THE SOUTHERN NEGROS SUSTAINABLE AGRICULTURE DEMONSTRATION PROJECT
Phase II
2000-2001

A Project Partnership of
"PAGHIDA-ET SA KAUSWAGAN" DEVELOPMENT GROUP (PDG) Inc.
RESOURCE EFFICIENT AGRICULTURAL PRODUCTION (REAP) - Canada;

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The Environment Program of the Partnership Branch of the
CANADIAN INTERNATIONAL DEVELOPMENT AGENCY (CIDA)

and

The Jules and Paul-Émile Léger Foundation

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1. Project Participants

Paghida-et sa Kauswagan Development Group (PDG) was established in 1987 in Kabankalan, Negros Occidental, Philippines to empower rural communities to sustain their own initiatives and meet their basic needs and aspirations, to protect and rehabilitate ecosystems, and to work toward a just and sustainable future through social transformation. The organization is currently involved in agrarian reform issues, promoting organically-based sustainable agriculture, strengthening the institutions of people`s organizations, and supporting environmental protection and mining issues. PDG began working with REAP-Canada in 1998 with the aim of expanding their sustainable agriculture outreach in Negros.
PDG, Kabankalan Catholic College Compound, City of Kabankalan, Negros Occidental, Philippines pdg@knet.com.ph, tel and fax (63)(034) 471-2573

Resource Efficient Agricultural Production-Canada (REAP-Canada) is an independent research and development organization based in Ste. Anne de Bellevue, Quebec. Since 1986, REAP-Canada has been working with farmers in Canada and internationally to develop sustainable farming systems. Since 1991, the organization has been developing agri-fibre and bioenergy systems in response to increasing concerns about deforestation and global climate change. REAP-Canada was awarded the International Environment Award at the 1999 CIDA awards banquet for excellence in programming in the Canadian Environmental Network International Program theme of Climate Change.
REAP-Canada, Box 125 Ste. Anne de Bellevue, Quebec, H9X 3V9,
REAP@Interlink.net, www.reap.ca, Tel. (514) 398-7743 Fax (514) 398-7972

Collaborating Agencies

MASIPAG is a farmer-led network of farmer's organizations and local communities, representing more than 30,000 farmers in the Philippines. MASIPAG aims to empower and improve the quality of life of resource-poor farmers by helping them regain control over seeds and agricultural production systems. MASIPAG assists in conference organizing and farmer training components of the project.

MAPISAN is a federation of farmers groups in Southern Negros that consists of 13 farmer associations representing more than 5000 farmers. MAPISAN's main objective is the promotion of organically based sustainable agriculture. The MAPISAN farmer trainer network assists with the various farmer trainings conducted in the project and resource person works for the cropping systems diversification trial farms.

Dr Teodoro Mendoza of the Department of Agronomy at University of the Philippines at Los Banos provides technical support to the project in terms of the cropping systems development and training of farmers in sugar cane production.

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1.0 Review of Project goals, objectives and components

1.1 Local context/needs analysis

In the mid-1980s, the island of Negros, Philippines became infamous in Southeast Asia due to the collapse of the sugar industry and consequential food crisis. Many aid organizations were created in Negros during this time, primarily in the northern section. Paghida-et sa Kauswagan Development Group (PDG) was one of the few organizations to become established in the south. Today, with the signing of a peace accord and the advent of agrarian land reform, peasant farmers are accessing land throughout Negros, and there is unprecedented interest in agricultural diversification and ecological farming methods in the region.

The environmental quality of Southern Negros remains in a long-term trend of deterioration and is a major factor contributing to chronic poverty problems. The growing population is placing tremendous pressure on the region's diminishing natural resources. The secondary forests are being heavily denuded both by charcoal producers and upland farmers for land clearing, with the island experiencing 95% deforestation. Without significant forest cover, typhoons and El Nino events can cause serious environmental damage in the region. The fisheries are being degraded as a result of mangrove clearing, cyanide and dynamite fishing, pollution from mining activities, siltation and over-fishing. Deterioration of the forest and marine resources places additional pressure on agriculture to support the economic, nutritional and energy requirements of the rural population.

The agricultural situation in Southern Negros also continues to be critical. Severe soil erosion is occurring on upland farms and soil organic matter is declining due to crop residue burning. Input-intensive farming practices make small farmers loan-dependent and vulnerable to vagaries of the weather and market. For both ecological and economic purposes there is a great need to develop more resource efficient farming systems in the region.

Primarily, there remains a chronic need to diversify farming in Southern Negros. In the lowland areas of Negros more than half of the available agricultural land is planted to sugar cane, which is grown using conventional farming methods Including high inputs of fossil fuels and synthetic pesticides and fertilizers. Additionally, conventional sugar cane production offers very limited employment opportunities for women, as the work is male-dominated. Diversified farming systems in the region would increase food security for families and offer significantly more opportunities for the full participation of women in all aspects of food production from planting to marketing to value-added processing. Farm diversification will facilitate the achievement of equitable social and economic progress in Southern Negros.

