Management of Soil Erosion Consortium (MSEC): An Innovative Approach to Sustainable Land Management in the Philippines

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Introduction

There have been several erosion studies conducted around the world to address the alarming concern on the loss of soil and natural resources degradation. However, most of those researches are conducted in a plot scale, while only a few addressed the problem on a catchment scale. This has led the then International Board for Soil Research and Management (IBSRAM) to establish the Management of Soil Erosion Consortium (MSEC) as one program under the Soil, Water and Nutrient Management (SWNM) initiative of the Consultative Group on International Agricultural Research (CGIAR). The MSEC methodology is anchored on the innovative research paradigm based on a participatory and interdisciplinary catchment scale approach. In late 1998, the consortium started the project "Catchment Approach to Managing Soil Erosion in Asia". It was implemented in six Asian countries, including the Philippines, with support from the Asian Development Bank (ADB). This phase was completed in December 2002.

The International Water Management Institute (IWMI) continued to support the project in 2003 in partnership with local R&D coordinating agencies in Indonesia, Laos, Philippines, Thailand, and Vietnam. In the Philippines, the project focused on the following objectives:

1. To enhance data management to facilitate exchange and sharing of information among MSEC member countries and other interested users;
2. To continue to:
    a. Quantify and evaluate the biophysical and environmental factors affecting soil erosion.
    b. Generate reliable information and scientifically-based guidelines for the improvement of catchment management for soil erosion control.
3. To conduct more in-depth analysis, assessment and synthesis of data collected during Phase I and have a better understanding of the biophysical and socioeconomic processes and their interactions at the catchment level;
4. To enhance the complementation between the ASIALAND sloping lands and MSEC projects for a more integrated and comprehensive approach to minimizing/controlling soil erosion and increasing land productivity.

This report presents the highlights of the 2003 activities and outputs of the project in relation to research, information dissemination, capacity building, linkages and other related activities.

Activities and Methodology

In relation to these objectives, the activities in 2003 were concentrated on the following:

1. Analysis and assessment of rainfall, runoff and soil loss

2. Evaluation of on-site effects of erosion
3. Monitoring and analysis of land use and socioeconomic changes.
4. Development, dissemination and advocacy of information, education and communication materials on MSEC.
5. Institutionalization and linkages with other agencies and institutions.
6. Formulation and advocacy of relevant policies at the municipal level.
7. Monitoring and assessment of catchment management intervention
8. Enhancement of MSEC Philippines project information database

The methodology for data collection and analysis followed the same procedure employed in the previous years (Ilao *et al*, 2002). However, because of some problems in instrumentation, data collection and monitoring was not done in all microcatchments and for all parameters. Monitoring and analysis of land use changes and socio-economic data were done twice in 2003, in March and December. A ground survey was conducted to gather the changes in land use in the Mapawa catchment.

Likewise, in 2003, MSEC Philippines implemented a complementation scheme proposed in 2002 with the IWMI-ASL Project. This was done by adopting a common site, the Bgy. Maria Paz, Tanauan City, and implementing joint complementary activities.

Results and Discussion

Maintenance of Project Site

In 2003, repair and rehabilitation/improvement of the main weir (Figure 1) and the AMS were undertaken to improve data collection and interpretation. Also, strengthening of the structure is needed as some defects/leakages were detected in the main weir. With regard to the AMS, the Project Team was able to coordinate and solicit support from the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) to repair and improve the operation of the said instrumentation. Thus, data collection for the temperature and relative humidity was put to order including the recalibration of the different sensors installed in the AMS.

Figure 1. Repair and rehabilitation of the main weir

Rainfall and Runoff

Rainfall occurs all throughout the year in the MSEC catchment of Mapawa. It increases in the months of April and May and declines in October or November (Table 1 and Figure 2). The driest month monitored during the last four years is April of 2002, with rainfall of only 41 mm, and the wettest is in the month of June of the same year with 548 mm of rain.

The rainfall in 2003 was higher than in the previous years and consequently higher than the average for four years of observation (Figure 3). However, there was no rain observed in the months of January and February which is similar to that observed in 2000.

Table 1. Monthly rainfall in the MSEC catchment from 2000 to 2003

Month	Year				
	2000	**2001**	**2002**	**2003**	**Average**
January	0.0	113.3	166.3	0.0	**69.9**
February	0.0	164.5	70.8	0.0	**58.8**
March	265.9	171.6	110.2	137.5	**171.3**
April	370.9	215.9	40.6	101.5	**182.2**
May	452.7	346.6	165.3	365.4	**332.5**
June	449.8	226.6	548.3	320.3	**386.3**
July	180.7	335.7	89.4	430.7	**259.1**
August	371.1	211.0	329.4	381.3	**323.2**
September	144.4	328.4	189.6	522.0	**296.1**
October	341.0	318.8	349.7	439.7	**362.3**
November	186.9	325.6	137.4	190.2	**210.0**
December	143.6	148.4	148.1	280.1	**180.1**
Total	**2907.0**	**2906.4**	**2345.1**	**3168.7**	**2831.8**

