Mountain Research and Development Vol 22 No 1 Feb 2002: 10–13

*Jose Nestor M. Garcia*
*Robert V. Gerrits*
*Robert A. Cramb*

# Adoption and Maintenance of Contour Bunds and Hedgerows in a Dynamic Environment

## Experience in the Philippine Uplands





*The widespread adoption of soil conservation technologies by farmers (notably contour hedgerows) observed in Guba, Cebu City, Philippines, is not often observed elsewhere in the country. Adoption of these technologies was because of the interaction of such phenomena as site-specific factors, appropriate extension systems, and technologies. However, lack of hedgerow maintenance, decreasing hedgerow quality, and disappearance of hedgerows raised concerns about sustainability. The dynamic nature of upland farming systems suggests the need for a location-specific farming system development framework, which provides farmers with ongoing extension for continual promotion of appropriate conservation practices.*

**FIGURE 1** An overview of Adlaon Village, a neighbor of Guba, showing cultivation on steep slopes and some conservation farming in the foreground. (Photo by R. V. Gerrits)

## A high rate of adoption

The rate of adoption of soil conservation technologies by upland farmers in the Philippines has remained low, with few successful projects. One such project is located in the hinterlands of Cebu City, implemented by the Mag-uugmad Foundation, Inc (MFI), a nonprofit, nonstock, farmer-based NGO concerned with the declining status of upland farmers, degradation of upland resources, and the downstream effects of resource degradation. Surveys conducted from 1993 to 1997 in 8 upland project sites throughout the Philippines revealed that the rate at which soil conservation technologies are adopted at the MFI Guba site represents a phenomenon rarely seen elsewhere in the Philippines. A 1-week informal survey was conducted to determine the reasons for this widespread adoption and to analyze sustainability. Interviews with key persons and households, transect walks, and farm visits were conducted in various localities.

Guba is located approximately 25 km northwest of Cebu City center and is relatively accessible by means of 3 direct, unsealed gravel roads. The site's climate is characterized by lack of a pronounced maximum rainy period. Soils are heterogeneous but primarily acidic, heavy clay loams, with slight to severe erodibility and susceptibility to waterlogging. A conservation project begun in 1981 in Barangay Guba, Cebu City, spread to the 9 neighboring *barangays* (villages) of the city, covering a total area of around 78 $km^2$ (Figure 1).

## Livelihood based on farming

Farming is the primary source of livelihood for most households. Local employment opportunities include contract bagging, spraying, harvesting and hauling of mangoes, contract firewood and charcoal production, and the purchase and sale of bamboo. Off-farm employment by one or more of the younger farm-household members also provides some cash income.

The average farm size is 1 ha of Alienable and Disposable or Public Forest Lands. Key persons interviewed suggested that 30% of the farmers are tenants who either rent some land in addition to their existing (but small) landholdings or are wholly dependent on rented land. Most tenants have long-term tenancy agreements (in some cases, intergenerational), creating a feeling of security of tenure. The growing accessibility of the site has brought about increased commercialization of farming. This leads farmers to restrict maize cultivation to the first of two former cropping periods and utilize the second for the cultivation of vegetables. Flowers, fruit

**FIGURE 2** Contour hedgerows on steeply sloping land used for maize cultivation at Guba. (Photo by R. V. Gerrits)

trees, and livestock are further sources of food, income, and fertilizer.

## Implementation of soil and water conservation

MFI activities at the site focused on the promotion of soil conservation technologies, mainly contour bunds, contour hedgerows, and contour canals (Figure 2). Implementation of these technologies includes: (1) identification of contour lines; (2) spacing between contour lines determined by the slope of the land (the steeper the slope, the closer the spacing); (3) construction of contour canals to reduce the volume of overland flow and planting of grasses (*Panicum maximum* and *Pennisetum purpureum*) and leguminous shrubs (*Leucaena leucocephala*, *Leucaena diversifolia*, *Gliricidia sepium*, *Fleminingia macrophylla*, *Desmodium rensonii*, *Calliandra* spp) on the bund to form contour hedgerows; and (4) regular pruning of the hedgerows and mulching of the pruning on the cropped area to enhance soil fertility.

