Department of Agriculture
BUREAU OF SOILS AND WATER MANAGMENT

" Development of Decision Support Tools on Sustainable Land Management (SLM) as a Key to address Abiotic Stresses in Areas Vulnerable to Climate Change"
(PhilCAT-SLM)

COMPILATION OF SLM PRACTICES IN THE PHILIPPINES

Engr. Samuel M. Contreras
Project Leader

Project Objectives

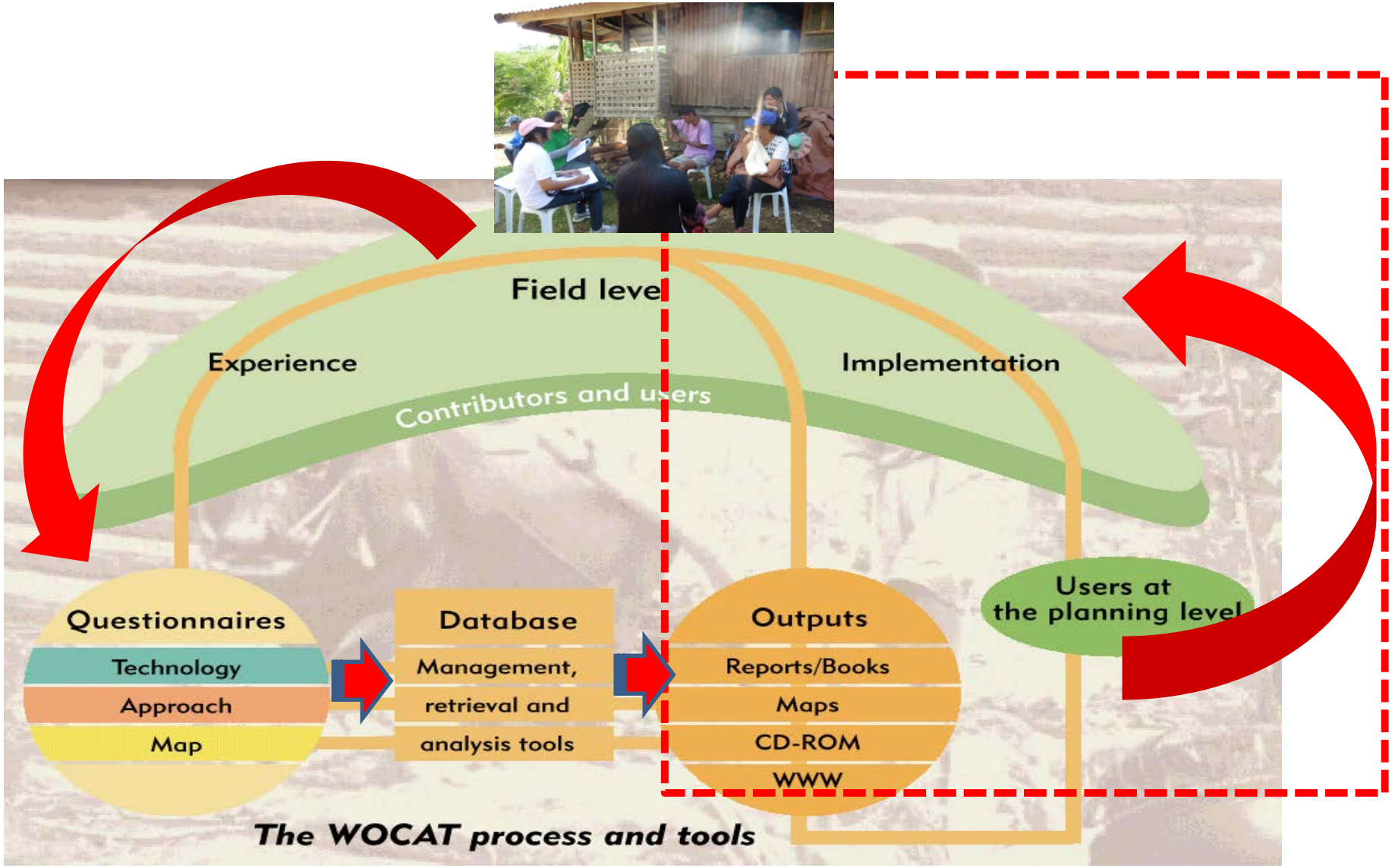
General Objective:

To develop sustainable land management (SLM) decision support tools for combating land degradation, and the effects of climate change.