Fig.1: Locations of MAPISAN farmer federations in Negros

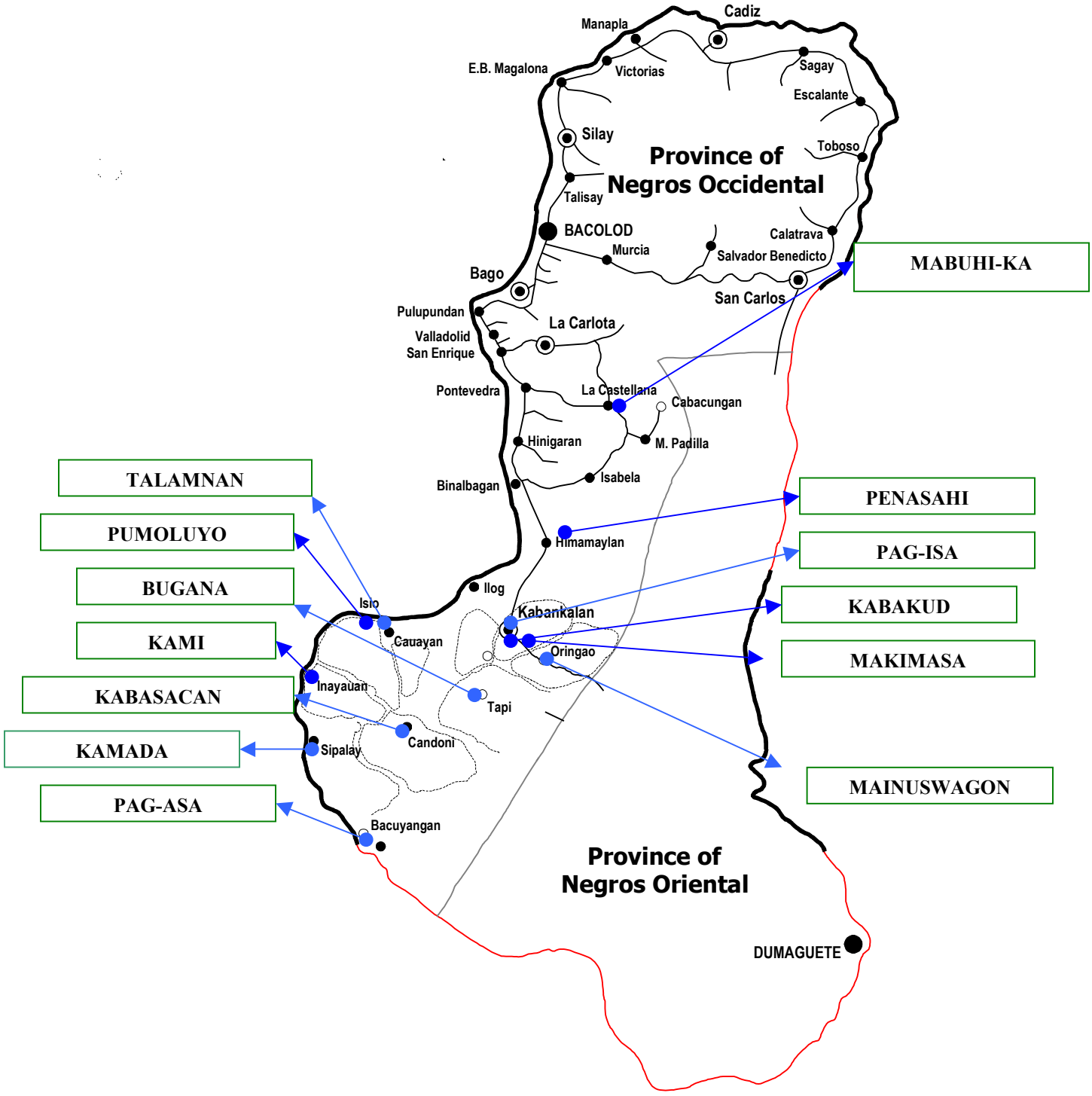
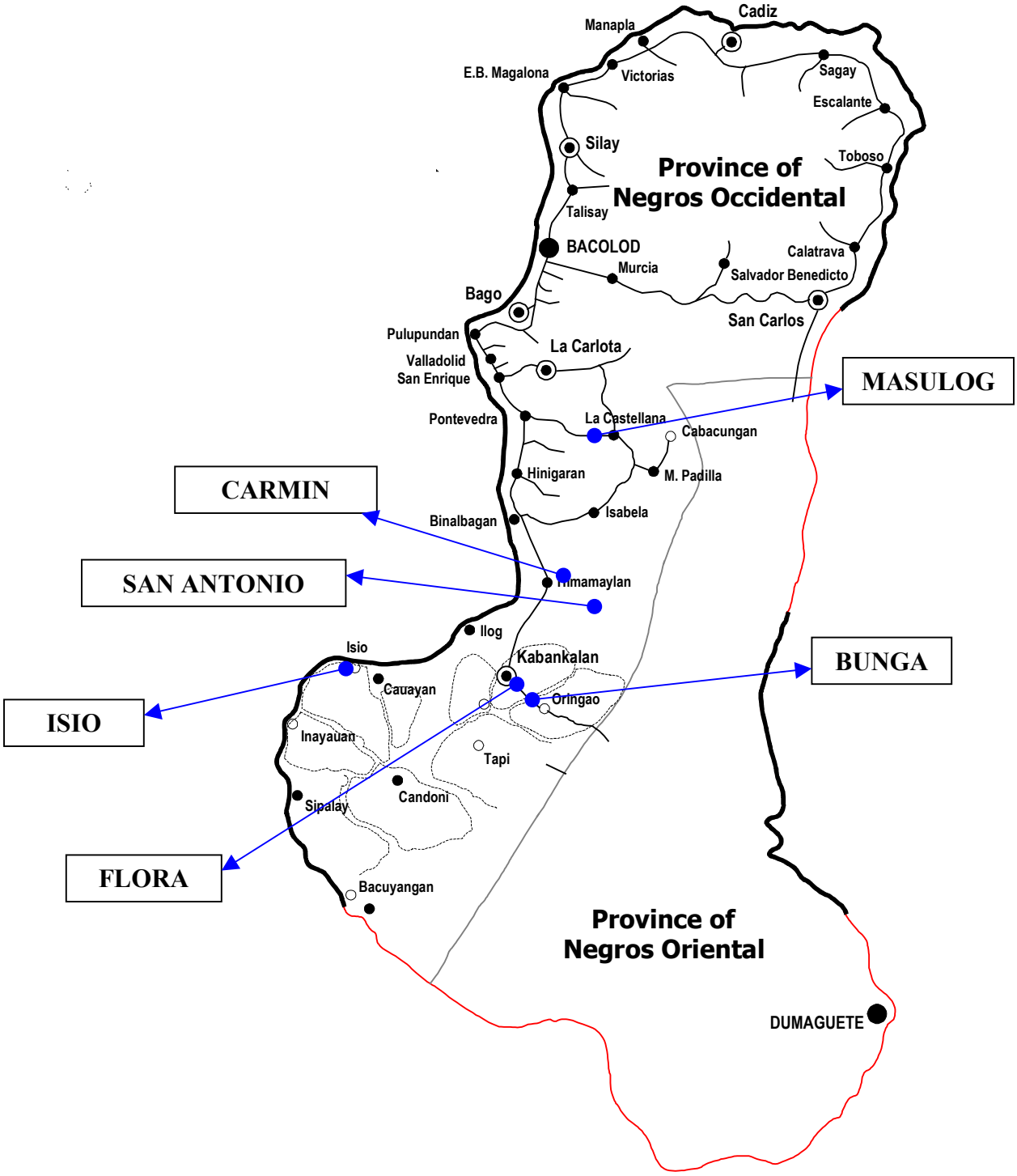


Fig.2: Locations of project demonstration sites



1.2 Project Objectives

The following objectives were stated for the current funding year:

1) Evaluation, development and demonstration of cropping system diversification in Negros through:

a. Establishment of 4 trial farms demonstrating ecological sugar cane production through trash farming
b. Establishment of 4 trial farms demonstrating corn production through intercropping
c. Development of diversification trial farms in 6 agrarian reform communities, each assessing 10 varieties of vegetables and grain legumes

2) Improved farmer outreach by means of:

a. Training 600 farmers on sustainable agricultural practices
b. Developing 2 female farmer trainers
c. Creating 2 new farming modules.

1.3. Project engagement

The Southern Negros Sustainable Agriculture Development project engages farmers and communities in the principle sugar-growing region of the Philippines. The project directly involves the communities of Flora, Carmin, Isio, Bunga and Bajay, located near the city of Kabankalan, Negros Occidental. The upland communities of Masulog and San Antonio also participate in the project. Additionally, many small farmers who are not located in these communities are involved in the project through farmer trainings on sustainable farming systems.

2.0. Project Outcomes

2.1. Creating more ecological farming systems through crop diversification

2.1a. Sugarcane trash farming demonstration plots

Sugar cane dominates the lowlands of Southern Negros, and has had widely recognized ecological, social and economic impacts on the region. Conventional sugar cane production requires significant inputs of fertilizer and herbicides (especially simazine) and these agri-chemicals can contaminate rural drinking water. Additionally, conventionally grown sugar cane creates a monoculture landscape that reduces biodiversity. This problem is exacerbated after harvest, when large amounts of residue produced by the crop are generally burned in the field, killing animals such as snakes, wildcats and ground-nesting birds. Increased rat populations have resulted from the loss of these predators.

Residue burning also increases atmospheric pollution and causes respiratory problems for people in nearby communities. Furthermore, residue burning is the primary cause of declining soil fertility in the sugarlands of Negros.

Nonetheless, sugar cane production does have economic benefits. From the small farmers' perspective, sugar cane is an important income source as the crop grows well in the lowlands of southern Negros. Also, the Philippine government supports the price of sugar, making it one of the most cost competitive major crops to grow in the region.

Through the use of more ecological production systems, cost reductions in growing cane can be achieved, while preserving the local environment and improving soil fertility. To enhance sugar cane soil fertility management, a continuous residue farming system known as trash farming is being encouraged in Southern Negros. This system has two components. First, during pre-harvest detrashing, the lower cane leaves are removed 3 months before harvest and left to decompose in the field. This practice reduces the amount of labor required for harvest while improving soil quality and providing weed control. Second, during post-harvest detrashing, residual material (trash) is left in the field after harvest instead of being burned. The trash is typically broken down within 3 to 4 months, further contributing organic matter to the soil.

Through trash farming, sugar cane could sustain soil fertility and enable diversified farming of annual grain crops and vegetables without an overall depletion in soil fertility. Research in sugar cane production systems has shown that trash farming can minimize nitrogen fertilizer requirements, as significant nitrogen fixation occurs during cane trash decomposition (Mendoza et al., 2000). Additionally, decomposing cane residue contributes nitrogen-rich organic matter to the soil, and cane plants develop more extensive rooting systems that enable them to access these nutrients. The elimination of residue burning through trash farming also helps to maintain soil fertility by preventing the oxidization of nutrients to the atmosphere, while maintaining soil nutrient conditions that are less favorable to weed growth. Trash farming further inhibits weeds as the decomposing residue provides a physical barrier to growth. Damage to preharvest detrashed cane from rats is limited as it is more difficult for the animals to climb the bare stalks. Lodging of this cane is also uncommon as reduced leaf canopy makes plants less susceptible to severe weather. With fewer leaves, the volume of cane residue left after harvest is greatly reduced, thus simplifying trash management.

To encourage the adoption of trash farming in Southern Negros, 22.5 hectares of demonstration sites have been established in the communities of Flora, San Antonio, Bajay, Isio and Masulog of 1, 3, 2.5, 8 and 8 hectares, respectively. Flora, San Antonio, Bajay and Isio practice pre-harvest detrashing, while Masulog practices post-harvest detrashing. Communities involved in the trash farming are observing improved cane production, reduced costs of production and a reduced need for weeding. Those that practice pre-harvest detrashing note

a decreased amount of labor required at harvest and a reduction in crop lodging and rat damage to the cane.

