R.E.A.P – Canada Newsletter
December 2000

Resource Efficient Agricultural Production
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Dear REAP-Canada Supporter

As winter descends upon us and the New Year approaches, it offers a moment to consider the struggles and achievements of the past year. Here at REAP-Canada, it has been a successful year, a year in which we have worked hard to promote ecological agricultural and energy systems, a year in which we have made a concerted push for *real* sustainable development, in both our domestic and our international programs.

To continue this successful route, REAP is making some changes to prepare for the future. Roger Samson, REAP's executive director for the past 11 years, is stepping down from his position so that he can direct his energies towards international development as REAP's international program coordinator. In January, Rupert Jannasch, a member of REAP's board of directors, will take up the executive director position. Rupert has a wide range of experience in the sustainable agriculture sector. For the past 3 years, Rupert has been a researcher at the Nova Scotia Agricultural College where he has investigated ecological pasture management. He has practical farming experience, research and extension experience, and is an active participant in Canada's organic farming movement.

Another change taking place at REAP is in our outreach publication. For the past two years we have been co-contributors with the Canadian Organic Growers (COG) in producing the journal, Eco Farm and Garden. This upcoming year, we will discontinue our association with Eco Farm and Garden in order to pursue a more focused dialogue with our membership and those with a specific interest in REAP's research. In the upcoming year, members will receive a biannual newsletter that will provide updates on REAP's programs. In addition to the newsletter, we will direct more energy into our website (www.reap.ca), so members can better access reports, articles, and pictures. If you to continue receiving Eco Farm and Garden you can join COG directly or contact us and we will make the arrangements.

Report on Biomass Research Program

For 10 years, REAP-Canada has been investigating the potential of switchgrass as a bio-energy crop that can replace fossil fuels. The recent price hikes in heating and transportation fuels has energized the search for competitively priced, locally produced, and environmentally friendly energy sources. Research by REAP will provide the breakthrough that biomass crops need to enter into the energy marketplace in a meaningful way.

Some of our most exciting work this year has been:

- Working in partnership with Eastern Ontario farmers and IOGEN Corporation to grow 300 acres of switchgrass for a cellulosic ethanol plant in Gloucester, Ontario. An increase in acreage is planned for next year

- Commercially pelleting of switchgrass at the Belcan pellet plant in St. Marthe, Quebec.

We are extremely excited about the potential of using switchgrass fuel pellets for space heating applications. Our research indicates that fuel bills in homes heated with switchgrass pellets could be a third less than in those homes using fuel oil and natural gas. REAP staff presented their findings in October at the Bioenergy 2000 conference in Buffalo, NY. The paper describing the potential for this technology is available on our web site (www.reap.ca).

Figure 1 – IOGEN founder Patrick Foody Sr. stands in front of a healthy switchgrass field destined for ethanol production. The Iogen plant will be the in the world to convert switchgrass to ethanol.

The next stage in our bioenergy program is to actually begin a switchgrass pellet heating demonstration project that proves the feasibility of this system in a commercial setting. With our partners, the University of Guelph's Alfred College, we are beginning a conversion of the space and water heating system to switchgrass pellets. The system will be established at the college, with the dual purpose of reducing hefty heating bills and educating the farming community. Successful operation of such a system could be a valuable tool to promote bioenergy concepts to the regions farmers and to policy makers in Ottawa.

Report on International Programming

This year has seen a real consolidation of our international programming in the Philippines. Our CIDA (Canadian International Development Agency) sponsored program, the Southern Negros Sustainable Agriculture Demonstration Project, first established in 1998 has borne good fruit. This program has allowed us to contribute to the improvement of the lives of poor farming families. Farmers have been encouraged and empowered to diversify their crops, implement organic farming techniques and promote biodiversity through seed saving. In general, the communities we work with are improving lives lwhile restoring health to their local agro-ecosystems. The project has become a stepping stone for further interventions in the region. Next year, along with our Southern partner NGO, PDG (Peace and Development Group), we will be implementing projects that will introduce improved biomass cookers to communities, as well as train farmers in ecological sugarcane production. These projects are supported through CIDA's Climate Change Strategy program to reduce greenhouse gas emissions.

To work on these projects, REAP is fortunate to have two CIDA-sponsored youth interns, Lindsey Mulkins and Trevor Helwig, stationed in the Philippines since September. These two are making a tremendous to see that REAP's programming gets carried out. Some of REAP's contributions to agricultural sustainability in the Philippines will be presented in the next issue of LEISA (Low External Input and Sustainable Agriculture. We are please to reprint this article written by REAP staff with support from our Filipino partners. We would also like to recognize the generous donation of $10,000 from *the Cardinal Leger and His Endeavours Foundation* in Montreal for the contribution to

our international work.