Project Components

1. Awareness raising, education, and training particularly on WOCAT tools and methodologies
2. Documentation of SLM and climate change adaptation best practices and success stories using WOCAT methodology and tools;
3. Development of on-line database on SLM knowledge management;
4. Development and publication of compendium of best practices on sustainable land management (SLM)
5. Multi-media Documentation of SLM
6. Project Management and Monitoring

The WOCAT Process and Tools

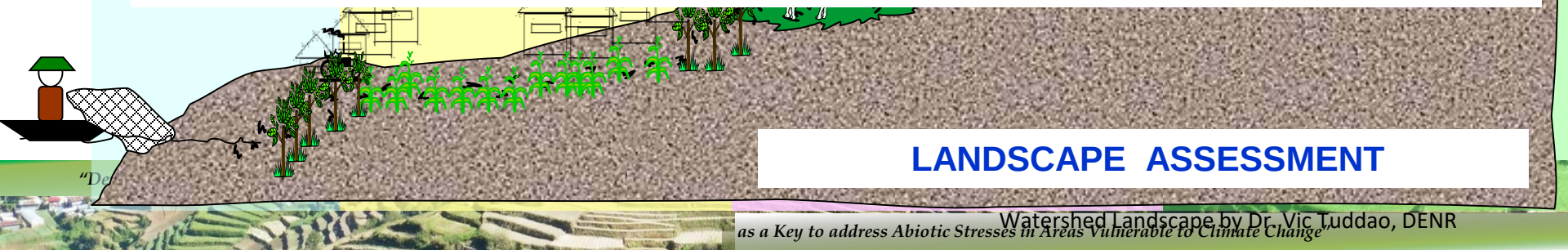


S L M P R A C T I C E S

Coast (0-10 masl)	Lowland (<100 masl)	Upland - Hillyland (100-500 masl)	Highland (>500 masl)
Lowest lowland area	Level to nearly leve (0- 3%) - Very	Gently sloping to rolling (8-18%)	Moderately steep to steep (30-50%) to

Technology Functions within the landscape (34 SLM Technologies and 9 Approaches)

1. Soil Fertility Management
2. Water Management
3. Runoff Management and Erosion Control (Structural measures)
4. Runoff Management and Erosion Control (Vegetative measures)
5. Enrichment Planting and Protection of Vegetative Cover
6. Fire and Wind Breaks
7. Biological Pest Control



LANDSCAPE ASSESSMENT

Watershed Landscape by Dr. Vic Tuddao, DENR

SLM PRACTICES IN THE PHL

Project Web site

www.bswm.da.gov.ph/philcat-slm

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PhilCAT-SLM

Home About us Members SLM Practices Guidelines Contact

About the Project.

Despite continuous efforts to spread SLM practices, adoption is still alarmingly low. Successful adoption of SLM depends on a combination of factors and it is a challenge to find best SLM practices for diverse local conditions. It is, therefore, essential to provide decision support tools for local land-users, specialists, planners, and decision-makers and invest in knowledge management and decision support mechanisms by following sound procedures and tapping existing knowledge (WOCAT 2011).

SLM technologies and approaches remain scattered and in different formats. There are knowledge gaps specifically in terms of area covered, impacts and economics of SLM and therefore these knowledge are not used to make decisions. Hence, there is a need to document this wealth of knowledge on SLM, put them into a database, and process them into knowledge products that can be used as decision support tools .

Objectives

The general objective is to develop sustainable land management (SLM) decision support tools for combating land degradation, and the effects of climate change

Specific Objectives:

1. Document available SLM and climate change adaptation best practices and success stories, both indigenous and science-based knowledge, from different parts of the country;
2. Increase capacity and awareness of local partners on SLM and adaptation strategies in areas vulnerable to the effects of climate change;
3. Develop SLM knowledge management and decision support tools using WOCAT methodology;
4. Strengthen the PHILCAT in its advocacy and activities related to SLM; and
5. Communicate and disseminate results to land users, SWC advocates and specialists, and policy and decision makers to facilitate broader adoption.

Location/Coverage

Project Outputs

The project will deliver the following outputs with respect to each specific objective:

Objective 1: To document available SLM and climate change adaptation best practices and success stories

- Output 1. Guidelines and protocols to select SLM best practices completed
- Output 2. SLM best practices identified and selected from the 5 strategic ecosystems through the conduct of seminar-workshop in the identified SLM centers.
- Output 3. SLM best practices are documented using WOCAT questionnaires on technologies and approaches, and mapped/tagged

Objective 2: To increase capacity and awareness of local partners on SLM and climate change adaptation strategies.

- Output 4. Trained project staff and local partners on the application of WOCAT tools and methodologies.
- Output 5. Well-informed local partners regarding SLM as climate change adaptation options.

Objective 3: To develop SLM knowledge management and decision support tools using WOCAT methodology.

- Output 6. Documented SLM best practices are entered in the WOCAT database.
- Output 7. Summarized report of SLM best practices generated from the WOCAT database.