Efforts are being made to spread the practice of trash farming throughout the region. A farmer training on ecological sugar cane management in December, 2000 exposed 17 farmers from 13 communities to trash farming and some are now in the process of adopting the practice. Signs posted near trial farms increase the visibility of the sites and serve as another means of farmer education.

The success of the trash farming demonstration sites in this project is the partial basis for a larger REAP-PDG project funded by CIDA and initiated in March 2001. A central goal of this new project is to encourage the widespread practice of sugar cane trash farming throughout southern Negros. A detailed analysis of greenhouse gas emission reductions will be made for this project.

2.1b. Corn intercropping demonstration plots

Increased corn production in Southern Negros could help diversify the landscape away from sugarcane, while providing farmers with an alternative food and income source. Currently, some communities are growing glutinous and sweet corn for home consumption and market sale. Corn is a desirable crop as it is easy to maintain, with minimal requirements for pesticides and water. Additionally, since it is harvested every two months, it provides farmers with a more continuous source of income relative to sugarcane, which is generally harvested only once a year. Successful intercropping of corn would make the crop even more attractive as only one land preparation would be required for the production of multiple crops and the potential for pest problems within all intercropped species would be reduced. Also, a benefit from a specific crop, such as nitrogen fixation, can be translated to other intercropped species, thus improving overall production.

To explore methods of intercropped corn production, it was proposed to create four demonstration sites intercropping corn with an understory of squash, to preserve soil moisture and minimize soil erosion, and pigeon pea, to act as a nitrogen fixing overstory species during the dry season. The system was designed to maximize the use of solar radiation and water resources throughout the growing season, and was developed in cooperation with farmer trainers in 1999.

To investigate this cropping system, one 0.12 hectare demonstration site was established in Flora, and two demonstration sites (one individually and one communally managed) were established in Bunga, of 0.15 and 0.20 hectares, respectively. A problem with pigeon pea seed quality occurred which impacted the success of the demonstration. Poor seed quality is a common problem in the tropics due to the detrimental impact of high temperature and humidity on seed germination. No substitute seed could be sourced and the fourth site was not

established because of the low germination of the original pigeon pea seed supply. The pigeon pea needs to be planted prior to the month of September for the plant to be sufficiently well developed prior to the onset of flowering in the dry season. Later planting of seed in the year would only result in vegetative growth until the next season.

At the three lowland sites where it was established farmers found the combination of corn/squash/pigeon pea a difficult system to implement. Since pigeon pea is a small tree, it interferes with plowing after the crop completes its growth cycle. Some growers also found that pigeon peas are not a good source of income, especially on the lowland soils around Kabankalan. It was concluded that the original system of squash, pigeon pea and corn is likely most appropriate for food insecure farmers living on marginal upland farms where soil erosion is more problematic. In future programming activities in upland communities, this system will be revisited.

The results of the demo trials on the lowlands indicates that farmers are in need of other higher value corn intercropping systems. The most promising that was identified was a corn/tomato intercropping system. Based on a technology used in Cuba, three rows of tomatoes are planted between two rows of corn, with corn sown 30 days after the tomatoes are transplanted. This arrangement provides ideal growing conditions for tomatoes in terms of reduced temperature and solar radiation and has proven to minimize pest pressure on the tomatoes and improve fruit quality. This intercropping combination is particularly favorable as it enables farmers to plant tomatoes before and after the optimal sowing period, enabling off-season marketing (de los Angeles Pino and Rios Labrada, 2000). Tomatoes are an attractive crop in Southern Negros as they have a high market value and are desired for home consumption (some farmers in Negros are already intercropping tomato in sugar cane). With the arrival of the rainy season (Late April/early May), corn/tomato intercropping trials will be implemented at the three demonstration sites in Flora and Bunga. High levels of pesticide application are commonly associated with field production of tomatoes in Negros for both disease and insect control.

Despite difficulties in establishing corn intercropping demonstration sites, farmers in several communities have had promising intercropping results on their individual farms. In the Flora community, farmers have successfully intercropped 0.2 hectares of sweet corn with squash and 0.15 hectares of glutinous corn with squash, although farmers found these combinations require large spacings. Additionally, farmers in Masulog have met positive results by intercropping corn and peanuts. It is evident that corn intercropping systems are required to provide greater sustainability to corn based production systems in the tropics. It is a high priority area for development in the Philippines as the systems can provide high levels of food production while requiring much less water than rice based food production systems.

2.1c. Vegetable and grain legume diversification trial farms

Vegetable and grain legume cultivation has the potential to significantly increase the food self-reliance of Southern Negros farmers. Additionally, as one of the few income opportunities that can match sugarcane production, increased vegetable cultivation could greatly improve farmers' financial security.

To encourage the diversification of farming systems in Southern Negros, the original aim of this project was to establish trial farms in six communities, each testing 10 varieties of vegetable and grain legumes. This system was modeled after the MASIPAG rice system, whereby rice cultivars are tested and selected according to local adaptability in communal farms. Mid-way through the current year, however, this portion of the project was reassessed. It was determined that the demonstration farms were not the ideal method of promoting crop diversification in communities. Several reasons for this discrepancy were noted. First, the maintenance of communal vegetable trials requires considerable labor from multiple community members, with at times little payback for individual farmers. Vegetables, unlike rice, are generally grown on individual farms (typically of 1-1.5 ha), not on communal lands of agrarian reform communities (typically 4-10 ha). Second, communal trials are not always responsive to the range of vegetable growing experience that can be present within a single community. Thus, these trials can force less experienced farmers to be immediately exposed to more difficult-to-grow vegetables instead of basic vegetables (Table 1). Likewise, they can restrict experienced farmers from developing expertise in the production of specific crops or experimenting with new cropping techniques, such as in the Flora community, where most farmers are skilled vegetable growers. Third, since communal trials require significant coordination of farmers' efforts, organizational difficulties can interfere with the maintenance of communal trial farms, such as occurred in the community of Carmin.

Table 1. Southern Negros vegetables rated according to degree of difficulty of cultivation

Easy	**Moderately difficult**	**Difficult**
Kamote	Eggplant	Onions
Okra	Squash	Garlic
Kang kong	Radish	Watermelon
Gabi	Peppers	Tomatoes
Bush sitao	Pole sitao	Pechay
Mung beans	Bitter gourd	Carrots
Cassava	Cucumber	Cabbage
Pigeon Pea		Potato
Peanuts		

Through discussions with staff at PDG and community members, it was determined that most farmers prefer individual vegetable and grain legume trial farms because of their small scale and the opportunities they provide for innovation and control over individual production systems. Still, some communities continue to favor the communal trial farms. Based on these findings, it was decided that for the remainder of the project, support of communal farms would be maintained while the adoption of individual farms would be encouraged through the transfer of seeds and information. This approach was undertaken during the last three months of the reporting period. Currently, a total of 6 communities maintain communal and/or individual vegetable and grain legume trial farms (Table 2).