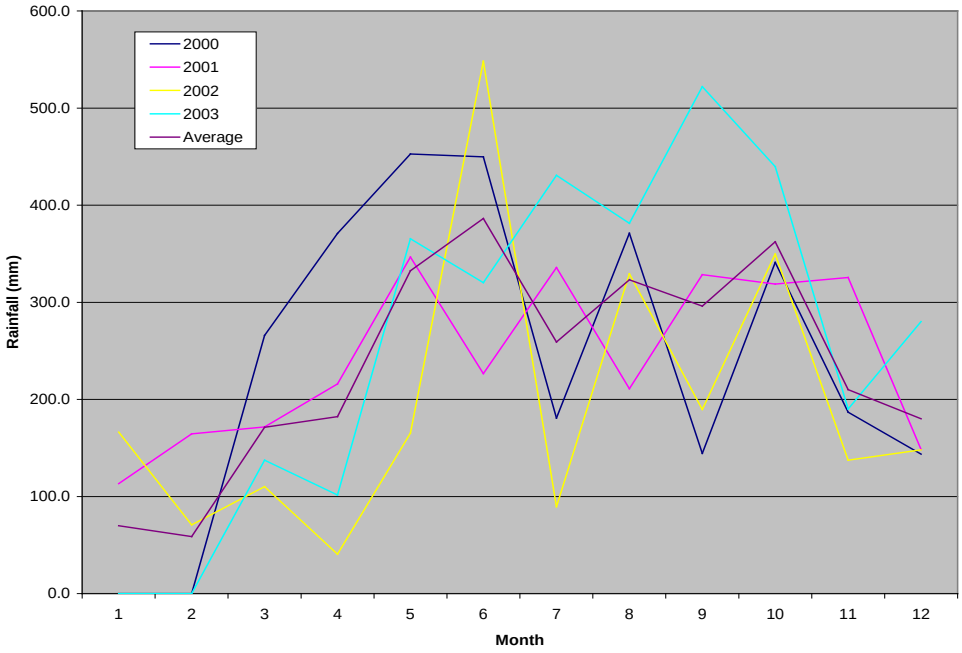

Figure 2. Temporal variation of monthly rainfall in Mapawa catchment, 2000-2003

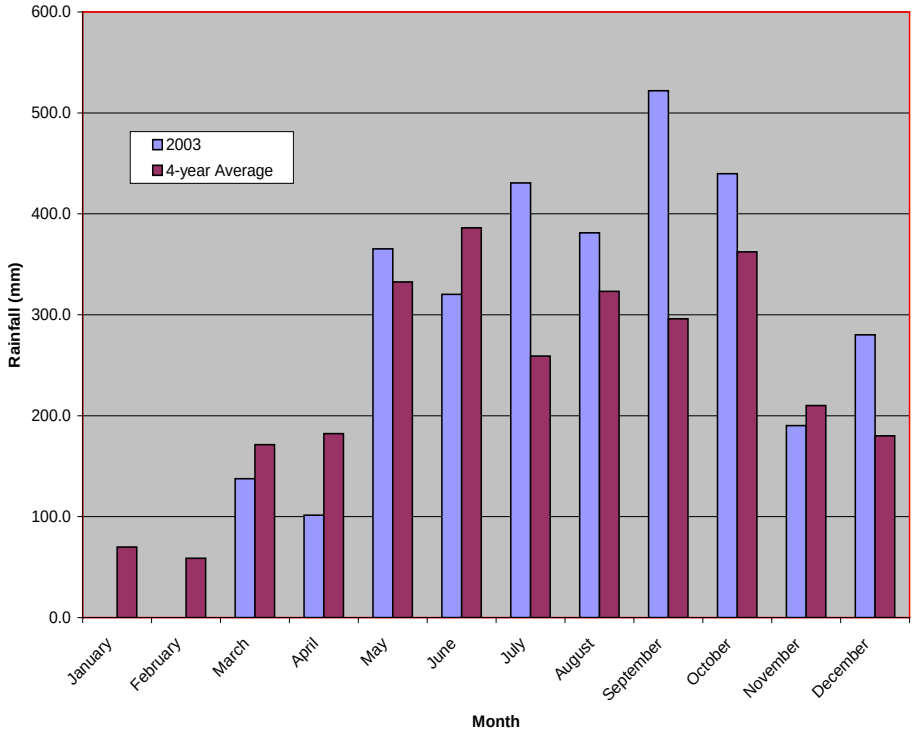

Figure 3. Monthly rainfall in Mapawa catchment in 2003 compared with the four-year average

There were four (4) events that were recorded in the main weir and 10 events in MC2 in 2003. Table 2 shows the amount of rainfall, the flow and the runoff coefficients during these events. There were several events missed because of data logger problems. On the other hand, almost all events in MC2 were recorded. Table 3 shows the suspended sediment concentration and calculated soil loss measured during the four events observed in the main weir. During these events no bed load was observed in the weir.

Table 2. Rainfall, runoff and runoff coefficient of main weir (MW) and MC2 in 2003

N	Catchment	Date of Runoff	Rainfall (mm)	Flow (li)	R (%)
1	MW	9-Sep-03	33.5	4,177	0.01
2	MW	10-Sep-03	26.5	28,580	0.13
3	MW	11-Sep-03	35.5	277,080	0.92
4	MW	13-Sep-03	33.5	398,380	1.41
5	MC2	9-Aug-03	44.0	302,733	3.85
6	MC2	12-Aug-03	15.5	73,050	2.64
7	MC2	15-Aug-03	13.5	753,867	31.23
9	MC2	19-Aug-03	26.0	42,930	0.92
10	MC2	20-Aug-03	24.0	54,207	1.26
11	MC2	10-Oct-03	22.5	62,178	1.55
12	MC2	11-Oct-03	30.5	83,409	1.53
13	MC2	12-Oct-03	19.0	185,742	5.47
14	MC2	13-Oct-03	20.5	2,434,005	66.40
15	MC2	15-Oct-03	66.5	4,106,547	34.54

Sediment Yield

Figure 4 shows the temporal variation of soil loss as bed load in the Mapawa catchment and the four micro-catchments from 2000 to 2003. Soil loss in the main weir increased from 2000 to 2002 but decreased in 2003. As shown in Table 1, the annual rainfall in 2002 was the lowest in four years but the observed bed load was the highest. This was probably because the main weir was reconstructed in January 2002 and the bed load capacity of the trap was doubled compared to the original capacity. A portion of the bed load had not been collected at the trap before the reconstruction. The bed load decreased in 2003, presumably due to the increased awareness about soil erosion as a result of the training the MSEC conducted earlier. Added to this was the cross site visit to Claveria, Misamis Oriental in the later part of 2002. It should be noted that there was an increase in the number of adopters of soil conservation measures in the MSEC catchment, particularly the establishment of the Natural Vegetative Strips as showcased by the ICRAF project. On the other hand, MC2 had the highest bed load yield in 2001 and the lowest in 2002.

