HARVESTABLE HEDGEROWS ENCOURAGE EROSION CHANGE

The farmer cooperators greatly value the innovation of varied and mixed planting on their plots. Traditionally, monocropping has been practised on individual farm plots.

A cooperator-farmer and some of his sons working on one of the 'improved farming practice' farms.
A farmer-friendly approach to conservation agriculture is helping villagers on the Philippines island of Bohol reduce soil erosion and increase incomes.

**BY ROBIN TAYLOR**

Income-earning crops such as pineapple and bananas are being grown in hedgerows adjacent to the main crops—such as cassava and corn—as a creative form of ‘money-making erosion control’ in the mountainous interior of Bohol Island in the Philippines.

It is hoped that the use of plants, which can generate extra income as well as stabilise the landscape, will be a decisive factor in the island’s farmers embracing conservation farming techniques that are being demonstrated in an ACIAR-supported project.

The project—‘Evaluation and adoption of improved farming practices on soil and water resources’—is in line with ACIAR’s Philippines program on farmer-based land and water resource management for profitable and sustainable agriculture. It is an important component of a cluster of projects managed by Dr Gamini Keerthisinghe, from ACIAR’s Soil Management and Crop Nutrition Program, which are specifically focused on increasing agricultural productivity on fragile sloping lands.

The demonstration of improved ways to both farm and stabilise the landscape follows earlier ACIAR work that mapped out the extent of the land degradation and the poverty it has inflicted in the island’s hinterland.

The Australian leader of the initial and follow-up projects, Professor John Bavor from the University of Western Sydney, says the task was to identify the main factors contributing to land degradation, and then to work with local farmers to determine alternative practices that will improve their landscape and their economic circumstances.

“A key objective of the project is to quantify, demonstrate and provide examples to farmers of the farm-level economic benefits that can be realised by implementing selected best management practices for soil, water and crop management in affected areas,” he says.

Professor Bavor says most of the damage was being done by up-and-down cultivation on slopes, continuous planting of nutrient-depleting crops such as corn and cassava, and extensive cultivation of steep upland soils.

**CASE STUDY: Early adopter breaks debt shackle**

Alberto Tado is a farmer participating in ACIAR’s project site in Sierra Bullones, within Bohol’s Inabanga watershed. The municipality has about 4,800 households and about 5,000 people engaged in farming.

Before the project started Mr Tado’s annual income from rice, eggplant, squash, cowpeas and melon, on about 0.5 hectares, was 16,000 Philippine pesos (PhP) (about A$500).

His farm was selected as an ACIAR project demonstration site to improve its productivity and soil conditions. Mr Tado is managing the site for the project, adopting best farming practices for crop, soil and water management. For comparison, farmer participants at other unimproved sites use only traditional farming and land-management practices.

Mr Tado has received onsite training in soil and water conservation technologies, soil analysis, farm journal planning and farm record keeping. Advice has also been provided on how to broaden his cropping options, such as with other vegetables.

The Philippines Bureau of Soils and Water Management, the International Centre for Research in Agroforestry and local government bodies have also introduced alternative income-raising activities utilising food-processing techniques, accelerated compost preparation, vermicomposting and vermiculture. These new initiatives have been introduced through meetings and hands-on training workshops with the local community.

In the first cropping season, from January to August 2008, Mr Tado planted eggplant, squash, sweet pepper, mango and cowpeas. After just his first harvest his commitment to the project was rewarded. The income from his eggplant crop alone was PhP 31,000 (A$1,000), which gave him the opportunity to free his coconut plantation from debt. This was a significant achievement as the family plantation had been in debt for years.

As well as the income from his vegetable crops, Mr Tado anticipates an additional income from pineapples planted in hedgerows, which will be harvested in two years. His experience has served as an impressive model for other farmers.
ACIAR’s research program manager for soil management and crop nutrition, Dr Gamini Keerthisinghe, says entrenched practices such as this require a flexible approach to resolve the problem in a way that encourages farmer involvement.

“There is no standard recipe for making farming sustainable on marginal lands. We have to look at what the current practices are and what sort of management practices best suited to the local conditions we can introduce to optimise the efficient use of available resources to increase productivity,” Dr Keerthisinghe says.

“It is important that intensification of agricultural productivity does not come at the expense of degradation of natural resources. However, one of the challenges is to identify practices that conserve the resources and provide additional farmer income.

“Introducing cash crops as hedgerows to minimise soil erosion and increase overall farm productivity is one example,” he says.

In the case of Bohol, high rainfall (2,000 millimetres a year) on steep slopes has created chronic erosion, removing topsoil that was rich in crop nutrients and organic matter. This has resulted in low farm productivity and income.

Shifting cultivation—a farming system where farmers move on from one place to another to continue cultivating the land—has created chronic erosion, removing topsoil that was rich in crop nutrients and organic matter.

One such initiative—the ‘Improving the utilisation of water and soil resources for tree crop production in coastal areas of Vietnam and New South Wales’ project—has been running for three years and is due for completion in 2010.

Leading the project in Vietnam is Dr Hoang Minh Tam, director of the Agricultural Science Institute of Vietnam’s South Central Coast, who is working with Australian project leader Dr Peter Slavich, of the NSW Department of Primary Industries (DPI).

