Lessons from the history of adoption of diffusion of soil and water conservation practices

Sam Fujisaka, CIAT

We know or should admit that soil and water conservation measures have functioned well on pilot projects but have not been adopted and scaled out. At the same time, farmers--using their own techniques--conserve upland soils and water where it makes sense to do so. These two observations (from a person who once thought he had the answers but eventually failed to have an impact) lead to some arguable lessons.

Why there has been no adoption.

1. **Adoption of conservation practices = intensification; extensive agriculture > intensive as long as extensive is possible.**

Techniques to conserve soil and water represent land use intensification. Farmers in Laos, Vietnam, the Philippines, Thailand, Peru, Brazil, and Costa Rica continue to rely on extensive practices such as slash-and-burn as long as it is possible to do so. The "possibility" of extensive agriculture hinges largely on land cost and open land frontiers. As frontiers close and land prices rise, farmers start to—i.e., are slowly forced to--intensify land use; although the degree of intensification depends on inherent economic incentives to do so (below).

2. **Adoption is too expensive but if made cheaper, watch out for other problems.**

Adoption of soil and water conservation techniques is often simply too expensive in terms of labor (and seasonal opportunity costs of labor), land, and planting materials. Our work in northern Mindanao more than a decade ago responded to farmers' concerns about soil erosion where rates were some 220 t/ha/year. They learned about establishing contour lines, animal double hilling up and trenching, and planting of contour hedgerows. Terraces formed behind the hedgerows; but the package was too expensive.

In response to high costs and with our facilitation, they innovated: thin contour strips of "weeds", dropping labor costs from more than100 days/ha to about 10 days/ha and saving needed land. Both models controlled soil erosion equally. Work failed because erosion control didn't necessarily address nutrient management; and farmers obtained more benefits from moving to other fields. Key to failure was that land was still accessible to support extensive agriculture.

3. **Innovations are misdirected.**

Although one of my closest colleagues has been perhaps the most successful person in SE Asia in the promotion of soil and water conservation, we argue about this: Does it make sense to control soil erosion on deep sandy soils that are largely equally nutrient poor from the surface to the subsoil? Other miscues include promotion of cash crop perennials where markets and market infrastructure do not exist or where future demand is grossly overestimated (e.g., Japanese demand for *camu camu* from the Amazon).

4. **Needed inputs are not available.**

Planting materials, planting materials, planting materials. Many of our research-developed innovations for groundcover, multi-purpose legumes, and agroforestry depend on delivery of planting materials. Provision of seed, cuttings, and seedlings to where they are needed, however, is most often left to national programs with insufficient funds to really support significant scaling out. *Arachis pintoi* makes a nice ornamental plant in Latin America, but has yet to reach its potential as a legume ground cover and improved animal forage.

5. Conservation practices get distorted or sloppy as they get farther from the pilot area.

Real scaling up means that the researchers in the pick-up trucks wearing baseball caps don't come around every week. Instead, some hard working person might be lucky to come by once a month on a motorcycle. Some of the contour lines get crooked, exacerbating erosion. Neighbors' cattle overgraze the vegetative strip. Things fall apart.

Where farmers conserve soil and water (intensify), two examples.

1. Theobroma, Rondonia, Brazil.

Theobroma is a huge government sponsored settlement in the Amazon located along the famous highway BR364. The settlement lies somewhat closer than other forest margins areas to the center-south region of the country and directly and intentionally (to draw early settlers) on an island of richer alfisols surrounded by ultisols and oxisols. Land fragmented over a few generations; and the land frontier was effectively closed by the fixed boundaries of soil fertility. Farmers, however, were tied by road to the populous parts of the country; and were able to take advantage of markets and soil fertility (and forced by a closed land frontier) to produce perennial tree crops and cheese in intensive agricultural systems that were eventually resource conserving.

2. The Diang Highlands in Central Java, Indonesia.

Farmers grow vegetables on the steep slopes of the Diang Highlands of Central Java. The small area features rich volcanic soils—albeit on steep slopes--and good road connections to lowland cities. Demand for vegetables is high. Trucks grind uphill with loads of chicken manure readily available in the lowlands and for use on the vegetable plots; and burn out their brakes getting the highland high-value produce down to the cities. Farmers' response: careful management of soils, soil nutrients, and water on very small plots. Although the contours are somewhat crooked, the use of rock walls (!) in some areas is effective and profitable.

The lessons?

1. Adoption of soil and water conservation techniques generally represents land use intensification. Extensive agriculture is practiced wherever the benefit-cost ratios are more favorable for extensive over intensive agriculture.

2. Financial returns start to favor intensification as the land frontier and the option of extensive resource use are closed. This condition may be necessary but is not sufficient to provoke sound resource management. Upland areas with poor soils and lack of markets in Vietnam and Laos, for example, may remain poor and may see little adoption of conservation measures as systems remain low input-low output systems linked to poverty.

3. Farmers do conserve resources where it makes financial sense to do so. Favorable markets and productive capacities of systems can combine in ways that farmers themselves are willing and able to conserve resources.

4. But are there alternatives for the trickier situation of the poorer, low potential areas? In this case, we need to examine appropriate mechanisms to facilitate provision of environmental services.