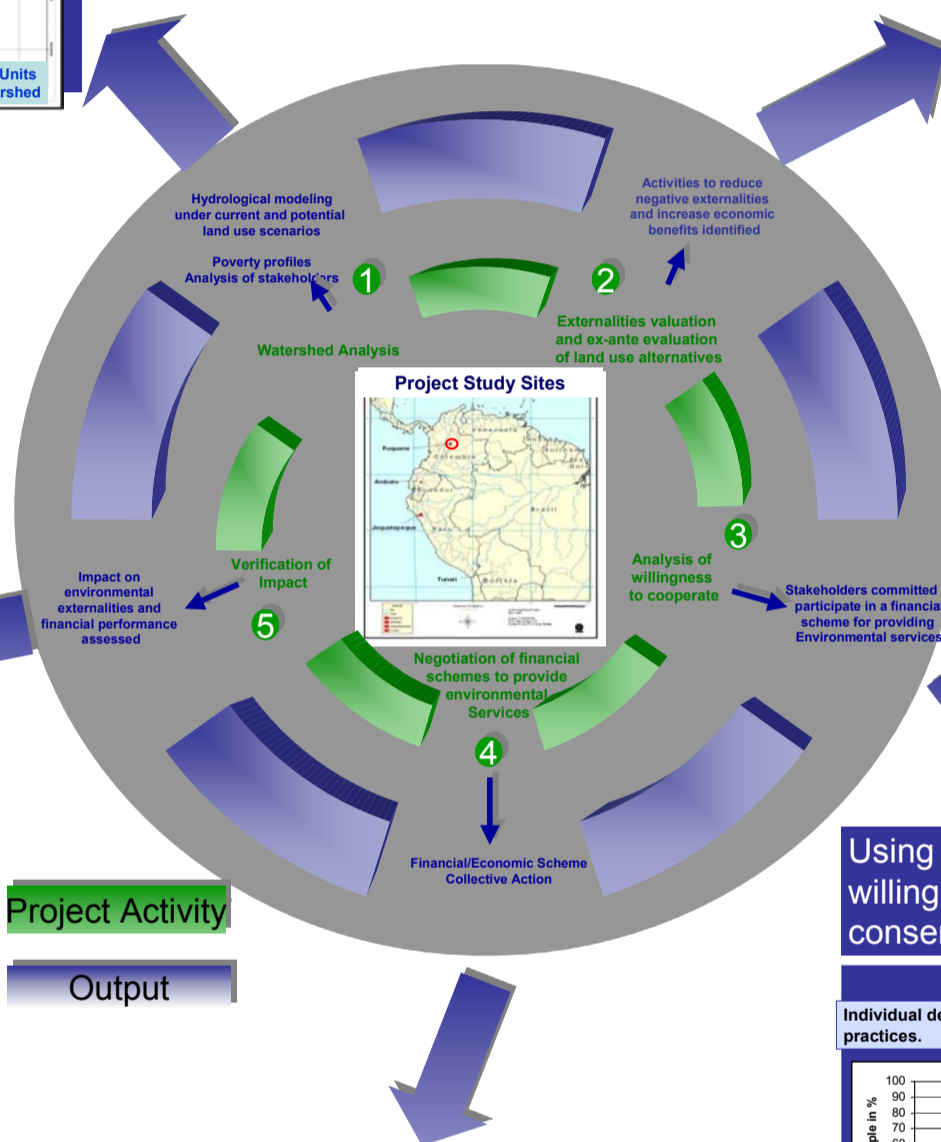
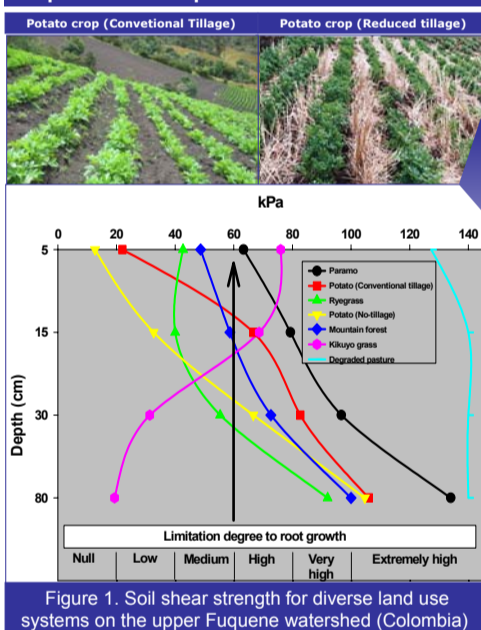