Soil conservation technologies were usually promoted in association with other farming system technologies, including: (1) crop diversification such as vegetable production; (2) integrated pest management; (3) soil fertility management (crop rotation, green and animal manure, composting, and commercial fertilizers); and (4) animal production and management involving forage crop production in hedgerows, cut-and-carry feeding systems, penned livestock (eg, goats), and return of manure to the field.

## Reintroducing labor exchange groups

The project started in 1981 with the recruitment of Timotei Llena, a progressive farmer who had recently been honored as "Best Farmer for Production" by the Department of Agrarian Reform. Llena adopted and extended the promoted technologies to the first *alayon* group (labor exchange group), which he organized with his kin. In 1982, growing interest in the new technologies by neighbors led to their adoption in 23 farms. Maximum expansion of the project occurred over a 2-year period between 1983 and 1984.

To ensure wide dissemination and adoption of the technologies, the project employed a number of strategies including the following:

- *Use of site manager and part-time farmer-instructors.* Both were provided with remuneration. The site manager received US$2600 annually, whereas part-time farmer-instructors received US$200. Farm wages were about US$3.20 per day. The site manager supervised the farmer-instructors, maintained the model farms and the training center, and addressed requests for information and training from farmers. The farmer-instructors served as extensionists.
- *Organization of labor exchange groups (*alayon*).* Because of labor problems in the establishment of soil and water conservation (SWC) technologies, MFI revived *alayon*, a traditional labor exchange system for agricultural and other activities with groups of 5–8 farmers.
- *Extension and training.* The farmer-instructors provided *alayon* members with training. Likewise, cross-farm visits have become a feature of the MFI extension methodology. These visits facilitate introduction of new technologies, stimulate farmers' interest, and allow them to share their ideas and experiences.
- *Support for the* alayon *and individual farmers.* MFI provides "starter packages" that include tools, seed, and fertilizers or livestock (or both) and represent part of a revolving fund to which the *alayon* or individual farmer is required to pay back these materials within a given period of time. Materials are subsequently made available to another *alayon* or individual farmer.
- *Community organization.* MFI has developed a 2-year phase-out plan that aims to institutionalize the changes it has initiated. This plan focuses on: (1) helping the community form a legally recognized people's organization—the establishment of the *alayon* work groups is a precursor to the establishment of a people's organization; (2)

providing experiential training in value creation, financial management, and leadership skills; and (3) establishing organizational linkages to share technology, information, and resources.

- *Upland Resource Management Outreach Project.* This project uses farmer-instructors to extend training to farmers and extensionists outside the project area. Since 1984, over 15,000 people have participated in training programs, most of whom are farmers.

## Adoption and the impacts of recommended technologies

The number of those who adopted any of the SWC technologies promoted was estimated to be over 1000 in the 10 neighboring *barangays* alone, with several spontaneous forms of adoption. During the survey, spontaneous adoption was still observed in some *barangays*. Adoption appears to be limited to Cebu City.

Contour hedgerows, contour bunds, and contour canals are used in maize and vegetable cultivation and, to a lesser extent, in cut flower production. Farmers reported control of soil erosion, evidenced by gradual terrace formation, as the main effect of soil conservation technologies. As a consequence, increased soil fertility, reduced inorganic fertilizer requirements, and increase in yield and income were also reported. Likewise, increase in the supply of fodder from hedgerows for livestock was significant for farmers who raised livestock (Figure 3).