From sugarcane monoculture to agro-ecological village
The Flora community in transition

By Lindsey Mulkins, Roger Samson, Louie Amongo, Emmanual Yap, Teodoro Mendoza and Ben Ramos

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 are pervasive on 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 USD/day and are locked into a cycle of poverty, indebtedness and physically grueling 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. The CARP land transfer and community organizing was facilitated by the Paghida et sa Kauswagan Development Group (PDG).

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 emphasizes community self-reliance, is called an 'agro-ecological village' (Samson et al., 2000). 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 minimize 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.

Table 1. An agro-ecological approach to rural development in the Philippines

Activity	Agro-ecological system	Conventional approach
Approach	Emphasizes self-reliance and empowerment through optimal use of on-farm resources Orientates market development towards import displacement Minimizes human impact on local environment and biosphere	Emphasizes 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 minimized.	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

Modified sugar production

Traditionally, 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 (Alaban et al., 1990). 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 P205 /ha, and 74 kg K20 / 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, harming populations of snakes, wildcats and ground nesting birds. Finally, air quality deteriorates with burning, leading to respiratory ailments, eye disease and increased incidence of cancer among sugar workers.

The alternative cane farming practice of pre and post harvest trash (crop residue) 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, residual sugarcane biomass is again 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, minimizes erosion, protects canes from lodging during typhoons, and significantly reduces harvesting time.

Figure 2 – Sugarcane trash lying between rows builds up organic matter in soil and reduces fertilizer input requirements

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 plant crop (initial cane planting) and 21.1% in the first ratoon crop (Mendoza et al al., 2000). 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 practiced 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 urea fertilizer of conventional sugarcane growers in the lowlands of Negros. However, with changing cultural practices, the optimal fertilisation level is yet to be determined. Other factors being investigated are to assess self detrashing and conventional cane cultivars under low input trash farming management and to harvest field residues following the final ratoon crop as a biofuel.

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 minimize 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 a central part of 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 LEISA Newsletter Vol.14 3&4, p.47), the national ecological farmers association in the Philippines. The MASIPAG program emphasizes 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 community to completely eliminate burning and inorganic fertiliser inputs, as the rice straw fixes nitrogen during decomposition.

Further 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 30 cm rows. 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 minimize 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 for 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 minimize 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 (harvested after 90 days) with pigeon peas (180-250 days) and a ground covering species such as squash (120-150 days) or sweet potato (120-150 days). Binary mixes such as maize and peanuts are also cultivated.

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 farmer's lack of experience with larger scale vegetable production and absence of locally adapted seeds have prevented the fully organic production of vegetables. Cultural control approaches are being implemented to minimize pesticide use in eggplant and bitter gourd production. Presently, the main pest challenges are the eggplant stem borer and armyworm and aphids in the brassica crops. Farmers are intensively experimenting with new vegetable varieties, trap cropping and physical pest controls.

Figure 3 – Diversification into vegetable production, such as the green chilies that this woman is holding, improves diet and increases income levels.

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 their 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. Additionally, relative to 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. The community's approach also reduces greenhouse gas emissions through the elimination of crop residue burning and minimized reliance on fossil fuels.In Negros, men and women that were traditionally 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 appears 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.

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This article will be published in IIEIA in their upcoming issue. For more information of ILEIA you can contact at http://www.oneworld.org/ileia. The information in this article is based on the report "Towards an Agro-Ecological Village at the Flora Community," which is available on the REAP-Canada website at www.reap.ca

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Fundraising Petition

Dear friend of REAP,

In order to qualify for CIDA funds for its international projects, REAP needs to generate 25% of the total project costs in cash contributions. We are asking you to help us by generously supporting our Philippine program. Consider REAP-directed development projects as aid money with a difference. Every dollar you donate will be spent directly on programs that empower subsistence farm families to generate long-term solutions to their food, fuel and fibre needs. Your contribution will assist communities emerge from a state of poverty and environmental degradation into self-contained settlements where healthful food, clean water and economic and social stability allow human dignity to flourish. If you support the work REAP is conducting in communities like Flora, then please make a contribution this holiday season. Thank you.

I wish to make a charitable donation:

$ amount

(a receipt for income tax purposes will be issued for all donations over $20.00)

Make all cheques payable to “REAP-Canada” and send to:

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