Table 2. Vegetable and grain legumes planted in six southern Negros communities (C=communal trial farm, I=individual trial farm)

	Carmin	**Masulog**	**San Antonio**	**Flora**	**Bunga**	**Isio**
1.	Okra: I	Tomatoes: C, I	Eggplant:C	Tomato: I	Mung beans: C	Bush Sitao: C
2.	Pole Sitao:I	Bell pepper: C, I	Okra: C	Bell pepper: I	Okra: C	Pole Sitao: C
3.	Mung beans:I	Bitter gourd: C, I	Bell pepper: C, I	Bitter gourd: I	Pole sitao: C	Okra: C
4.		Mung beans: C	Bitter gourd: C, I	Mung bean: I	Gabi:C	Pechay: C
5.		Okra:C, I	Mung beans: C	Okra: I	Eggplant:C	Carrots: C
6.		Eggplant: C	Pole sitao: I	Pole sitao: I	Sweet potato:C	Repillo: C
7.		Pole sitao: I	Bush sitao: I	Squash: C	Papaya:C	Bell Pepper: C
8.		Cabbage: I	Black beans: I	Pigeon Pea:C	Bush sitao:C	Tomato: C
9.		Pak choy: I	Pechay: I	Pechay: I	Cassava:C	Bitter Gourd: C
10.		Pechay: I	Tomato: I	Radish: I		Plamunnok : C
11.		Bush sitao: I		Hot Pepper:I		Pak Choy: C
12.		Onion: I				Black beans: C
13.						Onion: C
15.						Squash: C
16.						Eggplant: C
17.						Sweet Pepper: C

Farmers were encouraged to maintain the trial farms with minimal inputs of fossil fuels, synthetic pesticides and fertilizers to reduce financial burdens and environmental damage. In particular, natural methods of pest management and weed control are encouraged (appendix 1)

The communities that did not produce the target number of ten varieties of vegetables and grain legumes (Carmin, Bunga) were inhibited by a variety of factors. Fear of theft stopped some farmers from planting sought-after vegetables, while others struggled with poor seed quality resulting from the humid and hot climate. Organizational problems in Carmin was the main factor limiting the success of the trial at this site. A similar experience occurred in the previous year when the Bino community chose only to plant the easiest seeds to grow that were provided. In Flora, Bunga, and Masulog many farmers are now becoming skilled vegetable growers. Some farmers now view the communal trial farms as tedious and unnecessary at this stage of their development. At the Flora community in the last two years new vegetable crops for commercial sale that have been developed include bitter gourd (1/4ha), pole sitao(1/2ha), pechay (.1ha), bell and hot pepper (1ha), sweet potato (.15ha), watermelon (.2ha), tomatoes (.1ha). Peanuts are now also grown on 1ha. All these crops were previously grown in the Flora community trial farm in the exploratory and first project year.

In addition to trial farms, significant numbers of farmers in southern Negros communities are growing vegetables on their individual farms (table 3). Many of these vegetables are for market sale, the most popular of which are eggplant, squash, radish, bell pepper, tomato, bitter gourd, pole sitao and pechay. At the trial farm stage, effort is made to support the production of these crops through seed distribution and sharing of farmer knowledge.

Table 3. Vegetable production among southern Negros farmers

Name of Farming Community	Number of farmers that are members of farmer's organization	Number of these farmers that are growing vegetables
Flora	75	62
Masulog	37	28
Bunga	30	25
Bino	52	15
San Antonio	17	17
Isio (Pumoluyo Federation)	900	187

Although the promotion of individual trial farms appears to be the most effective way to encourage vegetable and grain legume diversification, this approach provides less opportunity for inexperienced vegetable growers to be mentored by

those with more experience. Without the guidance and confidence building provided by a communal trial, new agrarian land reform beneficiaries may hesitate to grow vegetables at all. They should begin with the easiest ones to help in this process (Table1). More farmer-to-farmer trainings on sustainable vegetable production, and an emphasis on cross-site visits, are also important factors helping build capacity and need to be further strengthened in future programming. In some communities, certain farmers have developed expertise around the production of crops like tomatoes and eggplant, and could become important resource people or sources of seeds for less-experienced farmers.
Efforts are being made during seed distribution to encourage farmer testing of particular kinds of vegetables and grain legumes to further their improvement.

Overall after two years of experience the communal demonstration of vegetables appears to be a useful approach for helping new agrarian reform communities gain some confidence and experience in vegetable production. However the new vegetable crops tested and production systems utilized must ultimately be assessed and further improved on an individual farm basis. The SNSADP project helps support this activity not only through the trial farm demos but through trainings, production and purchase of reference materials, and through small tool production (such as rakes, hoes and other weeding devices). PDG staff also is supporting many of these communities through its institution building processes for new communities.

The overall goal of the vegetable trial farm component of the project is to make a wider supply of locally produced, pesticide free vegetables available for home consumption and commercial sale in Negros markets using locally adapted and maintained seeds. From an environmental perspective this reduces exposure to pesticides (encouraging human health and biodiversity) and minimizes use of fossil based energy inputs in the food production and distribution system.

2.2. Farmer outreach

2.2.a. Farmer to farmer trainings

To facilitate the spread of information about sustainable agriculture, trainings and conferences for 1007 individuals were organized during the current reporting period. Training workshops, attended by 791 people, were conducted by farmer trainers and covered topics including Basic Orientation to Sustainable Agriculture, Organic Fertilizer Production, Diversified Integrated Farming Systems Trainings, the MASIPAG rice production system, and Sustainable Agriculture Trainer's Trainings (table 4). Two conferences, the Sustainable Agriculture MAPISAN conference and the Southern Negros Environment and Mining conference, were attended by 216 people and were organized to share information about agricultural and environmental issues that are affecting farmers. In total, 751 males and 256 females attended the trainings and conferences, representing a 25% participation of women.

Transportation in southern Negros can be expensive or inadequate, thereby preventing some farmers from attending trainings. To mitigate this problem, phase two of this project supported the modification of a truck into a passenger vehicle to be used for trainee transport.

Table 4. Farmer trainings and conferences conducted between April 2000 and March, 2001

	Training Title	Organization	Participants			Date
			Male	Female	Total	
1	MASIPAG level 2	BUENAVISTA SMALL FARMERS ASSOCIATION	23	16	39	May 23-25, 2000
2	SA Trainer's Training	MAPISAN	15	7	22	June 18-20, 2000
3	Basic Orientation on SA	MAPISAN	27	4	31	July 25-27, 2000
4	Diversified Integrated Farming Systems Training	PUMOLUYO	43	19	62	July 14-17, 2000
5	Trainer's Training 2	MAPISAN	24	4	28	August 15-17, 2000
6	Basic Orientation on SA	TALAMNAN	17	5	22	Sept. 21-23, 2000
7	Basic Orientation on SA	PAG-ISA	35	8	43	Sept. 18-19, 2000
8	Basic Orientation on SA	BUGANA	22	9	31	Oct. 3-5, 2000
9	Basic Orientation on SA	MAINUSWAGON	17	5	22	Oct. 4-6, 2000
10	Basic Orientation on SA	KABAKUD	26	12	38	Oct. 5-7, 2000
11	Basic Orientation on SA	PAG-ASA	20	7	27	Oct. 18-19, 2000
12	Basic Orientation on SA	MABUHI-KA	19	4	23	Oct. 25-27, 2000
13	Basic Orientation on SA	KABASACAN	27	11	38	Oct. 24-26, 2000
14	Organic Fertilizer Production	MAPISAN	13	2	15	Oct. 19-21, 2000
15	Cross-farm visit	KAMADA	26	5	31	Nov. 16-18, 2000
16	Cross-farm visit	KABAKUD	21	7	28	Nov. 17-19,2000
17	Cross-farm visit	ABRAMS	42	13	55	Nov. 19-21, 2000
18	Cross-farm visit	BUGANA	22	7	29	Nov. 19-21, 2000
19	Cross-farm visit	KAMI	14	8	22	Nov. 21-23, 2000
20	Cross-farm visit	PENASAHI	23	6	29	Nov.22-24, 2000
21	Sugar land Community Development	MAPISAN	15	2	17	Dec. 1-3, 2000
22	Basic Orientation	TALAMNAN	18	4	22	Dec. 22-24, 2000

	on SA					
23	Basic Orientation on SA	KABASACAN	24	9	33	Dec. 26-28, 2000
24	Basic Orientation on SA	KAMADA	26	11	37	Dec. 15-17, 2000
25	Organic crop inspection and certification	MAPISAN	12	1	13	Jan. 1-3, 2001
26	Basic Orientation on SA	KABAKUD	26	8	34	Jan. 24-26, 2001
	TRAINING TOTAL		597	194	791	
	Conference Title	**Organization**	**Participants**			**Date**
			Male	**Female**	**Total**	
1	Sustainable Agriculture MAPISAN Conference	MAPISAN	71	30	101	May 22-24, 2000
2	Environment & Mining Conference	MAPISAN	83	32	115	Oct. 15-17, 2000
	CONFERENCE TOTAL		154	62	216	
	GRAND TOTAL		751	256	1007	

Training Descriptions:

1. *Basic Training on Sustainable Agriculture (SA) or MASIPAG Level 1*

This initial training level presents the need for sustainable agriculture in the context of the prevailing national and local situation in agriculture. It also introduces the MASIPAG Program, the trial farm as a strategy towards SA and monitoring and evaluation methods of on-farm research.

2. *MASIPAG Level 2*

This training delves deeper into the issues and problems brought about by the Green Revolution. It also tackles soil problems, examining soil as the basic medium for plant growth. Diversified, integrated farming systems, alternative pest management, rice breeding and seed technologies are also discussed.