Fuquene Watershed Problematic
The Fuquene Lake located downstream provides water to 27 aqueducts. However, the lake is being affected by an accelerated process of eutrophication. This is being caused by high amounts of sediment discharges and N and P yields that come from agriculture (potato and cereals) in the upper watershed.

Optimization model for ex ante evaluation of land uses and management practices in

VARIABLES	DECISION ALTERNATIVES SCENARIOS											
	Hydrological modeling (Net Income, Capital, Cash flows)	Land availability	Erosion thresholds	Hydrological balance	N contributed	CO ₂ fixation	Labor profiles	Wood production	Energy production	Protein production	Dairy production	Meat production
Net incomes (n yr) (objective function)	X	X	X	X	X	X	X	X	X	X	X	X
Capital	X	X	X	X	X	X	X	X	X	X	X	X
Cash flows (by sem. or yr)	X	X	X	X	X	X	X	X	X	X	X	X
Land availability (upper, medium and downstream watershed) (ha)	X	X	X	X	X	X	X	X	X	X	X	X
Erosion thresholds by land use (t/sem.)	X	X	X	X	X	X	X	X	X	X	X	X
Hydrological balance, contribution to the superficial aquifer (m ³ /ha/sem.)	X	X	X	X	X	X	X	X	X	X	X	X
N contributed to water flows by land uses (t/ha/sem.)	X	X	X	X	X	X	X	X	X	X	X	X
CO ₂ fixation by vegetative cover (t/ha/sem.)	X	X	X	X	X	X	X	X	X	X	X	X
Labor profiles by land uses (no. workdays/sem.)	X	X	X	X	X	X	X	X	X	X	X	X
Wood production by planted forests (t/ha)	X	X	X	X	X	X	X	X	X	X	X	X
Energy production for livestock (megacal./Kha)	X	X	X	X	X	X	X	X	X	X	X	X
Protein production for livestock (kg dry matter/ha)	X	X	X	X	X	X	X	X	X	X	X	X
Dairy production (t/sem./individual)	X	X	X	X	X	X	X	X	X	X	X	X
Meat production (t/sem./individual)	X	X	X	X	X	X	X	X	X	X	X	X

Mechanism to verify the expected impact.

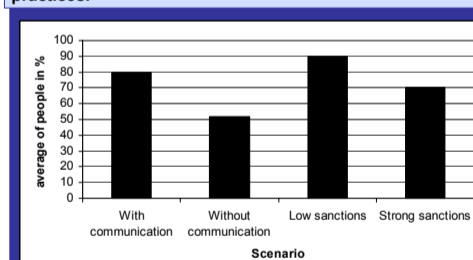


Changes in net incomes and environmental externalities with conservation agriculture in prioritized Hydrological Response

Part	Activity	Sediment yield (10 years)	Net Income	Labor employment	Social benefits
Middle part	Potato and cereals cropping with conservation agriculture	-49%	+1%	+62%	+111%
Upper part	Potato cropping with conservation agriculture	-39%	+18%	-14%	+40%

Using economic games to explore the willingness of potato farmers to adopt conservation agriculture.

Individual decisions made by potato growers adopting conservation farming practices.



Communication means to the chance of negotiation between potato farmers and downstream water consumers for adopting conservation agriculture as an strategy to increase potato productivity while the quality of downstream water is improved. Sanctions refers to penalties that were applied in the game to farmers that decided to continue with conventional agriculture.

A pooled fund for providing soft credits to small and medium farmers and stimulate conservation farming adoption. About 700 Ha have been implemented under conservation agriculture in Fuquene.



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