From sugarcane monoculture to agro-ecological village

Lindsey Mulkins and colleagues

The island of Negros is known as the sugar basket of the Philippines. More than half of the available agricultural land in the lowlands is devoted to sugarcane cultivation. The social and ecological problems associated with monoculture sugarcane production pervade the island. Negros became infamous in the 1980s when the collapse of the sugar industry led to the starvation of thousands of sugar workers and their families. Today, much of the landscape of Negros remains in monoculture sugarcane production under the control of wealthy plantation owners known as *hacienderos*. Many landless labourers continue to toil in the cane fields for 1.50-2 US$/day and are locked into a cycle of poverty, indebtedness and physically gruelling work.

For some of the sugar land communities of Negros, however, there is a positive transformation underway. One such community is the Flora community near Kabankalan in southern Negros Occidental. In 1997, through the Philippine government's Comprehensive Agrarian Land Reform Program (CARP), 76 hacienda workers and their families (approximately 375 people) were awarded an 87 hectare former sugarcane plantation, which they divided into individual farms of 0.82 hectares, and a collective farm of 17.7 hectares.

Photo: REAP-Canada

Conventional sugarcane production in the Flora community is now being transformed into sugar-cane trash farming

The Flora community has since diversified the former hacienda and is following an ecological approach to increase its food self-reliance and make more efficient use of its production capacity. To create a more organised and collective decision making structure, the community has formed a farmers association called PAGLA-UM. The community has also benefited from the presence of a number of organisations specialising in sustainable farming systems research and development. These include PDG, MAPISAN, MASIPAG, REAP-Canada and University of the Philippines in Los Baños, Department of Agronomy.

The Agro-Ecological Village

The Flora community's efforts to create internal food and energy systems are gradually resulting in a more ecological way of living. This approach, which emphasises community self-reliance, is called an 'agro-ecological village'. The general characteristics of agro-ecological villages are outlined and compared to conventional approaches in table 1. The community is using the approach to achieve empowerment, increase financial security, and minimise vulnerability to vagaries in the weather or fluctuations in the market. Sugarcane production has been reduced in scale and ecologised through the implementation of alternative production systems. It still remains a vital crop for the community, providing (outside) income, feed for 145 draught animals and organic matter to maintain soil fertility. In fact, sugarcane's capacity to produce large amounts of biomass for decomposition drives nutrient and organic matter cycles that are critical to the sustainable production of other crops like maize, grain legumes and vegetables.

Modified sugar production

The traditional form of cane production in Negros has led to serious environmental degradation. Sugarcane fields are frequently burned before or after harvest, resulting in reduced soil fertility. Between the early 1970s and 1988, soil organic matter declined by 26% in one of the main cane growing regions of Negros. Reduced soil fertility has led to lower cane yields, and consequently, higher application rates of fertilisers. Current estimates of sugarcane fertilisation levels in the Philippines are 209 kg N / ha, 55 kg $P_2 0_5$ /ha, and 74 kg $K_2 0$ / ha per year. Additionally, cane production in upland areas causes erosion, resulting in the siltation of water bodies. Ground water has also been contaminated by the high application rates of nitrogen fertiliser and persistent herbicides such as *simazine*. Trash burning has reduced biodiversity and is leading to respiratory ailments, eye disease and increased incidence of cancer among the people.

The alternative practice of pre and post harvest trash (crop residue) cane farming is beginning to be implemented in the Flora community. Three months before harvest, dead leaves are manually removed from the cane stalk (detrashed) and left to decompose on the soil. After harvest, the residual sugarcane biomass is maintained on the field. Through the decomposition process, the trash fixes nitrogen and increases soil organic matter content, reducing application rates of nitrogen fertiliser. Trash farming also enhances weed control, preserves soil moisture, minimises erosion, protects canes from lodging during typhoons, and significantly reduces harvesting time.

Trash farming is known to increase sugarcane yields, particularly those of ratoon crops (regrowth of cane after harvest). In Southeast Asia, yields increase on average by 5.8% in the planted crop and 21.1% in the first ratoon crop. Trash farming reduces the yield decline traditionally associated with ratooning, enabling sugarcane to be cropped an additional one to two ratoon cycles before yields become economically non-viable. If practised over a long time scale, sugarcane trash farming in communities such as Flora has the potential to create a positive feedback system where continuous improvements in soil fertility will lead to increased productivity, reduced input requirements and longer ratooning cycles. The Flora farmers are currently using less than half the amount of urea used by conventional sugarcane growers. However, with changing cultural practices, the optimal fertilisation level is yet to be determined.

The main disadvantages of trash farming are an increased risk of fire and higher labour costs. Cane trash is usually piled in alternate rows to minimise fire risks and enable cultivation between every other row. Labour costs of trash farming are offset by reduced input costs and increased cane productivity. Currently, average yields in the community are about 70 tonnes / ha.