**FIGURE 3** Hedgerows can provide fodder for goats and other livestock at Guba. (Photo by R. A. Cramb)

Widespread adoption in the Cebu City area is a result of the interaction of several factors including favorable site-specific factors, extension strategies, and appropriate technologies. The site-specific factors include:

- Good inter-*barangay* linkages, facilitating farmer-to-farmer extension systems.
- A high level of farmer awareness of soil erosion and its effects but a lack of awareness of how to address the problems.
- Increasing access to the large urban Metro Cebu market, which allows farmers to commercialize their farming systems, giving them greater incentives to conserve their land.

Some important features of the MFI extension system include: (1) use of a farmer-to-farmer extension approach, the advantage of which is that farmer-extensionists are familiar with farming and with the people, possess credibility, and have an established social network; (2) cross-farm visits, seen as a useful approach that allowed skeptical farmers to directly observe the benefits of technologies; (3) promotion of a self-help philosophy; and (4) long-term implementation associated with long-term extension.

Other factors also seen as contributing to project gains included the following:

- *Exchange labor.* This reduces the burden for each farmer in adopting the promoted technology and simultaneously enhances sharing of information, experiences, problems, and resources amongst farmers, thereby contributing to learning, friendship, and teamwork. It also allows some pooling of capital at the time of group formation for the purchase of farm tools.
- *Associated technologies.* MFI has taken advantage of the increasing commercialization of farming by associating soil conservation with crop production technologies, emphasizing hedgerow establishment as the first and key feature of crop production in general. This way, irrespective of validity, farmers perceived the recommended soil conservation technologies as an integral component of crop diversification for commercial vegetable production.
- *Stable land tenure agreements.* The length of tenancy agreements at this site (in some cases, intergenerational) suggests a very stable land tenure situation. Accordingly, large numbers of tenants voluntarily established conservation measures on their rented land.

## Sustainability of adoption and future needs

Project success has so far been evaluated in terms of the extent to which farmers adopt recommended technologies. However, success is better evaluated in terms of the sustainability of technology utilization.

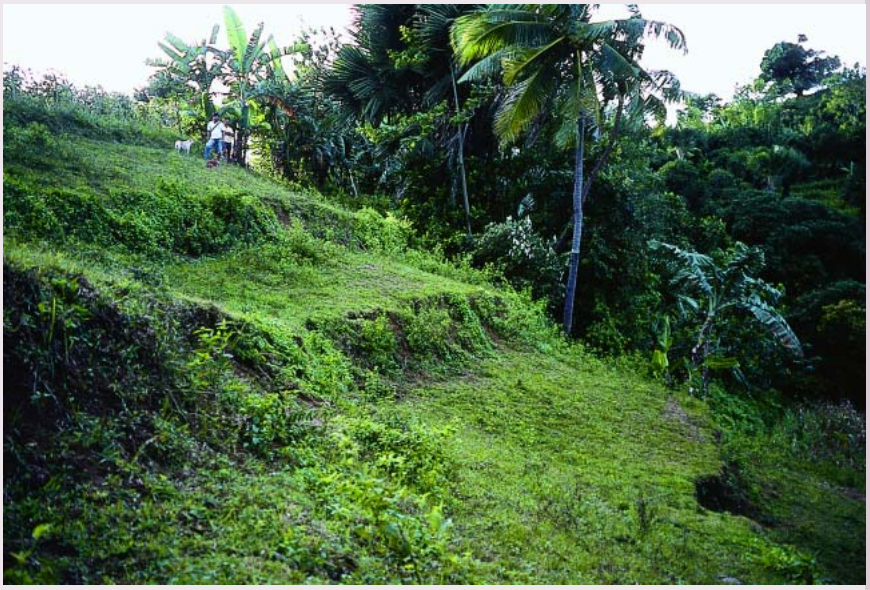

**FIGURE 4** Failure to maintain hedgerows can result in the gradual erosion of terraces. (Photo by R. V. Gerrits)

Farmers' lack of hedgerow maintenance, decreasing hedgerow quality, the disappearance of hedgerows, and the loss of their contribution to livestock production, mulching of cropped alleys, and nutrient cycling, in general, raise concerns about the sustainability of adoption (Figure 4). Drought and socioeconomic factors, such as uncontrolled grazing of livestock on terraces, account for some of these losses. However, general neglect and cases of abandonment suggest the more fundamental failure of the hedgerow technology to be incorporated into farmers' normal practices.