Table 3. Sediment concentration, runoff flux, soil loss and rainfall measured in the main weir during four events

Time	Sediment Concentration ($g\ li^{-1}$)	Flux ($li\ sec^{-1}$)	Soil loss		Rainfall (mm)
			($g\ 12\ sec^{-1}$)	(g)	
Sept. 9, 2003					
4:25:00	2.72	0.9	2.45	245	33.5
4:45:00	1.31	0.2	0.26	26	
5:05:00	0.21	0.1	0.02	2	
5:45:00	0.49	1.3	0.64	64	
6:05:00	0.00	0.6	0.00	0	
		Total		**337**	
Sept. 10, 2003					
4:05:00	4.50	1.7	7.65	765	35.5
4:25:00	2.82	0.9	2.54	254	
5:05:00	1.60	1.7	2.72	272	
5:25:00	4.24	4.3	18.23	1,823	
5:45:00	2.37	4.3	10.19	1,019	
6:05:00	0.16	3.5	0.56	56	
		Total		**4,189**	
Sept. 11, 2003					
3:00:00	6.46	36.6	236.44	23,644	26.5
3:20:00	1.37	28.4	38.91	3,891	
3:40:00	1.25	23.7	29.62	2,962	
4:00:00	0.97	17.5	17.00	170	
4:20:00	0.65	10.9	7.08	708	
		Total		**31,375**	
Sept. 13, 2003					
11:40	2.06	49.4	101.76	10,176	33.5
12:00	1.13	46.0	51.98	5,198	
12:20	2.13	46.0	97.98	9,798	
12:40	1.09	39.6	43.16	4,316	
1:00	0.10	31.0	3.10	310	
1:20	0.46	23.7	10.90	1,090	
		Total		**30,888**	

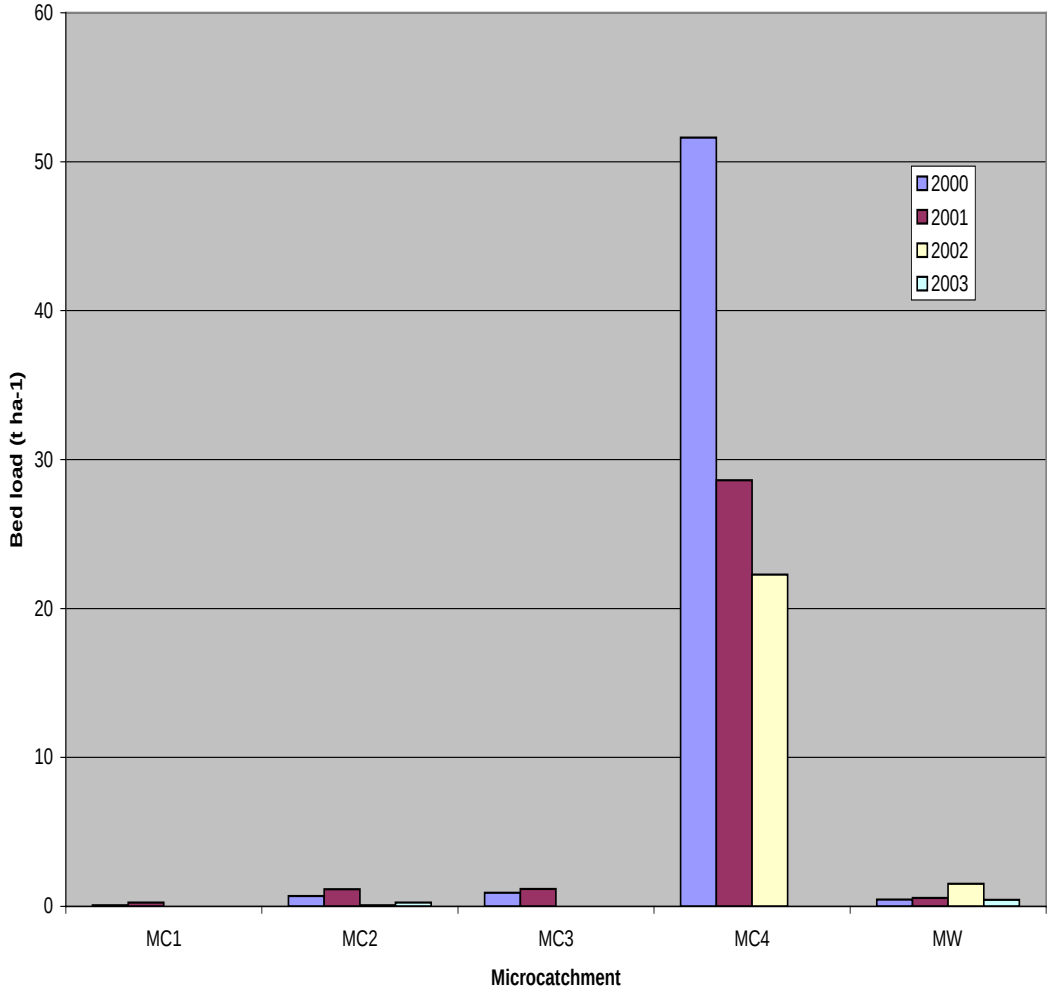

Figure 4. Yearly variation of soil loss in the different microcatchments in the Philippines, 2000-2003.

Nutrient Loss and Replacement Cost

Table 4 shows the nutrient loss and the cost of soil erosion using the replacement cost analysis on a yearly basis from 2000 to 2003. The cost to replace the nutrient N in all microcatchments was very high compared to P and K. This was probably because the P and K contents in the soil were relatively lower than N. Furthermore, there was a significant decline in organic matter as shown in the monitoring of the changes in chemical properties of the soil. The P and K content was more or less sustained after three years.