3. *Diversified, Integrated Farming Systems (DIFS)*

The DIFS training exposes participants to methods of diversified farming (vegetable production, livestock production, fish farming, traditional tree growing) and farm planning.

4. *Trainer's training*

This training prepares farmers to in turn give trainings on various subjects.

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5. *Organic fertilizer production*

This training gives participants a better understanding of on-farm organic fertilizer production such as vermicomposting.

6. *Cross-Farm Visits*
Cross-farm visits allow farmer groups interested in sustainable agriculture to visit farms of SA adopters and to share their experiences with other farmers' groups. The preparation of the subject farm for the visit is a collective activity as the hosting farmers' organization shares responsibility for the work.

7. *Sugar land Community Development*
This training introduces farmers to ecological sugar cane production systems, including sugar cane detrashing, within the context of a diversified landscape.

8. *Organic crop inspection and certification*
This training prepares farmers to produce, certify and market certified organic crops and livestock.

Conference Descriptions

1. Sustainable Agriculture MAPISAN Conference
This conference enabled farmers in the MAPISAN alliance to unite and share information about sustainable farming. Farmers also discussed strategies to improve the structure and function of the MAPISAN farmer's alliance.

2. *Environment and Mining Conference*
This conference united farmers from all over southern Negros to discuss the impacts of mining and environmental destruction on their livelihood. Strategies were developed to deal with these problems.

2.2.b. Development of female farmer trainers

Eleven females attended farmer trainer's training workshops during the most recent reporting period, and four have since become farmer trainers. This is viewed as a significant achievement by project staff and MAPISAN organizers as it will likely facilitate further involvement of women in the farmer trainings and empower them to practice sustainable agriculture on their own farms.

2.2.c. Evaluation of farmer trainings

In response to a need to more thoroughly measure the long-term application of knowledge acquired in farmer trainings, an evaluation system was developed during the last two months of programming. Initial training evaluations were conducted through communication of the PDG training coordinator staff person with farmer trainers, who are responsible for maintaining contact with trainees after trainings. As shown in table 5, farmer application of training lessons appears high over the long term.

Table 5. Evaluation of long-term application of skills and knowledge gained in four types of farmer trainings

Training Title	Major Topics	% Appli-cation of new skills	Level of application	Problem(s) encountered
Diversified Integrated Farming Systems (DIFS) 23 participants	Alternative pest management Bio-fertilizer production Soil & water Conservation & Management	65%	Adoption of: -organic rice farming -contour farming -varietal diversity (integration of rice, livestock, vegetable)	-No follow-through intervention at the farm level -difficulty of establishing contours
Trainer's Training 27 participants	MASIPAG Farming system Facilitating skills Qualities of a good trainer Rice breeding Alternative pest management	100%	-Provision of facilitation support -Participation as resource speakers on specific topics	
Basic Training on SA (MASIPAG Level 1) 120 participants	MASIPAG orientation MASIPAG Cultural practices Trial farm establishment	75%	-Adoption of LEISA (low external input sustainable agriculture) establishment of a trial/verification farm -adoption of contouring and varietal integration (rice, vegetables, fruit trees) -adoption of crop rotation and inter-cropping -adoption of semi-organic systems in vegetable production adoption of full organic systems on communal farms	-problems of sustaining adoption especially when the wife/husband is not resolved to adopt. -Recommendation: husband & wife should be encouraged to attend the training together
MASIPAG Level 2 75 participants	Philippine state of agriculture MASIPAG Farming system Soils fertility management Rice breeding	100%	-50 are adopting full organic rice farming -25 are adopting LEISA (low external input) establishment of vermi-compost	-insufficient supply of seeds

2.2.d. Development of farmer training manuals

The project supported the production of two farmer-training modules that will be used to assist the farmer training programs. The first module reviews ecological cultural practices for sugar cane production and is based on production guidelines developed for the 'Sugarland Community Development' training provided in December by Dr. Teodoro Mendoza of the University of the Philippines at Los Banos. Dr. Mendoza is currently finalizing the manual, which will be available for widespread distribution for the "Conservation and Utilization of Crop Residues in the Philippines as a greenhouse gas abatement strategy". The second manual focuses on seed conservation and community seed banking

and is the second edition of an older, less comprehensive manual. Additional drawings in the current version should make the Tagalog manual user friendly for Illongo speaking farmers. It has been completed and is being reviewed prior to final distribution. A draft version of the manual will be available at a National Seed Congress being held in the Visayas in April 2001, PDG and MAPISAN are hosting two of the field study tours for the 120 congress delegates.
congress. Production of the manual was headed by Dr. Pamela Fernandez of the University of the Philippines at Los Banos.

3.0 Appropriate Technology Manufacture and Distribution

Manufacture of appropriate low-cost equipment was carried out throughout this funding year, building on last years` initial production of sustainable farming tools and technologies. PDG has a small machine shop that has been underutilized, and the local manufacture of appropriate tools for sustainable agriculture provides them with another source of income while facilitating the spread ecological farming. The tools manufacturing activity is providing employment and skill development, as laborers from the communities are being trained to do the fabrication. Proceeds from the sale of the equipment are revolved back to the MAPISAN Appropriate Technology Fund, which was established in April 2000 through the existing REAP-PDG CIDA funding partnership. The concept of this fund is to make small revolving loans permanently available to the 5000 farmers in the MAPISAN alliance. High loan repayment levels are anticipated from the farmers as the loan fund is locally controlled and designed to support farmers within the MAPISAN Alliance.

In support of the crop diversification and farmer training initiatives on sustainable agriculture, appropriate low cost equipment was identified that could be either purchased or manufactured locally. Some of the items were basic farm tools identified by the farmers as necessary to make their farming system development more effective. The majority of effort, however, was placed on creating sustainable cooking technologies. Watersheds in the region are being degraded by overharvesting of wood fuels for charcoal and firewood use which is resulting in major water shed management problems and increased soil erosion. Rising fossil fuel prices in the past year are increasing popularity of traditional wood fuels hence the need for the development of sustainable cooking technologies.

The small tools and equipment manufactured this year included:

Rice Hull Cookers:
This year saw the continued production of the L-T 2000 stove, a convenient and fast cooking multi-fuel stove capable of efficiently burning underutilized residues such as rice hulls, sawdust, coconut husks and corn cobs. The stove is an environmentally and economically attractive option for rural cooking requirements. Currently, many households rely on unsustainable wood sources as well as kerosene and charcoal to meet their cooking requirements. The use of

these fuels is both environmentally damaging but also very expensive, with the cost of purchased firewood and kerosene for firestarting amounting to approximately 3000 pesos per year (approximately 10% of an average household's income). In contrast, fuels used in the L-T 2000 stove are either free or extremely low cost, and many are found on the farm as crop residues. As the primary fuel gatherers and fuel users in households, women in particular are in a position to benefit from the stove. Over the programming year 100 stoves were built and more than 75 have been put into use. Success of this portion of the project forms the partial basis of the Philippine Agricultural Climate Change project funded by CIDA and initiated in March 2001 by REAP and PDG. In this project, the large scale manufacture and distribution of 9000 LT-2000 stoves in Negros and the nearby island of Panay is seen as an effective way to mitigate greenhouse gas emissions while alleviating rural poverty and environmental degradation. The cost of production of the stove is 350 pesos (USD $7.00).

Relay Cookers (heat-retaining devices):
Twenty relay cookers were designed and distributed during the current year as a pilot project. These devices were created with the goal of improving cooking convenience and reducing the amount of fuel required to cook slower cooking foods such as rice. The relay cookers are made of used rubber tires that are shaped into flower-pot shaped containers and fitted with bases and lids. Newspaper lines the cylinder to prevent contact with the rubber. When using the relay cooker, rice is cooked as usual in a pot on a stove until it comes to a boil for 10 minutes. After this initial boiling period, the entire pot is transferred to the relay cooker and a properly fitted lid put in place to prevent heat escape. The rubber cooker retains sufficient heat in the pot to finish the cook, and within 20 to 30 minutes, the rice is completely cooked with no risk of burning. This device is attractive because it reduces fuel use for rice cooking while freeing up stove space for other types of cooking and minimizes rice losses due to burning. The cost of a relay cooker suitable for handling a medium sized rice cooking pot (suitable for a family of 6) was only 50 pesos (USD$1). An assessment of the relay cookers distributed is currently underway. Preliminary findings are that the pots are appreciated for their ability to save fuel, and act as a meal warmer for late family comers to the table. However, there have been some concerns about occasional uncooked meals and that a timing device to ensure an adequate initial rice boiling period may be necessary if this is to be avoided.