Dr Tam says the region is the poorest in the country due to the severely dry climate and low-fertility soils. “Most rain falls over three or four months of the year and, during this wet season, can cause flooding and erosion,” he says. “In the dry season agriculture is highly dependent on irrigation, which is often in short supply.”

Tree crops, such as cashew and mango intercropped with peanuts and cassava, are common and are mostly irrigated with long hand-held hoses. Cashews are also grown in areas where irrigation water is not available.

Most farmers use animal manures for fertiliser and in some cases might use inorganic fertilisers for higher-value crops.

Since ACIAR prefers to work in close consultation with farmers and farmer groups, the ACIAR team surveyed 150 farmers from the Ninh Thuan and Binh Dinh provinces about their farming practices. Dr Tam says the survey shows that when it comes to managing natural resources, the farmers have little understanding of crop requirements for nutrients and water, so resource-use efficiency is often low.

He provides the examples of farmers growing high-value crops, such as grapes, who tend to over-fertilise and over-irrigate. This is contaminating groundwater with nitrogen.
another when the land becomes exhausted—is not a viable option for farmers in this region, mainly due to scarcity of land. Thus farmers are forced to continuously crop the same land, further aggravating the process of soil degradation.

The lateral hedgerows may bring back some stability to the island’s farming.

Project leader in the Philippines, Dr Gina Nilo of the Philippines Bureau of Soils and Water Management, says the active participation of local farmers has been encouraged through the establishment of long-term field trials and demonstration sites. She says the demonstration sites using soil traps have clearly shown how much soil could be saved using hedgerows on sloping lands.

“This illustrates the magnitude of the soil erosion,” Dr Keerthisinghe says. “Seeing is believing and farmers are now working together to preserve the land for themselves and for future generations.”

Professor Bavor says corn, cassava and vegetables are minor crops compared with rice but could be much stronger economically if it was not for their link with erosion. “So what we are proposing is that by progressively adopting good farming practices that are suitable for these crops in this landscape, the farmers will be able to minimise soil and nutrient losses and produce an economically and environmentally viable crop.”

The project team has carried out baseline and end-of-cropping-season surveys to quantify productivity of crops, input costs, marketable yields, market prices and overall economic returns on all farms within the improved and unimproved sites. The farmer cooperators and the project team have collected case study data, which is being used to guide the team in future cropping periods.

The plight of Bohol Island’s upland farmers contrasts starkly with coastal communities where tourism is a substantial industry. Away from the coastal strip, agriculture is the main source of income for about 1.14 million people.

In some areas. Also farmers often dig wells and water the crop whenever they think it is necessary, without considering saving water.

By bringing a variety of scientific skills to bear on the problems facing farmers the ACIAR team was able to identify more profitable and sustainable uses of available resources.

Dr Slavich thinks the sandy soils close to the coast should be used for dryland agriculture because adequate water resources for irrigation are not available. In some of these coastal areas, aquifers are already showing signs of seawater intrusion caused by over-extraction, he says. However, in areas further inland, where access to groundwater and streams improves, the scientists think there is potential to increase yields using irrigation and fertiliser.

Irrigation trials that exploit alternative water-management practices on cashew, mango, groundnut and grape in Binh Dinh and Ninh Thuan provinces show significant potential to improve crop yields compared with traditional practices.

“Although cashews grow well on sandy soils, yields could be increased with inputs of fertiliser and irrigation from the current 600–700 kilograms per hectare for these ‘wild’ cashews to 2.5–3 tonnes,” Dr Slavich says.

Dr Tam also hopes the project will improve the efficiency of water and nutrient uptake on sandy soil. “It is especially important to reduce nutrient leaching and excessive use of our very limited water resource,” he says.

“An important outcome of the project will be changing farmers’ perceptions about irrigation. By using drip irrigation instead of flooding we can save water, which allows us to expand production while ensuring high yield and efficient production. It may also mean we can develop strategic irrigation in areas currently not irrigated to lift yields and improve reliability,” Dr Tam says.

The Vietnamese team is now working with International Development Enterprises, a non-government organisation (NGO) that is developing an affordable drip irrigation system for farmers. The NSW DPI’s Richard Swinton, another team member, says this system has been used successfully in Africa and other Asian countries.

Using similar equipment to that under trial in Vietnam, an irrigation experiment is also being established on a blueberry orchard at Alstonville, in northern NSW, to evaluate partial irrigation strategies. This site also serves as a training facility for visiting Vietnamese scientists.

NSW DPI team members have developed and delivered irrigation and nutrient management courses to 30 Vietnamese researchers, extension officers and some NGO staff. These courses covered a broad range of issues including soil and soil water characteristics, plant water requirements and scheduling, nutrient balances and managing locally appropriate irrigation systems to efficiently meet crop needs.

Dr Keerthisinghe says this Vietnam project is typical of the ACIAR approach: “When we look at constraints to agricultural production, ACIAR likes to work within a holistic understanding of the farming system. To address the needs of the farmers often we need a multidisciplinary approach that engages skills which cut across the production chain, including markets, to deal with broader questions with system-level complexities.”

--- ROBIN TAYLOR