The cost to replace N in the four year data generally differs, with 2002 having the highest recorded cost. The information presented in the various tables were only those derived from the measured bed load. For sure, the cost would be much higher if the nutrients carried in the suspended sediment were considered. Nevertheless, this simple estimate clearly showed the need to reduce erosion in order to maintain the soil fertility in the sloping uplands.

Table 4. Nutrient loss and replacement cost of erosion in MC2 and the whole Mapawa catchment, 2000-2003.

Year	Soil loss	Nutrient loss (kg)			Replacement cost (PHP)		
	(t ha-1)	N	P	K	N	P	K
MC1							
2000	0.45	112.67	0.07	12.57	1715.42	1.99	183.63
2001	0.57	88.4	0.11	14.5	1422.4	3.13	222.9
2002	1.52	134.6	0.08	16.65	2166.15	2.22	256.7
2003	0.43	63.72	0.02	6.79	1745.93	0.51	141.66
Mapawa							
2000	0.69	38.04	0.03	2.11	579.17	0.85	30.84
2001	1.15	44	0.05	7.17	708.41	1.52	110.25
2002	0.08	3.8	0	0.57	60.4	0.08	8.82
2003	0.26	9.82	0.01	1	268.99	0.26	20.68

Land Use

Table 5 shows the changes in land use in the catchment from 2000 to 2003. The cropped area of microcatchment 1 (MC1) increased from 5% in 2000 to 18% in 2003, while the increase was from 16% to 21% for the whole catchment (Figure 5). New areas were opened for potato plantation and a good number of farmers started adopting the NVS technology in the area. Micro-catchments 2, 3, and 4 had very little changes in land use.

Presented in Table 6 are the proportion of the catchment and microcatchments planted to corn monocrop, area under crop rotation and under fallow in 2003. Aside from corn (*Zea mays*) which is the staple crop, other high value crops are also grown. These include vegetables such as wongbok (*Brassica rapa* L.), cabbage (*Brassica olaiacea*) and tomato (*Lycopersicum esculentum*). The farmers usually plant corn as a monocrop. However, crop rotation is practiced in a larger percentage of the entire catchment in about 12.4 ha or 15% of the whole catchment. Only 3% of the area is planted to corn monocrop. A comparison among cropping systems showed that all of the farmers in MC1, MC2 and MC4 plant high value vegetables rotated with corn. On the other hand, the cultivated area in MC3 is used for monocrop.

Table 5. Land use change in the MSEC catchment from 2000 to 2003.

Catchment	Area (ha)	Land Use			
		2000	2001	2002	2003
MC1	24.9	74.6% open grassland, 16% forest plantation, 4% shrubs/ bamboo and 5.4% cropland	74.6% open grassland, 16% forest plantation, 4% shrubs/bamboo and 5.4% cropland	60% open grass land, 16% forest, 4% shrubs and 18% cropland	60% open grassland, 18% cropland, 16% forest plantation , 4 % shrubs/ bamboo
MC2	17.9	65% open grassland, 20% cropland, 11% forest plantation , 4% shrubs/ bamboo	65% open grassland, 20% cropland, 11 % forest plantation, 4% shrubs/bamboo	65% open grassland, 20% cropland, 11% forest plantation, 4% shrubs/bamboo	65% open grassland, 20% cropland, 11% forest plantation, 4% shrubs/bamboo
MC3	8	80% open grassland, 13% forest plantation, 6% cropland, 1% shrubs/ bamboo	80% open grassland, 13 forest plantation, 6% cropland, 1% shrubs/bamboo	80% open grassland, 13% forest plantation, 6% cropland, 1% shrubs/ bamboo	80% open grassland, 13% forest plantation, 6% cropland, 1% shrubs/bamboo
MC4	0.9	42% cultivated, the rest are G-melina and open grassland	42% cultivated, the rest are G-melina and open grassland	42% cultivated, the rest are G-melina and open grassland	42% cultivated, the rest are G-melina and open grassland
Mapawa	84.5	15.4% forest, 11.8% shrubs/ bamboo, 16% cropland, 56.8% open grassland	15.4% forest, 11.8% shrubs/ bamboo, 16% cropland, 56.8% open grassland	15.4% forest plantation, 11.8 % shrubs/bamboo, 19.6% cropland, 53.2% open grassland	51.8% open grassland, 15.4% forest plantation, 21% cropland, 11.8% shrubs/ bamboos

