Hearing the mucuna story

Researchers in Mexico and Honduras are working together to unlock the secret to a successful green-manuring technology developed by small-scale hillside farmers. Daniel Buckles shows how exchanges between farmers and researchers are being accelerated through effective networking.

Daniel Buckles

For more than 40 years, farmers in the humid tropics of Mexico and Central America have been quietly developing and refining a low-input technology based on the use of the leafy legume mucuna (velvet bean). Agricultural research centres and non-governmental organisations (NGOs) gradually became aware of this, shared early experiences and are now developing a collaborative research and extension effort to speed up farmer-to-farmer diffusion and improve the capacity of farmers and researchers to further develop the technology. The results are feeding into a growing body of experience with green manures in the humid tropics, and inspiring further communication between farmers and researchers in very different types of organisations. Thanks to these exchanges, the mucuna story is being heard by many.

Indigenous farmers' research

Mucuna pruriens (Stizolobium pruriens) is a legume from Indonesia, introduced to the Americas in the late 19th century. Mexican and Guatemalan farmers first experimented with it as a natural fertiliser several decades ago, noting its ability to smother weeds and improve maize yields on degraded fields. The notion of 'improving the fallow' was a small step for farmers keenly aware of natural processes of soil fertility decline and recovery through shifting cultivation. By broadcasting mucuna seed into abandoned fields, farmers can reduce fallow periods from five years to two. Further steps in using mucuna to manage fertility, weeds and water were taken by farmers in various parts of Mexico and Central America, often independently and through a steady but slow process of farmer experimentation and diffusion. Scientists' research into mucuna's properties and adoption did not keep pace with its widespread acceptance by farmers. However, knowledge about its potentials and limitations is growing as widely separated farmers and researchers share and adapt mucuna management strategies, such as mulching and intercropping, in different climatic and social environments.

Scientists catching up

Formal research experience has been slowly developing on the Atlantic coast of Honduras since the early 1980s, when the Honduran Secretaria de Recursos Naturales (SRN) and CIMMYT (International Maize and Wheat Improvement Center) noted the use of mucuna by smallholders. Experiments with mucuna and other legumes (Canavalia ensiformis, Vigna unguiculata) were later initiated in all Central American countries by the Regional Maize Program for Central America, Panama and the Caribbean, a network of national researchers and CIMMYT, funded by the Swiss Government. Intercropping trials have been undertaken for several years in a wide range of agroclimatic conditions, and various promising legumes identified (PRM-CIMMYT 1990). More recently, collaboration expanded to include personnel from the Honduran Forestry Institute (COHDEFOR), a Canadian funded agroforestry project and the Regional University Centre of the Atlantic Coast (CURLA) in an adoption study in Atlantida Department in northern Honduras. Here, an estimated 66% of hillside farmers rotate mucuna and dry-season maize.

Making cowardly land brave

The northern coast of Honduras has relatively thin soils, an altitude range from sea level to 1000 m, and a bimodal rainfall pattern permitting two maize harvests per year. The use of green manures dates back some 20 years, when migrants from the lowlands of Guatemala introduced both the seed and an effective management strategy: summer green manure. The technology was diffused throughout the region from farmer to farmer, without help from extension services. The system works like this: mucuna is interplanted
in dry-season maize at flowering time and left to grow as a sole crop during the wet season (late May to November). Wet-season maize is sown on separate plots in shifting cultivation, while the green-manure crop or abonera prepares the land for planting dry-season maize in December. As this aggressive weed smothers out virtually all competing weeds and is easy to cut, it reduces labour inputs for land clearing by up to two thirds. Dry-season maize is stick-planted into the mucuna bed, where it grows well because the mulch supplies nitrogen from decaying leaves and conserves soil moisture. Maize yields in the mucuna mulch are 35% higher than yields in conventional fields, 1.5 t/ha compared to 0.9 t/ha, using local varieties. As one Honduran farmer put it, “cowardly land becomes brave” when managed with the ‘fertiliser bean’.

Finding farmers' criteria
An exciting component of the Honduran adoption study was the use of visual aids to help farmers answer the sometimes complex questions. To find out farmers’ criteria for using mucuna in maize fields, they were asked to rank six factors such as weed suppression and moisture conservation. Four factors, including increased incidence of rats, were ranked in discussing mucuna’s disadvantages. In both cases, the farmers arranged cards with drawings of the factors. In this way a large number of farmers could be surveyed, providing insight into why some adopted the technology while others did not. Ease of land preparation and the fertiliser effects of the slash-mulch system are the most important advantages cited by farmers, while the main social limitation on diffusion of the technology is the intensity of land use in the farming system (Buckles et al, 1992b).

