Vegetative and Agronomic Technologies for Land Husbandry

Dawn Berkelaar

In Overstory Online #111 (free newsletter about agroforestry; see *EDN 83-7* (https://c.ymcdn.com/sites/echocommunity.site-ym.com/resource/collection/9EE3A8EE-FF5C-45A6-9BA9-0AB3A3E7652E/edn83.pdf) for more information), Roland Bunch summarized 35 years of extension in the area of land husbandry, which includes soil and water conservation. In this context, land husbandry refers to "everything a farmer does that conserves or improves the soil." Rather than just a single technology, the whole farming system must be taken into account. In this article we share some key points from Bunch's summary.

Bunch stated that there has been a definite shift from (expensive) structural technologies (e.g. terraces, contour rock walls) toward "vegetative or agronomic technologies" (e.g. green manure/cover crops). Introduced technologies should be able to pay for themselves within a year of first being used, since farmers' motivation for using new technologies is generally economic. Structural technologies have fallen out of favor because most require maintenance and many are also very expensive.

One of the most important things a farmer can do for his farm is to prevent soil erosion. One way to do so is by keeping soil covered, especially during the rainy season. Vegetative cover and high levels of soil organic matter are key. Below is a brief description of several vegetative or agronomic technologies.

Contour hedgerows

Bunch wrote that contour hedgerows or contour vegetative barriers "continue to be used widely, with many positive, long-term results." Farmers have introduced several modifications. First, they often space hedgerows twice as wide as recommended. Second, they use different species [and more diversity of species] than those that are typically recommended; instead of napier grass, they use plants and trees that also have other uses. Third, they use multipurpose barriers. For example, an intercropped hedgerow might include 100 m of napier grass for each grazing animal; 20 m of lemongrass; 20 to 40 m of vetiver (for medicine or thatch); and sugarcane for the rest.

Green manure/cover crops (gm/cc)

Bunch defines a gm/cc as "any species of plant, often but not always leguminous, whether a tree, bush, vine or crawling plant, that is used by a farmer for one or several purposes, at least one of which is that of maintaining or improving soil fertility or controlling weeds." Many different plants are used, including subsistence crops, trees, and non-legumes. A farmer's intention in planting a species is a key part of the definition.

Gm/cc are often intercropped, then cut down and left on the surface as mulch—in contrast to the outdated view of a gm/cc as a monocropped legume that is buried at the flowering stage.

Bunch has seen at least 150 gm/cc systems, with 60% of them developed by farmers themselves. Gm/cc are used for more than fifteen purposes. "The most important, in approximate decreasing order of priority, are: human food, animal feed, weed control, sources of income, improved fallows or the elimination of fallowing, a necessary preparatory stage before using zero tillage, and the recuperation of wastelands.

"The species most popular around the world are the scarlet runner bean (*Phaseolus coccineus*); pigeon pea (*Cajanus cajan*); velvetbean (*Mucuna spp.*); cowpea (*Vigna unguiculata*); other vignas; and the jackbean (*Canavalia ensiformis*)." Before introducing a gm/cc, find out what farmers' priorities are and what species are locally known.

Bunch lists many advantages of gm/cc systems. "They increase soil organic matter, fix nitrogen (often between 80 to 120 kg of N/ha/year), frequently cost less than the value of the benefits they provide (yes, we are talking, in many cases, about essentially free organic matter), control even the most noxious of weeds, provide soil cover, maintain soil moisture, and allow zero tillage. In an age of threatened globalization of commerce, perhaps one of the most important and least appreciated advantages of gm/cc is that they may be the only way small farmers in countries such as Paraguay or Cambodia will ever compete with the mechanized agribusinesses of the North. Mechanization's greatest advantages come in soil preparation and weed control. Since gm/cc can control weeds and allow zero tillage, they can eliminate both operations. Eliminating weeds is even cheaper than mechanizing their removal."

Dispersed shade

Most crops in the lowland tropics grow best with 10 to 15 percent shade, which can be roughly obtained by planting trees 10 to 15 m apart in all directions. Many small farmers already use this technique, especially in Southeast Asia. Bunch writes, "Those who know of these systems consider them to be probably the most promising agroforestry system known, both in terms of potential farmer acceptance and of the brute number of…trees these systems could get planted around the world." Advantages of dispersed shade systems include an increase in crop yields; protection against too much or too little rain; uses of the trees themselves; and an increase in yields because the shade is distributed fairly evenly (in contrast to a system like alley cropping, in which the shade is concentrated).

Improved (or eliminated) fallows

Many farmers crop their land every year with the use of gm/cc, instead of having to let the land lie fallow. Bunch wrote, “Improved fallows could probably single-handedly do more to solve Africa's food shortage, not to mention its problem of deteriorating soils, than any other single technology we know.”