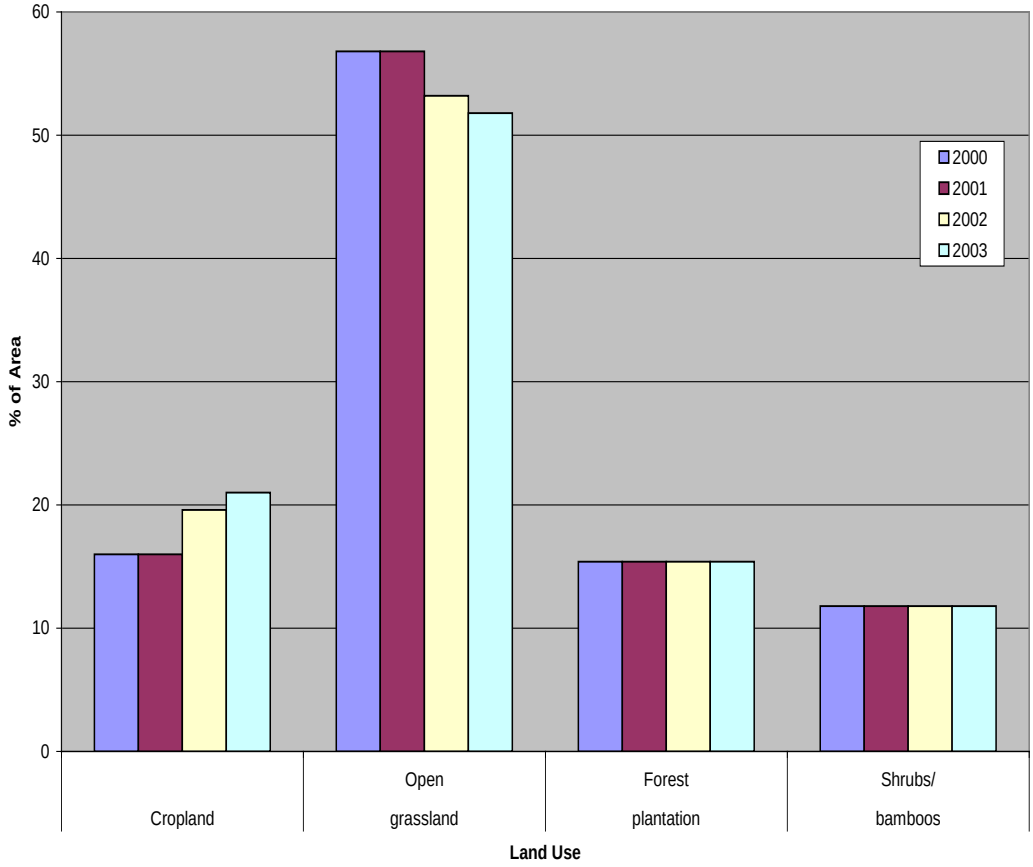

Figure 5. Change in land use of the Mapawa catchment from 2000 to 2003.

Table 6. Area planted to corn monocrop, under crop rotation and under fallow in 2003.

Catchment	Area (ha)	Corn Monocrop		Crop Rotation		Fallow	
		Area (ha)	% of Area	Area (ha)	% of Area	Area (ha)	% of Area
MW	84.5	2.66	3.14	12.4	14.64	2.69	3.17
MC1	24.93	0	0	3.55	14.24	0.94	3.77
MC2	17.88	0	0	2.32	12.78	0.77	4.31
MC3	7.96	0.5	6.28	0	0		
MC4	0.94	0	0	0.24	28.72		

A certain portion of the cultivated area has been left fallow for a number of years already (Table 7). Leaving the land fallow for a certain period is practiced as a pest management strategy to prevent potato bacterial wilt. The planting calendar followed by the farmers is shown in Table 8. A comparison of the income derived from farming employing crop rotation and cultivation of corn monocrop is shown in Table 9.

Table 7. Area under fallow of one to three years as of 2003

Catchment	Area (ha)	One Year Fallow		Two Years Fallow		Three Years Fallow	
		Area (ha)	Area (%)	Area (ha)	Area (%)	Area (ha)	Area (%)
MW	84.5	0	0	0.86	3.45	1.29	1.52
MC1	24.93	0.77	4.31	0	0	1.32	1.56
MC2	17.88		0	0	0.32	0.08	0.09

Table 8. Planting calendar from May 2000 to December 2003 of farmers in the catchment

Name of Farmer	May 2000	Sep 2000	May 2001	Sep 2001	Mar 2002	Aug 2002	Mar 2003	Dec 2003
Ernesto Timay	Potato			Wongbok				Potato
Vicente Quilaton		Corn	Corn		Corn	Beans		Potato
Julius Quilaton	Corn	Wongbok		Corn		Corn	Corn	
Ernesto Tamola							Cabbage	Wongbok
Domingo Conge			Potato					
Danilo Longjas							Potato	Tomato
Roger Tanosan		Corn		Tomato	Tomato		Corn	Wongbok
Carlito Dalaut				Corn			Potato	Wongbok
Ignacio Longjas	Potato							
Jessie Dawat	Cabbage		Corn			Corn		
Billy Layahon			Corn	Tomato		Tomato		
Ernesto Timay	Wongbok	Potato						
Rudy Lunga								Potato
Ener Ayocan							Carrots	Potato
Leonardo Galap					Potato			Corn
Dencio Dique					Cabbage			
Adelina Sihagan								Cabbage
Ruben Layahon								Tomato

Table 9. Comparison of net income (Phil. Peso) from crop rotation and monocrop cultivation

	May 2000	Sep 2000	May 2001	Sep 2001	Mar 2002	Aug 2002	Mar 2003	Dec 2003
				Crop Rotation				
Cost of Input	15478	699	6887	3533	8730	4964	11865	18154
Gross Income	63258	2712	42382	48150	21953	17221	24966	66491
Net Income	47779	3798	54388	73741	31517	29734	21473	42138
				Monocrop				
Cost of Input	2,000	1,426	2,487	2,779	1,240		2,740	2,428
Gross Income	8,000	3,924	3,633	6,678	1,854		8,074	12,624
Net Income	6,000	2,964	2,128	3,899	614		5,334	10,196

Soil Chemical Properties

Presented in Table 10 are the soil chemical properties in MC2 under different cropping systems. There were twelve (12) parcels being cultivated in the microcatchment, with 11 parcels employing crop rotation and one parcel planted to corn as a monocrop. The crops grown were during the time the area was surveyed. On the average, there was no change in the soil pH and extractable P and a slight decrease in exchangeable K in the farms of eleven farmers practicing crop rotation.

Only one farmer planted a monocrop of corn with NVS since 1999 adopting the technology from ICRAF. There was an increase in the pH from 4.9 to 5.3 after two years although no lime was applied. However, the organic matter content decreased from 9 to 7% in the two-year period. There was also a slight increase in phosphorus and a decrease in potassium. The farmer applies inorganic fertilizer.

The only farmer practicing rotation and with NVS is Roger Tanosan. He established his NVS in 1997. From 2000 to 2002, the soil extractable P, exchangeable K, and organic matter decreased from 15.4 to 7.04 ppm, from 333 to 213 ppm and organic matter from 11.4 to 4.80%, respectively. However, the pH has been maintained within the period of two years.

Table 10. Soil chemical properties in MC2 under different cropping systems.