Flora's production of rice and maize

The introduction of rice farming is central to the Flora community's move toward food self-reliance, enabling members to satisfy about 75% of their current rice needs with 3.8 ha of rice. The farmers have successfully implemented an organic rice farming system developed by MASIPAG (see ILEIA Newsletter Vol.14 3&4, p.47), the national ecological farmers' association in the Philippines. The MASIPAG programme emphasises the use of locally adapted varieties of rice selected under organic production systems, facilitating the management of rice without the use of synthetic fertilisers, herbicides or pesticides. Similar to sugarcane trash farming, Flora farmers maintain soil fertility in the rice paddies by mulching the rice straw back into the paddies after harvest. Whereas 90% of rice straw in the Philippines is burned, the mulching system has enabled the commu-

nity to completely eliminate burning and inorganic fertiliser inputs, as the rice straw fixes nitrogen during decomposition. More nitrogen is provided by azolla, a nitrogen-fixing aquatic plant that grows during and after the rice harvest. Recycled rice hull ash from household cooking and mud press from sugarcane processing are also added to the paddies to maintain fertility.

In the MASIPAG system, the rice is transplanted in rows 30 cm apart. Farmers plough the ground deeply to help the rice crop form deep roots to improve nutrient uptake. Disease pressure is minimised by maintaining low plant density, wide row spacing, and planting disease and pest resistant rice varieties. Fields are planted in an east-west orientation to facilitate air movement through the paddies and minimise crop shading. A MASIPAG trial farm of up to 50 rice cultivars is maintained by the community each cropping season.

In Negros, the most serious pest problems of rice are black bug and golden snail. Black bug is managed by manipulating water levels at critical periods of rice development. Golden snail populations are controlled by maintaining low water levels after transplanting. They are also lured away from the rice seedlings by supplying taro leaves, a preferred food of the golden snail, for a period of 25 days after transplanting.

The Flora farmers intercrop glutinous and sweet maize with the sugarcane crop for home consumption and fresh market sale. To minimise competition effects, maize is harvested after 60 days and is only planted in alternate rows of cane. The community is currently testing alternative cropping systems for more ecological maize production, including intercropping white grain maize, pigeon peas and squash or sweet potato.

Vegetable Production

The Flora community grows a wide variety of vegetable crops for home consumption and fresh market sale, including eggplant (12 ha), squash (5 ha), daikon radish (2 ha), bitter gourd and peppers. The large production of vegetables not only serves the farmers by improving their diets and income levels but also increases the supply and affordability of vegetables in local markets.

Of all the crops grown in the community, vegetables are sprayed with the most pesticides. The farmers' lack of experience with larger scale vegetable production and the absence of locally adapted seeds have prevented the fully organic production of vegetables. Farmers are intensively experimenting with new vegetable varieties and alternative pest controls.

Social and Ecological Implications

Through modified sugarcane cultivation and crop diversification, the Flora Community is enhancing the quality of life of its residents, while reducing the environmental impact. The health of the community has improved as the people have secured a reliable and diverse source of food. The new approach has resulted in a system of labour that better matches the working capacity of the community. Since cane detrashing usually occurs during the rainy season when labour demand is low, it enables farmers to divide work throughout the year. Unlike sugarcane monocultures, the community's diversified agricultural production offers many more opportunities for the involvement of women in all aspects of food cultivation, including cane detrashing, seed collection, planting, marketing and value-added processing.

Photo: REAP-Canada

Sugarcane trash farming

In Negros, men and women who were once marginalised are becoming full participants in the region's economy. Rising income levels amongst the rural poor increase demand for basic consumer goods, and higher education for children. The combination of agrarian land reform and the ecologisation of monoculture production systems in Negros thus appear to have the potential to create socio-economic benefits beyond those at the farm production level. Although the Flora agro-ecological village is still evolving, it already seems to provide a promising model as a development strategy for communities dependent on monoculture agriculture systems. ■

Table 1. An agroecological approach to rural development in the Philippines

Activity	Agroecological system	Conventional approach
Approach	• Emphasises self-reliance and empowerment through optimal use of on-farm resources • Orientates market development towards import displacement • Minimises human impact on local environment and biosphere	• Emphasises development of export markets to pay for imported goods • Communities are vulnerable to external forces and loan-dependent • Degrades local natural resources and biosphere
Food Supply	• Internal and plant-based, on-farm production of seasonal vegetables, rice, corn, fruit, fish and eggs	• Much food imported, including rice, canned and dried fish, processed foods, livestock feeds
Soil tillage and on-farm hauling	• Carabaos (water buffalo)	• Tractors
Seeds	• Community seed banking of open pollinated seeds, new seeds assessed in trial farms, farmer driven participatory plant improvement	• No local adaptation trials, plant improvement or seed saving. Imported hybrid seeds dominate plantings
Soil Fertility	• Maintained through trash farming, nitrogen fixing legumes, azolla, mudpress, carabao dung, rice hull ash. Soil erosion minimised.	• Urea, phosphorus and potassium fertiliser
Insect and disease control	• Biological control strategies, resistant cultivars, balanced fertility	• Insecticides and fungicides
Weed control	• Mechanical weeding devices, crop rotation, good soil fertility management, trash farming	• Herbicides and tillage
Household cooking	• Use of rice hull cookers, efficient wood stoves, biogas, with all fuels farm-derived	• LPG fuel stove, open fire cooking, kerosene as fire starter
Marketing	• Emphasis of internal self-reliance and import displacement with value-added processing	• Monoculture production, products sold to distant markets

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