Biogas Systems
The purpose of the biogas units was to demonstrate to communities the technology to backyard livestock producers and to assess the affordability and utility of such systems for agrarian reform beneficiaries. Of the 8.2 million pigs in the Philippines, it is estimated 85% are raised by small producers. If untreated, manure from livestock can cause water quality problems in surface as well as ground waters. The use of biogas systems allows for the treatment of the waste (destruction of pathogens) allowing the material to be safely used as fertilizer. The biogas produced during decomposition of the waste by methanotropic

bacteria can be used for cooking in modified LPG stoves. Thus the benefits of such systems are threefold:

1. treatment of animal waste leading to improved water quality
2. fertilizer production
3. biogas for cooking

The materials for two tubular polyethylene digestors were purchased from the Bureau of Animal Industry in Manila who are promoting the technology (Moog et al, 1997) and as of April 2001, 99 units had been installed in the Philippines but none in Negros. Of the various systems reviewed, this was found to be the most cost effective in terms of capital investment. The total cost of the BAI kits totaled P2500 (sufficient for 10-15 pigs) with an additional P6000 for the concreting works required during installation. In late March 2001, one unit was installed at a farmer member of the Bakas association near the Kalibutan training center in Originao. The system is undergoing final adjustments to bring it into a functional state. A second site for an installation has been identified in the Pumoluyo Federation.

Small Scythes:
In response to a need for easier vegetable weeding, a long-handled, short-bladed scythe was created and 11 were distributed to farmers as part of a pilot project. This tool was largely created in response to the need for a weeding tool that does not excessively disturb the easily eroded tropical soil, which is highly vulnerable to loss of organic matter in the tropical heat. The small scythe shears weeds just above the soil surface. Farmers leave the weeds to decompose and they act as a mulch, preserving both soil and water and restricting further weed growth. Furthermore, unlike the traditionally used bolo (machete) this weeding tool enables farmers to remain upright while weeding. The small scythe is especially well suited to weeding around newly planted, widely-spaced crops where the soil is flat (unhilled), including squash, eggplant, peppers, bitter gourd and corn.

Rice paddy equipment:
Small-scale production of rice paddy equipment was initiated this year for potential larger production in the future. 5 ‘suyods’ were produced, which are soil movers that can be used to flatten mud in rice paddies prior to planting, as well as 5 ‘pakala’s,’ which are used to soil pulverize and weed grasses in paddys. These tools have recently been distributed to farmers for assessment prior to larger scale production.

Rolling Cono Rice Weeder:
Assembly and distribution of 37 of these devices was completed this year and 50% have been distributed to communities. The cono rice weeders are used in lowland rice fields for weeding between transplanted rows in the MASIPAG rice farming system. The devices are 15 times faster than hand weeding. The conventional rice farming approach is to broadcast seeds and spray with

herbicides, which are a large financial expense for farmers. Furthermore, pesticide spraying exposes farmers directly to the chemicals, as protective clothing is prohibitively expensive.

4.0 Women in Development and Gender Equity

Women's lives have been positively impacted in several ways during the current programming year. The participation of 256 women in this year's farmer trainings and conferences in addition to the development of 4 female trainers facilitates the empowerment and involvement of women in the sustainable agriculture movement. Currently, 11 women are being trained to become training instructors, and it is hoped that their involvement will inspire even more women to attend trainings, become farmer trainers, and ultimately practice sustainable agriculture on their farms.

As mentioned in the previous section, women are also benefiting from the introduction of appropriate technologies like the L-T 2000 stove and the relay cooker. As the primary gatherers of fuel, these technologies reduce the amount of time that women spend in fuel collection. Additionally, women spend less of their day cooking, as both technologies are designed to reduce cooking time.

When the ecological farming techniques demonstrated at the trial level are adopted by individual farming families, they have the potential to positively change the lives of women. The farming woman's traditional role as family caregiver is made easier as crop diversification creates a higher family income. This money can be used to fund children's education, buy food and supplies for the family and carry out household improvements. Diversification also generates a wider variety of nutritious foods for home consumption, contributing to food security and improving the health of women and their families. Finally, farm ecologization improves women's livelihood opportunities. Sugar cane production is traditionally a male-dominated activity that provides only seasonal employment for women in weeding, fertilizing, planting and cane point preparation. The new production technique of continuous detrashing (described in the project outcomes section) can provide additional labour activities for women in terms of pre and post harvest detrashing and residue management. Furthermore, the expanding vegetable, corn and rice production in the communities is creating interesting employment opportunities for women such as vegetable marketing.

Interviews with women in the communities of Flora and Masulog (Box 1) suggest some of the ways women's lives have changed over the course of project implementation. The women generally cited an improved quality of life over past several years, which they attributed to factors such as higher and more stable income levels, more food security and more enjoyable employment opportunities. In general, the women stated that these factors arose from greater empowerment through land ownership and subsequent crop diversification. All of the women

interviewed cited increased income as a major benefit of crop diversification. The majority of the women spent their increased income on children's education and

Box 1. Compilation of data from interviews with women in the Flora and Masulog Communities

When asked what duties they perform around the farm, women replied:

Weeding: 13/14, 93%
Fertilizing: 11/14, 79%
Harvesting: 9/14, 64%
Planting: 7/14, 50%
All duties (no help from husband): 2/14, 14%
Same duties as husband: 4/8, 50%

Of the women interviewed, 10/14 (71%) lived on farms that have undergone diversification (from only sugar cane to sugar cane, corn, rice, vegetables) over the past 3 years:

When asked how farm diversification affects their lives, women responded that:

Diversification increases income levels: 10/10, 100%
Diversification increases the amount of tiring work for women: 3/10, 30%
Diversification increases the amount of enjoyable work for women: 4/10, 40%
Diversification provides families with more healthy food: 3/10, 30%
Diversification provides families with more food security: 3/10, 30%

Of the 10 women who cited improved income levels from diversification,

8 spent the money on their children's education (80%)
6 spent the money on home repairs (60%)
4 spent the money on food (40%)
4 spent the money on farm supplies (40%)
3 spent the money on their family's clothing (30%)
3 spent the money on electricity payments (30%)

Of 7 women asked, 5 felt optimistic about being able to provide for themselves and their families in the future. 2 women did not feel secure about their family's future and cited lack of land as their family's major challenge.

home repairs, although food purchase, farm supplies, clothing and electricity payments were also listed. Another benefit of crop diversification voiced by the women was the empowerment they felt being able to actively participate in the farming, as well as the variety of tasks diversified farming offered. Several interviewed saw farming as an escape from the tedious nature of housework and enjoyed being their "own bosses" while in the field. They felt empowered that they could actively provide for their families. It is difficult to separate the influence of this particular project on women's quality of life from the influence of other factors such as the implementation of agrarian land reform, the independent programming of PDG, and individual initiatives of the farmers themselves. Nonetheless, these interviews suggest that the goals of the current project (crop diversification and farm family empowerment through the spread of sustainable agriculture) are the same ones that lead to improved quality of life for women.

5.0 Environment

The environmental benefits of this project are multiple, though most of them will be only visible long after project completion. Long term environmental benefits include:

- Decreased soil erosion through sugar cane trash farming and other ecological farming practices
- Increased soil nutrient cycling and soil quality from the incorporation of crop residues into the soil
- Reduced requirement for fossil-based energy and chemical inputs
- Improved water and soil quality through reductions in the use of synthetic pesticides
- Restoration of plant and animal biodiversity
- Decreased air pollution due to the reduction in crop residue burning
- Reductions in greenhouse gas emissions through minimized crop residue burning and decreased use of fossil-based energy inputs

One environmental improvement that is currently measurable is the reduction in farmer use of synthetic pesticides. Through informal information sharing and farmer-to-farmer trainings, farmers are being encouraged to explore natural pest control methods (NPCM) to replace widely used synthetic pesticides for vegetables, grain legumes, corn and rice (Table 6). A wide range of such practices are being used, such as:

- Intercropping eggplant with ginger—farmers report the smell of the ginger repels insects
- Using rice hull ash from rice hull fueled stoves as an ant repellent for eggplant
- Covering bitter gourd fruit with plastic bags to act as a physical barrier against sucking insects
- Employing hand-pushed rolling rice weeders for rapid weeding between transplanted rows

Table 6. The degree of infiltration of NPCM in 5 communities

Name of Community	Number of members of farmer's association	Percentage of farmers using NPCM
Flora	75	45%
Masulog	37	50%
Bakas	30	60%
Bino	52	75%
San Antonio	17	75%

in terms of adoption by farmer association members and area of land affected (includes vegetables, grain legumes, corn and rice production

Over the long term, continued practice of natural pest control methods will improve water and soil quality, preserve biodiversity, and protect the health of food producers and consumers.