Parcel Owner	2000					2002				
	Crop	pH	O.M (%)	Extr. P	Exch K	Crop	pH	O.M. (%)	Extr. P	Exch. K
Crop Rotation										
Roger Tanosan	Corn	4.9	10.42	3.1	213	agroforestry/ tomato	4.4	5.63	8.8	183
Jessie Dawat	Cabbage	4.6	12.11	9.6	405	Corn	5.0	9.38	1.7	141
Roger Tanosan	Potato	4.9	11.41	15.4	333	corn	4.8	7.04	4.8	213
Densio Dique	Corn	4.7	2.82	9.9	162	cabbage	5.2	8.21	9.8	309
Dencio Dique	Corn	4.8	6.1	9.3	204	corn/sweet potato	5.0	5.16	3.1	270
Dencio Dique	Corn	5.3	10.7	1.9	159	fallow	5.2	7.27	2.3	114
Ronilo Compas	Corn	4.9	9.43	2.9	261	corn	4.9	7.27	0.7	99
Victor Compas	Corn	4.9	9.43	2.9	261	corn	5.3	6.68	3.5	210
Gilbert Ceballos	Fallow	5.1	9.72	3	243	vegetables	5.1	5.63	0.9	381
Average		4.9	9.13	6.4	249		5.0	6.92	3.96	213
With NVS and on crop rotation										
Roger Tanosan	Potato	4.9	11.41	15.4	333	corn	4.8	7.04	4.8	213
Farmer monocrop to corn and with NVS										
Victor Compas		4.9	9.43	2.9	261	corn	5.3	6.68	3.54	210

Catchment Management Intervention

Alley cropping using natural vegetative strips

Even before the project, some of the farmers in the area had been practicing some conservation practices in their farms. There were seven existing NVS adaptors cultivating an area of 3.5 ha and 1.4 ha practicing agroforestry with eucalyptus. After the cross site visit conducted in September 2002, the number of adaptors of NVS in the MSEC catchment increased. Seven farmers with a total farm area of 3.2 ha adopted the technology (Table 11).

Table 11. Farmers who adopted NVS, 2002-2003.

Name	Year established	Estimated area (ha)
1. Vicente Quilaton	2002	0.51
2. Eddie Montesa	2003	0.24
3. Dominador Balansag	2002	0.25
4. Carlito Dalaut	2003	0.64
5. Ernesto Tamola	2002	0.57
6. Ener Ayocan	2003	0.23
7. Benedicto Devilleries Jr.	2002	(1) 0.24
		(2) 2.68

Stream bank stabilization

The project conducted training on Laak bamboo (*Bambusa sp.*} propagation and provided bamboo propagules to interested farmers. Farmers whose areas are near the creek were encouraged to plant bamboo near stream banks to reduce soil erosion. Erosion in the stream bank is considered a major cause of soil loss in the catchment and has contributed much in the amount of sediment yield measured after a storm event.

A total of 300 propagules have been distributed to 13 farmers, almost 35% of these propagules (130 pcs) was given to Mr. Benedicto Devilleries Sr. whose farm lies along a creek and is intensively grown to corn throughout the year.

Livestock fattening

The project introduced livestock dispersal to motivate farmers in adapting conservation measures in their farm. Four heads of cattle were given to four beneficiaries who have already established a conservation practice, particularly with the NVS technology. The animals were distributed in the last quarter of 2002. Two of the animals were provided by the Local Government of Lantapan under their Livestock Dispersal Program.

Impact Assessment

In 2003, no follow-up activities were done on assessing the impacts of the project. However, two stakeholder surveys were undertaken to collect relevant information and data that could be used later for impact assessment of the project. In fact, PCARRD is requiring all its coordinated projects to undertake regular assessment of impacts of these projects.

Collaboration with ASIALAND Project

To strengthen the collaboration with another IWMI project, the ASIALAND sloping lands project, a monitoring station was established in Bgy. Maria Paz, Tanauan City, Batangas (Figure 6).

Figure 6. Weir at the Maria Paz site

However, the weir being constructed was damaged when a very heavy downpour occurred in August, 2003. It was repaired immediately with the technical and financial help of the Local Government Unit (LGU)-Tanauan City, contributing US$ 1,500 for the repair and improvement of the weir and the necessary support structure. IWMI-ASL Project and the Bureau of Soils and Water Management (BSWM) contributed also in terms of financial and technical support by complementing the structure with the establishment of a Water Impounding structure at the downside of the weir to collect and impound water mostly coming from the weir and use it for irrigation of nearby fields. Corn and vegetables are the most common crops planted in these farms.

Figure 7 shows the rainfall pattern in the area from 1989 to 1999. The rainfall belongs to the Type I climate classification in the Philippines as contrasted to the Type IV climate in Lantapan Bukidnon. Wet months are from July to November and very dry months are usually from January to March. This is only altered during El Niño and La Niña occurrences.

