



Potential adaptations by Central American farmers to expected increases in rainfall intensity as the result of climate change

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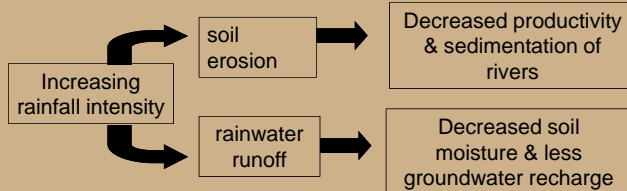
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Climate Change & Water Resources

- In Central America, increased intensity of rainfall events and more scarcity of water during the dry season is expected as the result of global climate change.¹
- Impacts on rural farmers: increases in soil erosion and runoff
- Soil and Water Conservation (SWC) techniques are already employed by farmers to address erosion.
- Research on popular SWC can shed light on the adaptations to climate change that may be useful to and well received farmers.

Impacts on Central American Farmers



When groundwater reserves are not replenished in the rainy season, during the dry season when even less precipitation is expected, farmers will experience shortages for household water consumption.

Soil and Water Conservation Techniques for

Addressing Intense Rainfall Events



Above: Green manure cover crop in Central America (Sustainable Harvest International 2005).
Below: Agroforestry system with live barrier in Guatemala (GEF 2006).



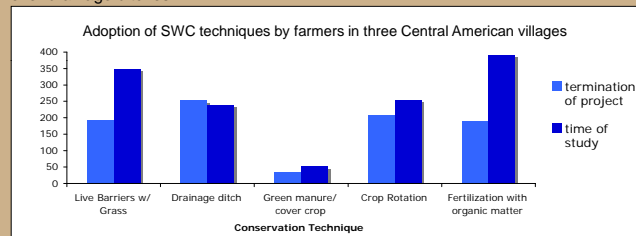
Objectives & Practices

- 1) Reduce impact of raindrop on soil
 - Plant cover crops, apply green manure or mulch: slows vertical velocity of raindrops before they hit the soil surface.
 - Incorporate organic matter onto field: increases the water holding capacity and cohesive properties of the soil.
- 2) Reduce soil erosion and surface runoff, enhance infiltration
 - Plant live barriers: slows velocity of water moving down-slope, catches soil behind barriers, roots allow for infiltration of water into soil.
 - Dig a drainage ditch: promotes concentrated flow in a small area, rather than sheet flow over the whole field (does not prevent surface runoff or promote infiltration).²

Adoption of SWC Techniques by Farmers

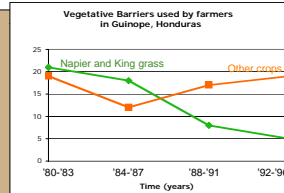
In a follow-up study of three development projects that promoted SWC techniques, data was collected on the number of farmers that had adopted SWC techniques during the project and since the end of the project. The projects were implemented in San Martin and Guinope, Honduras and in Cantarranas, Guatemala. The following preferences were exhibited by farmers:

- Fertilization of organic matter onto soil preferred over green manures/cover crops.
- To curb erosion and runoff: preference of live barriers of grasses plus other crops over drainage ditches.³



The results of the previous study and an additional study in Guinope, Honduras.

- Farmers generally opt for techniques that maximize returns on the labor inputs required for implementation.
- Other crops, including sugar cane and pineapple, have been utilized as live barriers by farmers because they provide additional household benefits.⁴



Effect of Live Barriers on Runoff and Erosion

Live barriers are planted along the contour in rows down the slope of a field. Sediment and water runoff are intercepted by the barrier, forming a terrace of moist, fertile soil.⁵ Vegetation requirements: stiff-stems, dense roots, non-invasive, ability to withstand year-round seasonal fluctuations.⁶

A study was conducted in Venezuela on the ability of various perennial grasses and plants to prevent erosion and runoff.⁷ The results of the study (presented below) indicate the following lessons for the potential effect of live barriers in Central America:

- Perennial grasses (vetiver grass, lemon grass, king or napier grass) are more effective at preventing soil erosion and runoff and have deeper and larger root masses.
- Other crops and low-lying shrubs (lily, fern, pineapple, *aloe vera*), prevent some erosion, but are not as effective at conserving soil and water.

Table 1. Soil loss, runoff, and root development after 10 months on bare ground and on adjacent plots of lily, fern, vetiver grass, lemon grass, and vetiver grass planted 10 years prior.

Treatment	Total soil loss (Mg/ha)	Runoff (mm)	Runoff (% of total)	Root mass depth (cm)	dry matter (g)
Bare ground	5.22	98.66	54.79	n/a	n/a
Lily	3.00	74.15	41.16	37	22
Fern	2.39	77.60	43.09	14	6
Recently planted vetiver	1.71	61.06	33.92	171	100
Lemon Grass	1.13	52.93	29.38	103	28
Vetiver grass planted 10 years prior	0.01	11.37	6.32	no data	no data

Live Barrier Implementation in Central America

Vetiver grass (*Vetiveria zizanioides*) can grow under a range of site conditions and it very effective at preventing erosion and runoff. Since it has few additional uses, after utilizing the grass, farmers have switched to a crop that provides additional benefits.⁸



Above: vetiver grass in Central Mexico (INIFAP).
Below: Aloe vera in SW Honduras (CAFOD 2006).

Sugar cane (*Saccharum sinense*) is planted throughout Central America. It is a more effective SWC technique than other non-grass vegetation, and it produces brown sugar and biomass for household consumption and to be sold at market. It has become a popular live barrier crop.⁹

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Above: sugar cane used as a live barrier in Colombia (CIAT 2001).



COMUCAP, a women's cooperative in Honduras, uses *Aloe vera* as a live barriers and the aloe is sold to national industries that produce medicines and cosmetics.¹⁰

Conclusion

- Because of the lack of monetary resources at the disposal of rural Central American farmers and the amount of labor required to effectively conserve soil and water resources, farmers are more likely to adopt techniques that prevent soil erosion and runoff in the long term and also provide immediate returns or benefits.
- Farmers have shown that there are willing to sacrifice soil and water resources if too much labor or too few benefits are involved in implementing a SWC technique.
- Farmers in Central America have been receptive to live barrier techniques. It can be expected from previous trends in adoption of SWC techniques that the same preferences for technologies that provide short and long-term benefits will hold true for adaptations to climate change in the future.

References

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