Farmer-driven experiments
Crop rotations with mucuna were also developed independently over 40 years ago by Nahua-speaking farmers in southern Vera Cruz, where a Mexican NGO and CIMMYT are studying green manuring and farmers’ perceptions of it in a series of farmer-driven experiments (Buckles & Perales 1992). Researchers noted that farmers in neighbouring villages use mucuna and other legumes (e.g. Vigna umbellata) in quite different ways: some as a component in an improved bush fallow, others as a wet-season rotation for dry-season maize, and still others as an intercrop in wet-season maize. Many farmers harvest the seeds of ‘nescafe’ (mucuna again!) as a coffee substitute. Researchers have given local experimentation with green manures a boost by making farmers aware of diverse management options already tried in the area, a simple example of the synergistic potential of networking. Farmer experimentation is accelerating and even jumping state boundaries, as various groups are now promoting slash-mulch systems with legumes and examining other farmer-generated solutions to problems of resource degradation. Technical and farmer evaluation in Mexico indicate that green manuring is a multi-purpose technology. In on-farm trials, farmers used mucuna as a sole crop in one corner of their fields to eradicate persistent weeds and in another corner as an intercrop; to restore soil fertility. In many ways, the technology is consistent with the traditional model of soil, weed and water management in shifting cultivation. It builds on farmer knowledge of land degradation and restoration processes, an important factor behind rapid and widespread adoption. This suggests that the development and diffusion of technologies would benefit from an understanding of the strengths and weaknesses of farmer knowledge.

Not without problems
While green manuring with mucuna is an important development for farmers in Vera Cruz and northern Honduras, the management practices used in these regions require bimodal rainfall and, for crop rotation, relatively extensive land-use systems. The potential for increased damage to the maize crop by rats is a concern expressed by half the farmers surveyed in Honduras, while many noted that aboneras can provoke small landslides on very steep slopes. Fields with mulch are more susceptible to uncontrolled fires in the dry season. Early intercropping of mucuna leads to competition with maize, reducing yields by 400 kg/ha in CIMMYT on-farm trials. Preliminary on-station findings suggest that mucuna rotations can provoke stalk rot and excessive lodging. Thus, while mucuna is well suited to the needs of many hillside farmers in the humid tropics, it has its limitations and is only one of hundreds of legumes worthy of attention.
New extension methods
While agronomic research with green manures progresses, close collaboration with farmers and networking with NGOs is also suggesting fruitful ways of modifying extension methods in Mexico (Buckles et al 1992a). In April of this year, three Mexican NGOs - the Sierra Santa Marta Project (PSSM), the Mexican Association for Rural and Urban Transformation (AMEXTRA) and the Centre for Agrarian Studies (CEA) - joined forces with CIMMYT, the national research and extension service (INIFAP-SARH) and an NGO from the USA (Forest Island Project) to launch an extension effort focused on farmer experimentation with green manures. This lets farmers compare options directly and, by increasing their knowledge of experimental design, strengthens their ability to draw valid conclusions from their own trials. Collaboration of CIMMYT and NGOs is mutually enriching, as the former provides basic concepts of experimental design whereas the latter have developed practical methods for dialogue with farmers.

Many organisations involved
A deeper understanding of managing green manures in hillside maize and the factors affecting diffusion and local adaptation is being developed in many parts of Mexico and Central America by various other organisations as well. World Neighbors and CIDICCO have gained a rich experience with green manures in labour-intensive farming systems in central Honduras (ILEIA Newsletter, July 1989). The CIPRES group in Nicaragua are working with mucuna in the tropical lowlands. The International Institute of Tropical Agriculture (IITA) has shown the effectiveness of mucuna in eradicating Imperata, a persistent weed which plagues farming in much of West Africa. These groups are multiplying knowledge of green manuring by exchanging survey instruments, farmer experience in managing legumes, and innovations in extension methods. Perhaps the biggest lesson to be learned from the mucuna story is that green manures can be effective and adoptable components in hillside farming systems. The principles of green manuring employed by farmers, not the particular legume or management practice, are far-reaching. Innovation by resource-poor farmers is pointing the way to a promising area of research too long neglected by research institutions.

Daniel Buckles
CIMMYT
Apda Postal 6-641
06600 Mexico
DF Mexico