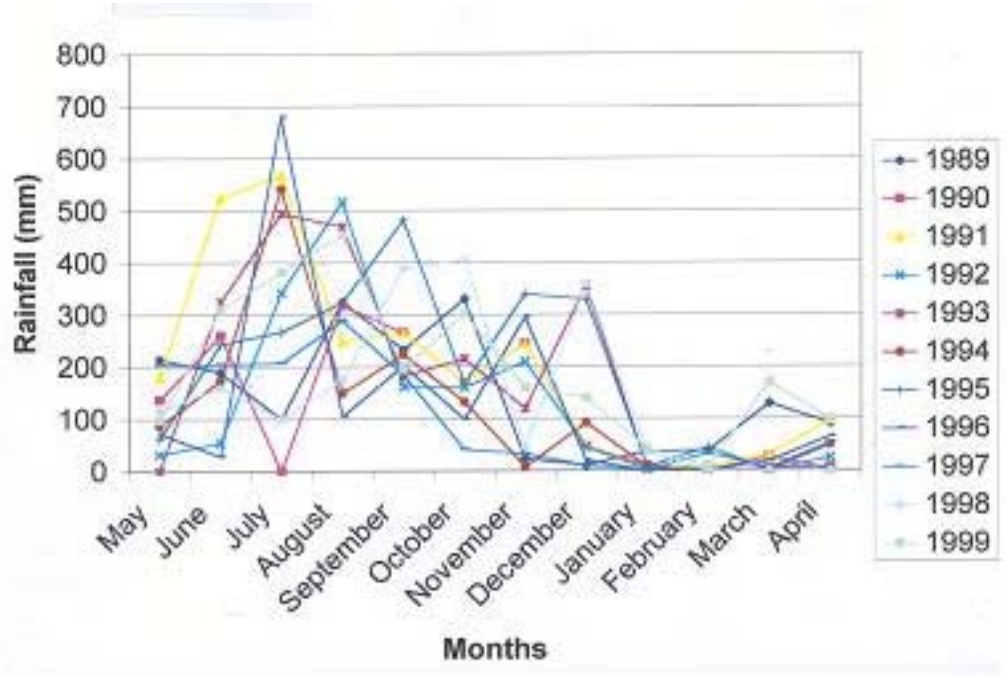

Figure 7. Rainfall pattern in Maria Paz from 1989-1999, PAGASA

Summary and Conclusion

Land use management in relation to soil erosion management is primarily influenced by ethnic background/culture, farming experiences accumulated through the years, environmental resources available in the locality, and trading/marketing forces prevalent in the area and the surrounding environs. These considerations can be viewed from the current farming community dynamics in Lantapan and Maria Paz sites. However, the degree and manner of interplay of these influences varied in these two sites.

Most of the farmers in these two sites derived substantial portion of their income from economic activities outside of the catchments. Off-farm income of farmers from Maria Paz Farmers are relatively higher than their counterparts in the Lantapan site because of more opportunities abound in nearby areas such as the industrial parks and related industries than those found in Bukidnon and nearby provinces.

The study of soil erosion management at catchment level have brought together the various stakeholders in an area, deepened the understanding of interaction among biophysical and social, economic and institutional aspects. The holistic and interdisciplinary manner of bringing together all the stakeholders can be described as difficult and requires more resources, but holds promise of being more sustainable, especially in institutionalizing the approach among these stakeholders.

The participatory approach to the research design and implementation remains as the best effective means of sustaining the cooperation of land users especially in the selection of land management options that will be most beneficial to them. However, it is necessary that participatory rural appraisal, focused group discussions and key informant interviews should be done regularly to solicit feedbacks and information critical in the assessment of the impacts of the approach and interventions introduced by the project to the stakeholders.

The project has generated and compiled data and information that will have to be sustained and utilized. For further analysis of these information should be done and should be shared and exchanged with other country partners and stakeholders. Further analysis and interpretation will bring out more meaningful information leading to more firmed up conclusions vital in the modeling the results for strategic planning and management of our natural resources and environment.

References

Ilao, R.O., C. M. Duque, L.E. Tiongco, M.G. Villano, N.V. Carpina, B.G. Santos, M.T.L. de Guzman, R.S. Quita, R.S. Yadao, and I.O. Mugot. 2002. Management of Soil Erosion Consortium (MSEC): An innovative approach to sustainable land management in the Philippines. Project Completion Report submitted to IWMI.

Maria Paz Site Characterization Survey. 2003.

MSEC-Philippines Terminal Report 1999-2002.

Capacity Building

At the regional and country levels, IWMI identified the needs of the country partners and NARES on skills and capabilities to achieve the objectives of the consortium. The conduct of soil erosion research on catchment is relatively new. With the reorganization and addition of the Ma. Paz site to the project, the project team and various stakeholders need to be continuously equipped with tools and concepts to better understand and enhance their capabilities on the various interactions among the biophysical, social, economic and institutional factors at the catchment level with regard to soil erosion management.

In 2003, there were 4 training-workshops sponsored by IWMI and MSEC-Philippines attended by the members of the project team and the various stakeholders. These trainings provided the MSEC researchers and stakeholders, especially in Ma. Paz site, the necessary skills and knowledge on how to collect and process data gathered by the project. For the Lantapan site, the farmers and the Lantapan LGU were updated on the developments of the project implementation and given some guidance on the organization and management of their association/cooperative. A Technology Needs Workshop was also done to identify and formulate recommendations to address these needs.

Capacity building activities of the researchers and coordinator are not limited to the informal and formal trainings. Attendance to agency in-house reviews, field visits and committee meetings organized by the other country partners were actively participated by the MSEC-Philippines. Exchange of information with other scientists contributed much to increase in understanding of biophysical, social and economic phenomena covered by the project. Field exposure greatly enhanced technical skills in the use of devices, experimental designs and structure needed by the project.

Trainings conducted/attended by the IWMI/MSEC Philippines Project Team.

Title/Subject Of Training	Date	Venue	Participants
1. Stakeholders Training -Workshop on Cooperative Development and Technology Needs		Bgy. Songco, Lantapan, Bukidnon, Philippines	Dr. Rebecca Cagmat Engr. Raul Alamban Engr. Ruby Quita Ms. Lydia Tiongco LGU-Lantapan LGU-Songco ICRAF researchers CMU student interns Mapawa farmers
2. Impact assessment and process documentation	July 20-30, 2003	PCARRD, Philippines	Engr. Raul Alamban Dr. Rebecca Cagmat Engr. Ruby Quita Ms. Ma. Teresa de Guzman MSEC partners from Thailand, Laos, Vietnam, and Indonesia
3. Data management and interpretation	October 6-10, 2003	Bangkok, Thailand	Engr. Raul Alamban Ms. Ma. Teresa de Guzman
4. Project orientation and participatory approaches for catchment research, biophysical processes instrumentation and data collection		Bgy. Ma. Paz, Tanauan City, Philippines	Engr. Ruby Quita Engr. Raul Alamban LGU-Tanauan City LGU-Ma. Paz Ma. Paz farmer-volunteers

Four (4) development communication undergraduate student interns worked with the project as part of their internship training. They were tapped in the documentation of meetings, workshops and trainings conducted by the project.