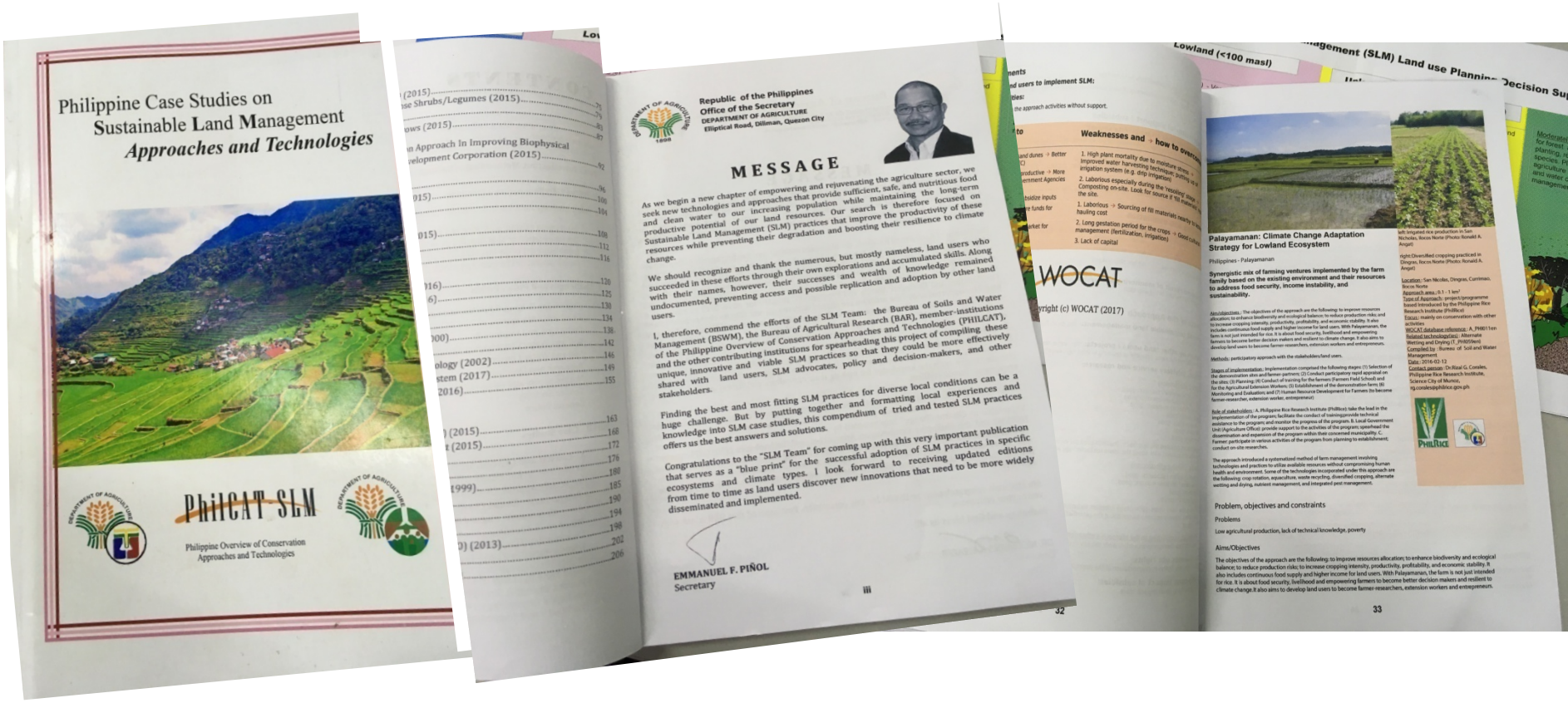
Objective 4: To strengthen the PHILCAT in its advocacy and activities related to SLM.

- Output 8. PHILCAT institutional members' active participation and contribution in the project implementation and WOCAT activities.

as a Key to address Abiotic S

Compilation of SLM Best Practices

Philippine SLM Case Studies……



IEC Materials Production

ADVANTAGES

The technology was made only with indigenous material such as rocks from the area.

DISADVANTAGES

Less durability of the technology because the rocks piled were easily dislodged. This could be improved by cementing the gaps between rocks to further enhance resiliency of the rockwall.

MAINTENANCE OF THE ROCKWALL

Maintenance is done thrice a year by repiling of dislodged rocks.

ACCEPTANCE/ADOPTION

There is a moderate trends towards spontaneous adoption of the technology. Even without LGU assistance, the technology will continue since most of the land-users in the area were trained and taught on how to construct rockwall with the use

WOCAT

World Overview of Conservation Approaches and Technologies

Bureau of Soils and Water Management

Department of Science and Technology
PCAARD

Bureau of Agricultural Research

University of the Philipines
Los Banos

"DEVELOPMENT OF DECISION SUPPORT TOOLS ON SUSTAINABLE LAND MANAGEMENT (SLM) AS A KEY TO ADDRESS ABIOTIC STRESSES IN AREAS VULNERABLE TO CLIMATE CHANGE"

ROCKWALL TERRACING

ROCKWALL TERRACING IS DONE BY PILING THE STONES ALONG CONTOUR LINES TO PREVENT EROSION IN HILLY AREAS

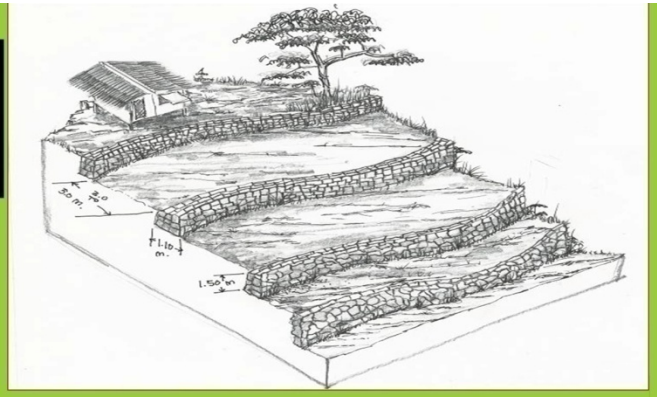
IEC Materials Production

WHAT IS Rockwall Terracing?