6.0 Public Engagement

Several events provided public exposure to the project during the current year. A presentation on the implementation of diversified ecological farming and reductions in crop residue burning at the Flora community was presented at two conferences. The first presentation was made at the International Federation of Organic Agriculture Conference in Basel, Switzerland in August entitled "the Flora Community: a developing agro-ecological village in the Philippines that is greenhouse gas friendly". Ben Ramos, the executive director of PDG, also attended the conference with support from a European funding agency. A second presentation on the Flora community was given at the USAID/Philippine government sponsored workshop "Public Policy coordination on biomass for rural development" on Sept 14-15, 2000 in Lapu-lapu city, Cebu, Philippines. This highlighted the community's ecological use of biomass including implementing sugar cane trash farming, non-burning of rice straw and the use of rice hulls a fuel source for the Lo-trau multifuel household cooker. Additionally, an article outlining the sustainable agriculture activities of the Flora community was published in the December 2000 issue of ILEIA newsletter (Appendix 3). Table 7 summarizes these and other forms of extension activities undertaken during this reporting period.

Table 7. Public extension between April 2000 and March 2001

Event	Date	Size of audience
Presentation at the International Federation of Organic Agriculture Conference in Basel, Switzerland	August 2000	40
Presentation at Fallsbrook Centre, Knowlesville, New Brunswick	August 2000	12
USAID/Philippine government sponsored workshop in Cebu, Philippines	September 2000	35
Seminar with McGill University International Development students	September 2000	35
Presentation for the Montreal Field Naturalists	October 2000	25
CIDA Seminar on Agro-ecological villages	November 2000	25
Information at Organic Agriculture Conference in Guelph, Ont.	January 2001	200

7.0. Summary

This project met most of its stated objectives for Phase 2, exceeding most while needing further supplementary work to meet some others in their entirety. The successes of the project provide basis for continued effective programming, while the unmet objectives present lessons through which future programming will be strengthened.

The implementation of sugar cane trash farming demonstration sites was successful, with 5 communities adopting trials and multiple others showing interest in the practice. The success of this aspect of programming has inspired the development of a larger CIDA-funded REAP/PDG project in part focused on the widespread implementation of trash farming.

Although we were unable to successfully meet our target of establishing four corn intercropping trial sites because of seed quality problems with pigeon pea, valuable lessons were gained from the three attempted demonstrations regarding ideal intercropping combinations. The corn, squash and pigeon pea combination was found to be unacceptable for lowland soils but would likely perform better in the upland. For lowland conditions, tomato and corn intercropping appears to be a promising combination that farmers will be testing in the upcoming planting season.

The goal of encouraging farm diversification through the production of vegetable and grain legumes was met, although our realized outputs differ from those expected. In the end, six communities developed vegetable and grain legume trial farms, with three of them growing more varieties than the target of ten, one growing ten, and two growing less than ten. Based on the realization that farm diversification would be most effectively achieved through the encouragement of individual, not communal, trial farms, the thrust of this part of the programming changed during the last half of the year. The region seems well suited to further diversification efforts which will be aided by lessons learned during this year.

The expectation for farmer training attendance was surpassed by over 400 trainees, with an increased involvement of women at the training level. The training intensity increased this year by approximately one third per month compared to the previous years effort (which was based over 15 months). These trainings appear to be an effective way to distribute information about ecological farming and facilitate the building of a sustainable agriculture movement through which farmers can become further empowered. The training process is being further strengthened through the project's support of training manuals on sustainable sugarcane production and seed conservation.

This year's production and distribution of appropriate technologies such as improved cooking systems and ecological farming tools was a large success. In particular, the manufacture of the L-T2000 multifuel stoves and the Relay

cookers help farming families reduce household smoke, cooking time and fuel costs. The popularity of these items in part forms the basis of REAP and PDG's newest CIDA-funded project.

This year of programming directly benefited women in several ways, including increasing their participation in sustainable agriculture farmer trainings, enabling them access to improved cooking systems, and encouraging the development of ecological farming systems that increase family income, health and quality of life and offer a diversity of on-farm employment opportunities.

This programming stands to benefit the environment in multiple significant ways, although many of these, such as improved soil and water quality will likely only be visible beyond the lifespan of the project. One indicator of environmental improvement, the reduced use of synthetic pesticides and fertilizers due to the adoption of natural pest control methods, is measurable over the short term and appears promising.

Public exposure to this project was extensive this year. Through international and domestic presentations and publications, a wide and varied audience was introduced to this project.

Appendix 1. Documented natural pest control strategies in southern Negros communities

VEGETABLES:

1. Eggplant:

    - The major pest problems for eggplant are rats, stem borers and fruit borers.
    - Stalks infested with stem borers are cut off and the insect killed manually in the field. The eggplant will form new shoots around the incision.
    - Fruit infested with fruit borers are removed and fed to pigs and carabao.
    - The yellow lower leaves of eggplant are removed by hand as they are used by insects for egg-laying.
    - Intercropping ginger and eggplant (2 rows of each, alternating) is also being explored as a strategy to repel pests (insects do not like the strong smell of the ginger)

2. Bitter Gourd

    - Plastic bags are secured around each bitter gourd fruit to prevent insect infestation.

3. Radish

    - Radish is a difficult crop to grow without pesticides, mostly due to the silkworm. Some farmers have found that the 'Tagsing' bird is an effective pest control. These birds live near rivers and nest in wild grasses and sometimes sugarcane. Some farmers are also intercropping radish with flowering pak choy to serve as a trap crop for silk worms.

4. Pechay

    - Pechay is most often infested with worms, which farmers manually remove. Some are also experimenting with intercropping pechay with flowering pak choy as a trap crop. 1 row of flowering pak choy is planted between 6 rows of radish.

SWEET AND GLUTINOUS CORN

- A common pest is the corn beetle, which chews off corn silks and results in unsaleable cobs.
- To repel the corn beetle, some farmers walk through the corn fields carrying a piece of burning rubber (a running shoe or tire lit on fire) and the smell repels the corn beetle. This is usually done twice when the corn is silking.

- Another major pest problem for corn is rat infestation. It is common for farmers to avoid damage from rats by detrashing the lowest corn leaves so that rats cannot climb up to the cobs.

RICE

- Rice bugs are a common rice pest, infesting the rice during the milking stage. They can be controlled by posting dead 'American frogs' (an intorduced, invasive species) on sticks throughout the paddies. The insects drink the juice of the frog, and are exposed to a toxin from the frog.
- Other rice bug deterrents are plant-derived. The plant manongall is sometimes mixed with native pepper and tobacco and sprayed on infested paddies. Also, stalks of the grass tagbak can be pushed into the ground near rice paddies to repel rice bugs. Of the bamboo family, bagacki can also be pushed into the ground and its odor will attract rice bugs away from rice crops. Other rice bug repellents include sanig (related to citronella), cosmos and lemongrass
- Some farmers plant gabi near their rice paddies as it is a favored food of the golden kuhol snail.

Sugarcane

- Preharvest sugarcane detrashing has been shown to reduce rat damage because the bare lower stalks are difficult for rats to climb
- Eliminating burning and practicing trash mulching reduces weeds since crop burning rapidly turns over nutrients to stimulate weed growth
- The trash mulch forms a physical barrier that prevents weed growth

Weeding:

- Due to the rapid loss of organic matter and erosion that can be associated with intensive vegetable production, farmers have developed the weeding technique of cutting weeds and maintaining them as a green manure on the surface. This technique also preserves soil moisture.

Various hand-held weeders are being used by farmers. A modified sickle with an extended handle is being used for weeding newly planted vegetables and corn. It works best on land that is flat. The tool has the advantage of being lighter than a bolo (traditional tool) and saves the farmers from bending over for long periods of time.

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Appendix 2: Article appearing in the December 2000 edition of the LEISA (Low External Input Sustainable Agriculture) publication.

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.