Workshop with stakeholders to assess technology needs

Information Dissemination

Information about the project and its activities and related information have been presented at the regional, national and municipal/catchment levels. At the regional level, the conduct of the International Training-Workshop on Impact Assessment and Process Documentation at PCARRD, Los Baños, Laguna, Philippines in July, 2003 facilitated exchange of information and experiences of the Project. At the local level (national, regional, municipal), information about the project and its status were presented during the meetings of LPHC and NOMCARRD-coordinated meetings and agency in-house reviews held regularly. The MSEC Database is being shared with the LPHC and other interested stakeholders of the project.

At the national level, information on the MSEC Philippines Project was presented during the meeting of the PCARRD Directors' Council Meeting on February 19, 2003 at PCARRD, Los Baños, Laguna. Other venues where the information about the project were presented were the Annual In-house Reviews of the Central Mindanao University, the Regional Symposium on R&D Highlights being conducted by the NOMCARRD, and local exhibits held in Lantapan and Cagayan de Oro City. Further, the Project is actively supporting the establishment of a Farmers' Information and Technology Services (FITS) Center in Lantapan to showcase the various information of the project. FITS is one of the components of the PCARRD-coordinated "National Techno Gabay Program".

At the municipal/catchment level, the information and results generated by the project were presented during the Lantapan Project Holders' meetings and during consultation meetings with the farmers/stakeholders.

Institutional Linkages and Policy Advocacy

One of the principal mandates of the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) is strengthening and improving continuously the capability of the National Agriculture and Resources Research and Development System (NARRDS) to organize, manage and conduct R & D activities. PCARRD strategically operates as a network, coordinating the R & D activities of government departments and state colleges and universities in various regions through its established regional R & D consortia.

MSEC's site in the Philippines is in Lantapan, a municipality in the province of Bukidnon. Bukidnon is one of the three provinces comprising Region 10 in the northern island of Mindanao. The consortium in this region is the Northern Mindanao Consortium for Agriculture and Resources Research and Development or NOMCARRD. Its base agency is the Central Mindanao University while its member agencies include the following:

1. Department of Agriculture - Region10
2. Department of Science and Technology - Region 10
3. National Economic Development Agency - Region 10
4. Department of Environment and Natural Development - Region 10
5. Central Mindanao University
6. Misamis Oriental State College of Agriculture and Technology
7. Mindanao State University - Institute of Fishery and Development
8. Xavier University
9. National Irrigation Administration - Region 10
10. Mindanao Polytechnic State College

MSEC Philippines Project is linked to the NARRDS at the national and municipal levels. NOMCARRD reviews, monitors and evaluates MSEC Philippines Project through the mechanisms of agency in-house reviews (AIHRs) and conduct of Regional Symposium (RS) just like any other R & D projects implemented in Region 10.

At the municipal level, PCARRD established the Lantapan Project Holders' Committee (LPHC) composed of a Steering Committee (SC) and the Technical Working Group (TWG). It is being coordinated and led by the PCARRD-coordinated Sustainable Agriculture and Natural Resources Management (SANREM) Project. The SC is composed of representatives from national and international agencies with projects at Lantapan such as PCARRD, SEARCA, ACIAR and ICRAF. NOMCARRD, CMU, Lantapan Local Government Unit (LGU), Province of Bukidnon as well as the regional offices of the Department of Agriculture and the Department of Environment and Natural Resources are also represented in the SC. The TWG is composed of the coordinators/project leaders of the various R & D projects being implemented in Lantapan municipality including the MSEC-Philippines. Also included are non-government organizations (NGOs) and various private entities located in Lantapan.

The LPHC is the integrating mechanism at the municipal level while the NARRDS (with PCARRD as the Secretariat) integrates MSEC R & D activities at the national level.

Policy Advocacy

To follow-up what has been undertaken in 2002, the Project organized a Dialogue and Consultation Workshop with the officials of the LGU-Lantapan Municipal Council and the

representative of the Department of Interior and Local Government (DILG) in the province of Bukidnon to discuss the progress of activities started in 2002 on policy advocacy on soil and water resources management for various stakeholders, especially the farmers in the Mapawa catchment. The general intent is to formulate policy instruments at the municipal level for natural land resource management. The discussion is focused on the drafting of the Implementing Rules and Regulation (IRR) for relevant ordinances and resolutions passed by the Municipal Council.

As a result of the dialogue/consultation, the Council requested the Office of the Mayor to initiate the drafting of the IRR through the Office of the Municipal Agricultural Officer (MAO). The Mayor is agreeable to the request provided that this effort will be in line and in support of the draft Lantapan Municipal Watershed Development Plan and Program. He requested the Council to act and pass the said Plan and Program soonest to be able to implement it in tandem with related ordinances and resolutions. The Project offered to extend the necessary technical support to the activities to be undertaken by the LGU-Lantapan.

Institutionalization of the Project

In 2003, the Project Team initiated discussions and arrangements with the LGU-Lantapan and the Bureau of Soils and Water Management (BSWM) for the institutionalization of the project under their respective mandates and functions. The LGU-Lantapan had seriously considered the absorption of the project under the Office of the MAO by 2005. Recently, the LGU-Lantapan had created the Municipal Environment and Natural Resources Office (MENRO) administratively under the MAO.

Further, the BSWM through its Director, Dr. Rogelio Concepcion, had agreed in principle to officially consider the MSEC sites in Lantapan and Maria Paz as part of the BSWM Outreach Station Network. Hence, these sites will be visited regularly by the BSWM researchers to conduct regular activities related to soil erosion management. It will also extend technical assistance to the concerned LGUs in the operation and management of the sites and their facilities.

Likewise, PAGASA will consider the AMS in the Lantapan site as part of its Meteorological Station Network in the Philippines. With this consideration, technical assistance on the regular check-up, repair and maintenance of the said equipment will be provided by PAGASA. Drafts of the MOA on the various collaborations of the Project with these institutions are now being reviewed by the concerned stakeholders and the Project Team.