Rockwall terracing technology is widely practiced by farmers in hilly area of Barangay Nasunggan, La Libertad, Negros Oriental. Rockwall terraces are built to reduce soil erosion and provide ease in land preparation through the removal of naturally present rocks in the cultivated area. It also contributes to the partial arrangement and diversification of land use.

HOW TO ESTABLISH ROCKWALL TERRACING?

- Rocks or stones that were taken from the area are piled along the contour lines with the width of 1.10m and a height of 1.50 m.
- 360 person days are needed to construct a 50-meter rockwall which costs 800 USD.
- Maintenance of the structure is done by piling dislodged stones three times a year.
- The terrace bed were cultivated and planted with corn, watermelon and vegetables. In some areas, livestock like cattle and native pigs were also raised.



Rockwall Terrace built to utilize the rock in the area

BENEFICIAL EFFECTS

Production and socio-economic benefits

- Increased crop yield
- Reduced expenses on agricultural inputs
- Increased farm income
- Diversification of income sources
- Increased production area
- Increased product diversification

Socio-cultural benefits

- Strengthened community institution
- Strengthened national institution
- Improved conservation and erosion knowledge
- Improved food security and self sufficiency
- Improved cultural opportunities
- Improved situation of disadvantaged groups

IMPLEMENTATION ACTIVITIES, INPUTS AND COSTS

Establishment activities

- Contouring
- Digging along contour, Gathering and piling of stones along contours

Establishment inputs and costs per unit

Inputs	Costs (US$)	% met by land user
Labour	804.44	100%
Equipment		
- tools	22.22	100%
TOTAL	**826.66**	**100.00%**

Maintenance/recurrent activities

- Repiling of stones and rocks that were dislodged

Maintenance/recurrent inputs and costs per unit per year

Inputs	Costs (US$)	% met by land user
Labour	13.33	100%
TOTAL	**13.33**	**100.00%**

OTHER FUNCTIONS

Main technical functions

- control of dispersed runoff: retain / trap
- control of concentrated runoff: retain / trap

Secondary technical functions

- control of raindrop splash
- reduction of slope angle

INFLUENCE OF NATURAL AND HUMAN FACTORS

Natural Environment

Average annual rainfall (mm): > 4000 mm; 3000-4000 mm; 2000-3000 mm; 1500-2000 mm; 1000-1500 mm; 750-1000 mm; 500-750 mm; 250-500 mm; < 250 mm

Altitude (m a.s.l.): > 4000; 3000-4000; 2500-3000; 2000-2500; 1500-2000; 1000-1500; 500-1000; 100-500; <100

Landform: plateau / plains; ridges; mountain slopes; hill slopes; footslopes; valley floors

Slope (%): flat; gentle; moderate; rolling; hilly; steep; very steep

Soil depth (cm): 0-20; 20-50; 50-80; 80-120; >120

Soil texture: medium (loam)
Soil fertility: medium
Topsoil organic matter: medium (1-3%)
Soil drainage/infiltration: good

Soil water storage capacity: medium
Water quality: good drinking water
Biodiversity: low

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease
Sensitive to climatic extremes: heavy rainfall events (intensities and amount)

Human Environment

Mixed per household (ha): <0.5; 0.5-1; 1-2; 2-5; 5-15; 15-50; 50-100; 100-500; 500-1,000; 1,000-10,000; >10,000

Land user: Individual / household, Small scale land users, disadvantaged land users, men and women
Population density: 10-50 persons/km2
Land ownership: individual, not titled
Land use rights: individual
Water use rights: individual
(Sharing of water from spring during summer)

Importance of off-farm income: less than 10% of all income:
Access to service and infrastructure: low: health, education, employment (eg off-farm), market, roads & transport, financial services; moderate: energy; high: technical assistance, drinking water and sanitation
Market orientation: mixed (subsistence and commercial)

IEC Materials Production

ADVANTAGES

- Availability of labor
  Job generation
- Strengthened community participation

DISADVANTAGES

- Poor Road Network (farm-to-market road)
- Lack of irrigation system in the cropping area
- Insufficient hedgerow crops

ACCEPTANCE/ADOPTION

There is a strong trend towards spontaneous adoption of the technology. Additional Barangays will be adopting the technology.

WOCAT
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Contour farming is a technology practiced in sloping areas in which hedgerows are established along the contour while crop production is carried out in between the hedges.

IEC Materials Production

What is Contour Farming Using Hedgerows?

Contour farming is being practiced by the farmers in sloppy areas to prevent or control surface run-off, soil erosion., and to conserve natural soil fertility. Hedgerows are established along contour lines which are planted with napier grass and permanent crops like banana and coco-nut. Napier grass are planted purposely as feeds for livestock. In between contour lines, corn is planted inter-crop with peanut.