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 fertiliser of conventional sugarcane growers in the lowlands of Negros. However, with changing cultural practices, the optimal fertilisation level is yet to be determined. Other assessments currently underway are a comparison of self detrashing and conventional cane cultivars under low input trash farming management, and the potential use of ratoon crop field residues 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.

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.

Lindsey Mulkins and Roger Samson, Resource Efficient Agricultural Production-Canada, Box 125, Ste. Anne de Bellevue, Quebec, Canada, H9X 3V9, reap@interlink.net, www.reap.ca

Louie Amongo and Emmanual Yap, MASIPAG, #3346 Aguila St., Rhoda Subd., bgy. Anos, Los Banos, Laguna 4030, Philippines, masipag@mozcom.com

Teodoro Mendoza, University of the Philippines at Los Banos, Department of Agronomy, Laguna 4031, Philippines, TCM@mudspring.uplb.edu.ph

Ben Ramos, Paghida-et sa Kauswagan Development Group (PDG), Mohon, bgy 1, Kabanakalan City, Negros Occidental, Philippines p_dg@lasaltech.com

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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ANNUEL SUR LES PROGRAMMES-PROJETS / ANNUAL PROGRAM-PROJECT PROGRESS REPORT 2000 - 2001 –
Titre du programme-projet / Program-Project Title: The Southern Negros Sustainable Agriculture Development Project
Direction et Division/ Directon and Division Partnership Branch/ESDP **Agent de l'ACDI / CIDA Officer:** Anu Rao
Partenaire de la DGPC / CPB Partner: Resource Efficient Agricultural Production (REAP)-Canada

PAYS / COUNTR(IES): The Philippines	**PRIORITÉ(S) / PRIORITY(IES):** 40% basic human needs 20% women in development 40% the environment	**Budget total / Total Budget:** *100.000.00* **Contribution de l'ACDI / CIDA's Contribution:***:75%* **Décaissements pour 2000-01 Disbursements:** $75,000 **Décaissements totaux fin 00-01 / Total Disbursements end of 00-01:** $75,000	
DÉBUT / START: March 2000 **FIN / END:** March 2001	**RÉSULTATS D.G. / BRANCH RESULTS:**		
EXPECTED OUTPUTS	**PHASE 1 OUTPUTS**	**ACTUAL OUPUTS PHASE 2**	**VARIANCE**
1. Establishment of 4 sugar cane trash farming trial farms *2.* Establishment of 4 corn intercropping trial farms *3.* Development of 6 diversification trial farms, each assessing 10 varieties of vegetable and grain legumes *4.* Training 600 farmers on sustainable agriculture practices *5.* Developing 2 female farmer trainers *6.* Creating 2 new farming manuals	• Creation of three case studies describing six farming systems • Development of five diversification trial farms testing 25 cropping alternatives • Provision of 21 trainings to 588 farmers and 3 conferences to 633 participants • Provision of sustainable agriculture library material to Negros Occidental Agriculture College	• Establishment of 5 sugar cane trash farming trial farms • Establishment of 3 trials testing corn/squash/pigeon pea intercropping systems • Establishment of vegetable and grain legume trial farms in 6 communities, testing 17, 12, 11,10, 9 and 3 varieties, respectively • Development of 4 female farmer trainers • Provision of 26 trainings to 791 farmers and 2 conferences to 226 participants • Creation of 2 new farming manuals and additional library materials to NOAC	• Poor seed quality, field preparation difficulties, lack of seed adaptation to lowland soils, and low market demand impeded the success of the corn intercropping trials at the lowland sites • Corrective actions include sourcing new pigeon pea seed for the next cropping season and planting pigeon pea, squash and corn in uplands only, planting tomato and corn intercrops in the lowlands • Some lack of adaptability of the communal trial farm system to vegetable production, organizational difficulties and poor seed quality prevented some communities from testing 10 varieties in diversification trials • Need to modify approach to include individual vegetable production trials and encourage networking among farmers to share seeds
Progress Achieved to date (in order listed above): *1.* 100% (exceeded goal by 1.25 X) *2.* 70% *3.* 90% *4.* 100% (exceeded goal by 1.68X) *5.* 100% (exceeded goal by 2 X) 6. 90%			
EXPECTED OUTCOMES	**ACTUAL CUMULATIVE OUTCOMES**		**ÉCARTS / VARIANCE**
1. Adoption of sugar cane trash farming and corn intercropping on individual farms *2.* Production of a diversity of vegetable and grain legumes on individual farms *3.* Application of sustainable agriculture techniques obtained from farmer-to-farmer trainings and farming modules	• Interest in the adoption of sugar cane trash farming expressed by 13 MAPISAN federations, 22.5 ha implemented • Adoption of corn intercropping by individual farmers in two communities • Individual production of vegetables and grain legumes by 334 individual farmers in 6 communities. • Long term evaluation of trainings indicates an 84% adoption rate of new techniques		• Trash farming and corn intercropping are relatively new practices that will gain in popularity as farmers gain confidence and experience in the systems

Progress Achieved to date (in order listed above): *1.* 30% *2.* 50% *3.* 90%			

EXPECTED IMPACT(S)	ACTUAL IMPACT(S)
• Improved food security and higher income levels result in an increased ability of farming families to meet their basic needs and minimize indebtedness • Reduced environmental impacts, including reduced greenhouse gas emissions, improved air, soil and water quality, and preservation of biodiversity through more sustainable farming practices • Farmer empowerment through access to information about sustainable agriculture • Increased participation of women in all parts of farming communities leads to improvements in their quality of life	• Although not apparent in all farming communities, some farm families (particularly those that have had the most successful adoption of practices such as vegetable diversification) have reported a higher degree of food security and increased income levels stemming from sustainable farming techniques • 60% of farmers in 5 communities have adopted natural pest control strategies. Longer term environmental benefits, such as reduced greenhouse gas emissions and the preservation of biodiversity from the elimination of crop residue burning, will likely only be realized after the completion of the project. • Farmer empowerment is currently rising and will likely continue to grow beyond the lifespan of the project as farmers increasingly apply their new knowledge and gain confidence from positive experiences. In the future, farmer empowerment can be measured by the self-sufficiency of farmers and their readiness to investigate new farming practices • The quality of life of women is expected to improve beyond the lifespan of the project as women engage more fully in the sustainable agriculture movement and take advantage of new employment opportunities that result from the project

Cross-cutting Themes	EXPECTED OUTCOMES	ACTUAL OUTCOMES
IFD & ÉG / WID&GE	• Increased participation of women in farming communities, including more on-farm employment opportunities, increased representation within the sustainable agriculture movement, and heightened access to new technologies	• 4 women have become farmer trainers and 11 undergoing trainer training • Interviews with women indicate their involvement in and enjoyment of a wide range of on-farm employment • Women gained access to rice hull cookers and heat retaining devices that reduce cooking time and limit exposure to indoor air pollution
ENVIRONNEMENT / ENVIRONMENT	• Reduced air pollution from crop burning and household cooking • Reduction in the use of synthetic pesticides	• Elimination of crop residue burning on 22.5 hectares of trash farming trial farms and distribution of 70 LT-2000 multifuel cookers and 20 heat retaining devices is decreasing air pollution • The use of natural pest control methods by 60% of farmers in 5 communities is reducing the concentration of synthetic chemicals in the region's land and water
ENGAGEMENT DU PUBLIC / PUBLIC ENGAGEMENT	• Domestic and international public exposures to programming	• Domestic and international presentations and publications inform a large and varied audience of this project

LESSONS LEARNED

The main lessons learned were that effective community organizing and financing needs to be in place prior to adding an additional layer of programming into communities. We propose to integrate these components into subsequent years of CIDA programming to avoid this problem in the future through what we can be termed agro-ecological village development programming where community organizing, ecological farm planning and training, loan support and technical support are fully integrated to facilitate community development. This will fully engage communities in the programming.

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Rating of the program or project: *(The rating provides an overview of the program or project progress and performance to date and should be selected based on the **officer's** understanding of the program or project (and not the partners'.) Use the % of progress in achieving outputs and outcomes and the following scale:*

- *a - project/program is likely to exceed expected results;*
- *b - project is viable and progressing satisfactorily;*
- *c - project has problems that are manageable;*
- *d - project has serious problems requiring major corrective actions and is unlikely to achieve expected results;*
- *e - unable to rate: provide reason e.g. "Too soon to tell".)*

Financial risks: *(As indicated in last FRAU report.)*

Sign off: Officer _____ Director