Hedgerow establishment and maintenance are laborious activities. Although MFI promoted the use of *alayon* during establishment of the technologies, it appears to have neglected the maintenance of hedgerows. *Alayon* groups usually died out after most of the members established soil conservation technologies. This observation, however, need not necessarily reflect poorly on the project. It is difficult to analyze whether farmers use soil conservation technologies sustainably, given the assumption that the recommended technologies remain appropriate in terms of meeting farmers' needs, and the implication that the farmer's environment is static. Although it might be suggested that change occurs slowly in upland farming environments, the fact remains that these environments are dynamic. Consequently, it could be concluded that "every technology has its day."

Farmers' actions suggest that their interest in the recommended technologies centers on the establishment of flat, cultivable alleys. Hedgerow biomass production exceeded the feed requirements of household livestock. But because pruning was not applied as mulch on the alleys, biomass production quickly became a nuisance. This suggests that the technology is not perceived to yield sufficient benefits relative to its maintenance costs.

It appears that the most sustainable technologies in the long run will be physical rather than vegetative because they require little maintenance and are not subject to climatic and biological extremities. These technologies become permanent features of farms and are unlikely to be neglected or become redundant as the farming system evolves. However, if it is acknowledged that systems are dynamic, there is some basis for a farming systems development framework with an ongoing extension presence through which appropriate conservation practices are continually developed and promoted. Within this framework, "appropriate" is determined by the stage of evolution of the farming system.

The future of the site would appear to involve further intensification of cash crops in light of growing economic opportunities. Increasing government land use regulation to protect vital watersheds is likely to be strongly influenced by further commercialization of farming systems, alternative and competitive land uses, and regulations stipulating protection of the watersheds. In this context, soil conservation technologies will continue to be worthwhile for more intensive, high-value cropping systems, which will require a continuous extension presence.

## AUTHORS

***Jose Nestor M. Garcia***
Farming Systems and Soil Resources Institute, College of Agriculture, University of the Philippines, College, Laguna, Philippines 4031.
jnmg@mudspring.uplb.edu.ph

*J. N. M. Garcia has degrees in soil science and agricultural systems and works as a Research Officer in the Farming Systems and Soil Resources Institute at the University of the Philippines at Los Baños. He has been involved for many years in teaching and research on conservation farming throughout the Philippine uplands.*

***Robert V. Gerrits***
3 Nunkeri Court, Forest Glen, Buderim, Queensland 4556, Australia.
rv_gerrits@hotmail.com

*R. V. Gerrits is an agricultural scientist and development consultant who has worked on agricultural research and development projects in the Philippines, Myanmar, Malaysia, and Indonesia. Until recently, he was Technical Advisor with CARE Indonesia.*

***Robert A. Cramb***
School of Natural and Rural Systems Management, University of Queensland, Brisbane, Queensland 4072, Australia.
r.cramb@mailbox.uq.edu.au

*R. A. Cramb is Reader in Agricultural Development at the University of Queensland, Australia. His teaching and research interests center on agricultural development and land resource management in the uplands of Southeast Asia.*

## FURTHER READING

***Cramb RA, editor.*** 2000. *Soil Conservation Technologies for Smallholder Farming Systems in the Philippine Uplands: A Socio-Economic Evaluation.* Australian Centre for International Agricultural Research [ACIAR] Monograph 78. Canberra: ACIAR.

***Gerrits RV, Garcia JNM, Cramb RA.*** 1997. *Hedgerow Adoption in the Hinterland of Cebu City. A Reconnaissance Survey*. SEARCA-UQ Uplands Research Project, Working Paper 20. Los Baños, Laguna, Philippines: SEAMEO Regional Center for Graduate Study and Research in Agriculture.