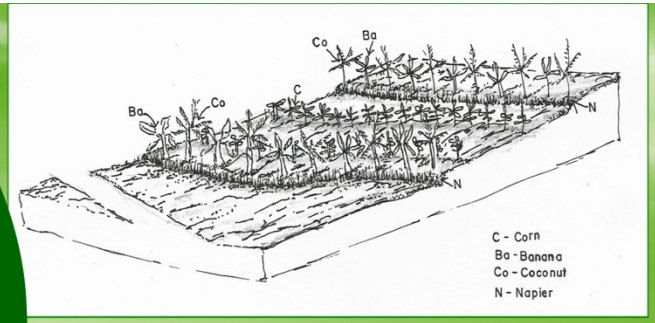
Start Contour Farming Using Hedgerows?

1. Contour lines (0.5 m) are measured with the aid of an A-frame.
2. Napier grass are planted along the con tour at 8x8m and 4X4m distance.
3. Grafted cacao trees are also inserted in-between banana at 4X4m distance.
4. Corn and peanut are planted in 4-meter wide and 30-meter long production areas located between contours.

Other Functions

Primary functions:
Control of raindrop splash
Control of dispersed runoff: retain / trap

Secondary functions:
Reduction of slope angle
Reduction of slope length



Technical Drawing: Patricio A. Yambot

Beneficial Effects

Production and socio-economic benefits

- Increased crop yield
- Increased fodder production
- Improved fodder quality
- Increased farm income
- Diversification of income sources
- Increased product diversifica-tion

Production and socio-economic benefits

- Strengthened community institution
- Strengthened national institution
- Improved situation of disad-vantaged gro ups
- Increased recreational oppor-tunities
- Improved conservation / erosion knowledge

Ecological benefits

- Increased soil moisture
- Improved excess water drainage
- Improved soil cover
- Increased biomass above ground Carbon
- Increased nutrient cycling recharge
- Increased soil organic matter / below ground Carbon
- Reduced emission of carbon and greenhouse gases
- Reduced soil loss
- Increased plant diversity
- Increased water quality
- Reduced wind velocity
- Increased / maintained habitat diversity

Implementation Activities, Input and Costs

Establishment activities

- laying out and establishment of contour lines/hedgerows
- planting of hedgerows (Napier)
- planting of perennial crops along contour

Establishment inputs and costs per unit

Inputs	Costs (US$)	% met by land user
Labour	28.89	100%
Construction material		
- bamboo sticks/pegs	0.56	40%
- A-frame	0.44	40%
Agricultural		
- seedlings	75.11	100%
- herbicides	17.78	100%
TOTAL	**122.78**	**76.00%**

Maintenance/recurrent activities

- Land clearing/ preparation (plowing, rotavating, harrowing)
- Furrowing
- Planting of corn (first cropping)
- Weeding, insect control
- Harvesting of First Crop
- Land Preparation for the second cropping (plowing, harrowing/rotavating, furrowing)
- Planting of Corn + Planting of peanut (second cropping- corn + peanut)
- Weeding / Insect Control
- Harvesting of Corn Harvesting of Peanut

Maintenance/recurrent inputs and costs per unit per year

Inputs	Costs (US$)	% met by land user
Labour	41.32	100%
Equipment		
- animal traction	5.34	100%
Agricultural		
- seeds	4.44	100%
- fertilizer	40.00	100%
TOTAL	**91.10**	**100.00%**

Influence of Human and Natural Factors

Natural Environment

Average annual rainfall (mm): > 4000 mm; 3000-4000 mm; 2000-3000 mm; 1500-2000 mm; 1000-1500 mm; 750-1000 mm; 500-750 mm; 250-500 mm; < 250 mm

Altitude (m a.s.l.): > 4000; 3000-4000; 2500-3000; 2000-2500; 1500-2000; 1000-1500; 500-1000; 100-500; <100

Landform: plateau / plains; ridges; mountain slopes; hill slopes; footslopes; valley floors

Slope (%): flat; gentle; moderate; rolling; hilly; steep; very steep

Soil depth (cm): 0-20; 20-50; 50-80; 80-120; >120

Soil texture: medium (loam)
Soil fertility: medium
Topsoil organic matter: medium (1-3%)
Soil drainage/infiltration: medium

Soil water storage capacity: low
Ground water table: 5 - 50 m
Availability of surface water: good
Water quality: good drinking water
Biodiversity: low

Tolerant of climatic extremes: seasonal rainfall increase, seasonal rainfall decrease
Sensitive to climatic extremes: temperature increase, heavy rainfall events (intensities and amount), floods, droughts / dry spells

Human Environment

Cropland per household (ha): <0.5; 0.5-1; 1-2; 2-5; 5-15; 15-50; 50-100; 100-500; 500-1,000; 1,000-10,000; >10,000

Land user: Individual / household, Small scale land users, disadvantaged land users, men and women
Land ownership: individual, not titled
Land use rights: individual
Water use rights: communal (organised)

Importance of off-farm income: less than 10% of all income: Hired laborers for the Department of Environment and Natural Resources (DENR) Project on National Greening Program
Access to service and infrastructure: low: health, education, employment (eg off-farm), market, energy, financial services; moderate: roads & transport; high: technical assistance, drinking water and sanitation
Market orientation: mixed (subsistence and commercial)
Mechanization: manual labour
Livestock grazing on cropland: yes

IEC Materials Production

ADVANTAGES

- Seed Production of Forage Legumes can control soil erosion and it also increase the soil fertility
- It can also serve as wind breakers

DISADVANTAGES

- Low seed production during long dry season or drought
- Provision of irrigation system is needed in order to continue the seed production during dry months

Contribution to the Livelihood

Seed produced from forage legumes serves as extra income from land-users which they were used for the education of their children

ACCEPTANCE/ADOPTION

There is a moderate trend towards spontaneous adoption of the technology. Most of the farmers were assisted by the local government officials on the production of seeds and the sales of the produce.

"Development of Decision Support Tools on Sustainable Land Management (SLM) as a Key to Address Abiotic Stresses in Areas Vulnerable to Climate Change"

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Los Banos

Seed production technology of forage legumes is a soil conservation practice in sloping areas in which Flemengia and Indigofera are densely planted along contours

IEC Materials Production

What is Seed Production of Forage Legumes?

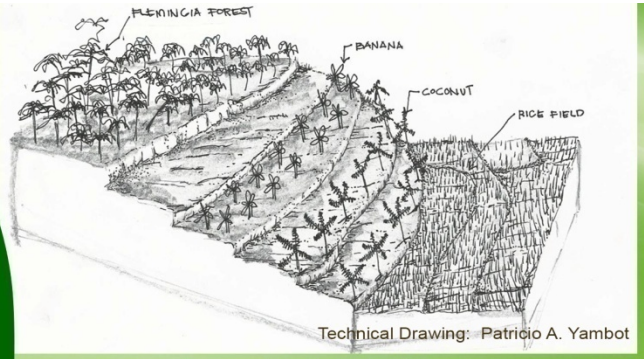
Forage Legumes such as Flemengia macrophylla and Indigofera tinctoria locally known as Malabalatong and Indigo plant, respectively, are used primarily for seed production. This process is introduced through Conservation Farming Village (CFV) project in Barangay Elecia, La Libertad, Negros Oriental.

The plants are drilled along contour lines and the seeds of these plants are maintained until mature enough for harvest. Fodder and other dry matter parts of the plants are used as feeds for livestock while hard portions such as branches are used as firewood.

Seed production of forage legumes is practiced by farmers in the Barangay to conserve soils as well as to supplement the seed requirement of expansion area of the CFV project in the municipality.

How to Establish Seed Production of Forage Legumes?

1. Contour lines are established in sloppy areas using an A-frame.
2. A hectare lay-outing requires 8 person days while land preparation (i.e plowing and furrowing) requires at least 30 person animal day per hectare.
3. Flemengia and Indigofera seeds are drilled along contour lines at rate of 24kg/ha and 8kg/ha, respectively.
4. Weeding and hilling-up are done 30 person animal day. Harvesting of pods starts a year during the months of February, May and October.
5. Indigofera produces seeds three months after flowering which starts a year from planting.
6. Matured pods are harvested twice a year by hand-picking then sun-dried for at least two days.
7. Manual threshing is done to remove seeds from the pods.



Technical Drawing: Patricio A. Yambot

Beneficial Effects

Production and socio-economic benefits
- Increased crop yield
- Increased farm income
  Diversification of income sources
- Increased product diversification

Socio-cultural benefits
- Strengthening community institution

Ecological benefits
- Improved soil cover
- Increased nutrient cycling recharge
- Reduced soil loss
- Improved harvesting / collection of water

Implementation activities, inputs and costs

Establishment activities
- Land Preparation: Plowing Harrowing and Furrowing
- Establishment of contour lines/ laying out

Establishment inputs and costs per unit

Inputs	Costs (US$)	% met by land user
Labour	49.44	100%
Equipment		
- bamboo sticks/ pegs	2.22	100%
Agricultural		
- seeds	44.44	0%
TOTAL	**96.10**	**66.67%**

Maintenance/recurrent activities
- Weeding/ Hilling-up
- Harvesting
- Sun Drying
- Manual Threshing
- Harvesting of Flemengia and Indigofera

Maintenance/recurrent inputs and costs per unit per year

Inputs	Costs (US$)	% met by land user
Labour	43.10	100%
TOTAL	**43.10**	**100.00%**

Technical Functions of the Technology

Main technical functions:
- Control of dispersed runoff: retain / trap
- Control of concentrated runoff: retain / trap
- Improvement of ground cover
- Promotion of vegetation species and varieties (quality, eg palatable fodder)

Secondary technical functions:
- Reduction of slope angle
- Reduction of slope length
- Increase of surface roughness
- Increase in organic matter
- Reduction in wind speed

Influence of Natural and Human Factors

Natural Environment

Average annual rainfall (mm): > 4000 mm; 3000-4000 mm; 2000-3000 mm; 1500-2000 mm; **1000-1500 mm**; 750-1000 mm; 500-750 mm; 250-500 mm; < 250 mm

Altitude (m a.s.l.): > 4000; 3000-4000; 2500-3000; 2000-2500; 1500-2000; 1000-1500; 500-1000; 100-500; <100

Landform: plateau / plains; ridges; mountain slopes; **hill slopes**; footslopes; valley floors

Slope (%): flat; gentle; **moderate**; rolling; hilly; steep; very steep

Soil depth (cm): 0-20; 20-50; **50-80**; 80-120; >120

Soil texture: fine / heavy (clay)
Soil fertility: medium
Topsoil organic matter: high (>3%)
Soil drainage/infiltration: medium

Soil water storage capacity: medium
Ground water table: < 5 m
Availability of surface water: good
Water quality: good drinking water
Biodiversity: medium

Tolerant of climatic extremes: seasonal rainfall increase, heavy rainfall events (intensities and amount)
Sensitive to climatic extremes: temperature increase, seasonal rainfall decrease, droughts / dry spells
If sensitive, what modifications were made / are possible: Mitigating measure is recommended such as drip irrigation if it is for commercial seed production.

Human Environment

Cropland per household (ha): <0.5; 0.5-1; 1-2; 2-5; 5-15; 15-50; 50-100; 100-500; 500-1,000; 1,000-10,000; >10,000

Land user: Individual / household, Small scale land users, common / average land users, men and women
Land ownership: individual, titled
Land use rights: individual

Importance of off-farm income: :
Access to service and infrastructure: low: education, employment (eg off-farm), market, roads & transport, financial services; moderate: health, energy; high: technical assistance, drinking water and sanitation
Market orientation: commercial / market
Mechanization: manual labour
Livestock grazing on cropland:

Decision support to select SLM options using Excel

SLM Decision Support Tool (NEW) - Microsoft Excel

DECISION SUPPORT TO SELECT APPROPRIATE SUSTAINABLE LAND MANAGEMENT (SLM) PRACTICES WITHIN THE LANDSCAPE

ENGR. SAMUEL M. CONTRERAS
DIVISION HEAD, SOIL CONSERVATION AND MANAGEMENT
BUREAU OF SOILS AND WATER MANAGEMENT

THIS WORKBOOK CONSISTS OF FOUR MAIN WORKSHEETS, NAMELY: 1) **TECHNO-ECOSYSTEM**- TO REFER THE SELECTION OF SLM TECHNOLOGY ON SPECIFIC ECOSYSTEM; 2) **TECHNO-MEASURES** -TO REFER THE SELECTION OF SLM TECHNOLOGY ON THE CONSERVATION MEASURE CATEGORIES; 3) **TECHNO-FUNCTION BY ECOSYSTEM** - TO REFER THE SELECTION OF SLM TECHNOLOGY ON THE MAIN FUNCTION WITH RESPECT TO SPECIFIC ECOSYSTEM, 4) **APPROACH** - TO REFER THE SELECTION OF SLM APPROACH ON SPECIFIC ECOSYSTEM, 5) **FINANCIAL ANALYSIS** - TO SUBJECT THE SELECTED SLM TECHNOLOGY TO

What are the basic inputs?

1. Initial assessment /identification - Are we looking for an Approach or a Technology?
2. Location or Area of interest - Coastal, Lowland, Upland to hillyland, or Highland
3. Bio-physical characteristics of the area of interest, i.e. land use, soils, slope, rainfall and nature of land degradation to be addressed.

How to use the Spreadsheet?

1. Prcoceed to worksheets **Techno-ecosystem** , **Techno-Measures,** or **Techno-Fuction by ecosystem** (i.e. dependng on the menu preference) for the selection of an appropriate SLM technology, or to Approach worksheet for the selection of a possble approach (Project/program).
2. Within each worksheet, refer to the landscape diagramn as initial basis in the selection of potential SLM technologies and approaches.
3. Based on the initial assessment, fill in the cell in yellow with the required letter(capitalized) , number , or comibination of number and small letter as indicated in the worksheet.
4. Assess and analyze the list of potential SLM technologies and approaches with respect to the bio-physical characteristics of the area of interest and nature of land degradation that will be addressed, as basis in making decision.Using the **Techno Function worksheet**, the specfic features of a technology and the qualitative assessement of the benefits for each technology can be obtained, by entering the technology number (not the count no.). This can also serve as another basis in selecting the most appropriate SLM practices .
5. After the initial selection (using capital letter or number as required), refer to the standardized report of the selected technology/approach for more details (i.e. What & how? where it is appropriate (natural and human environment?, cost and benefits and impacts). Also, refer to the **Assessment of the Technology** in making decision. The complete details of the selected technology can be accessed by clicking the opposite cell with two selections: 1) with no available internet or 2) with available internet.
6. Subject the selected SLM Technology(ies) to Financial/Economic Analysis to determine its profitability if applied to specific farm sites.

Note:

SLM Approach defines the ways and means used to implement one or several SLM Technology(ies), including material and technical support, involvement and roles of different stakehlders, etc. An approach can refer to a project/program or to acitivities initiated by the landusers themselves.

SLM Technology is a physical practice on the land that controls land degradation, enhances productivity, and/or other

DS | Techno-Ecosystem | Techno-Measures | Techno-Function by ecosystem | Approach | Tech | Tech1 | Financial Analysis

Ready

Decision support to select SLM options by Ecosystem

SLM Decision Support Tool (NEW) - Microsoft Excel

G65 =IF(C65=1,HYPERLINK(Tech1!A4),IF(C65=2,HYPERLINK(Tech1!C4),IF(C65=3,HYPERLINK(Tech1!E4),IF(C65=4,HYPERLINK(Tech1!G4),IF(C65=5,HYPERLINK(Tech1!I4),IF(

Sustainable Land Management (SLM) Land use Planning Decision Support Tool

t (0-10 masl)

lowland area (<
efer to the
plain located at
n to 10 m for
ef and mangrove
rotection and
ement

Lowland (<100 masl)

Level to nearly leve (0- 3%) - Very good land, can be safely cultivated and requires simple yet good agricultural practices.Either rainfed or irrigated and suitable for field crops production

Nearly level to gently sloping (3 - 8%) - Cropland, good land for cultivation, expansion for rice production . Can be utilized for upland crop cultivation, including high value crops , with simple soil conservatiion and management practiices (e. g . contour strip cropping)

Upland - Hillyland (100-500 masl)

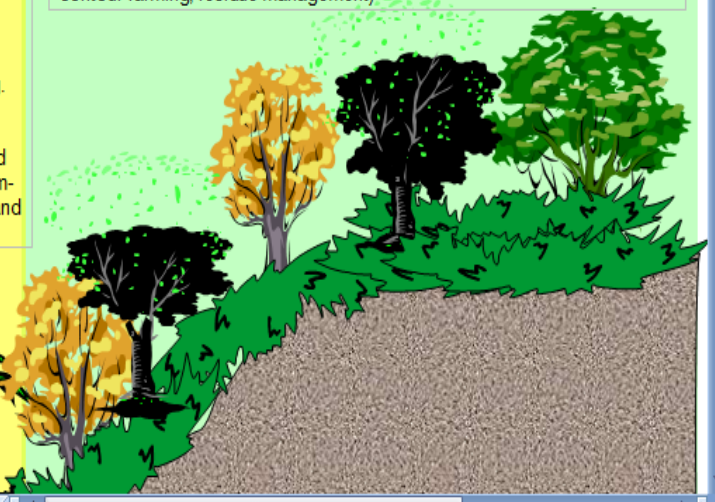
Gently sloping to rolling (8-18%) (Upland) - Modified cropland Soil conservation measures : alley cropping with vegetative (grass or legumes) barriers; alley cropping or hedge row intercropping system

Rolling to moderately steep) (18-30%) (Hillyland) - Diversified cropland, suitable for pasture or forest. This can be developed for agriculture by adopting farm-based agro-forestry system. Can be utilized for cultivation with careful management and complex soil conservation practices (e.g. hedgerow intercroppinng , multistorey cropping system)

Moderately Steep to steep (30-50%)(Hillyland) - Best suited for forest and pasture . Can be developed by adopting farm-based agroforestry system coupled with soil conservation and management practices.

Highland (>500 masl)

Moderately steep to steep (30-50%) to Very Steep (>50%): and Plateau
Suitable for forest and wildlife as protected areas. For rehabilitation through enrichment planting, replanting of damaged areas, and/or saturation planting with indigenous species. Planting of shade tolerant species. Those areas being cultivated for agriculture (i.e. Cordillera) including plateaus should consider appropriate soil and water conservation measures (e.g. terracing, contour farming, residue management)



DS | Techno-Ecosystem | Techno-Measures | Techno-Function by ecosystem | Approach | Tech | Tech1 | Financial Analysis

Ready 80%

Decision support to select SLM options by Ecosystem

SLM Decision Support Tool (NEW) - Microsoft Excel

G65 =IF(C65=1,HYPERLINK(Tech1!A4),IF(C65=2,HYPERLINK(Tech1!C4),IF(C65=3,HYPERLINK(Tech1!E4),IF(C65=4,HYPERLINK(Tech1!G4),IF(C65=5,HYPERLINK(Tech1!I4),IF(

LOCATION (A - Coast; B - Lowland; C - Upland to hillyland; and D - Highland):	D

General Description: **Highland**

Count No.	SLM No. and Name of the Technology	Location	Land Use	Land Degradation	Conservation Measures & Stages of Intervention	Technical Function	Altitude, meters above sea level	Annual Rainfall, mm	Landform	Slope	Sc F
1	7. Littuko growing for forest enhancement	Upland to hillyland and Higland	Natural;; Other: Grazing land; forest	Biological degradation: reduction of vegetation cover; loss of habitat	Vegetative Measures; Rehabilitation	Promotion of vegetation species and varieties; conservation of trees that serve as hosts; increase organic matter; increase biomass	100-500	2000-3000	hillslopes	hilly to steep	20 fer
2	11. Natural Vegetative Strips (NVS)	highland	Annual cropping, trees and shrubs: rainfed	Soil erosion by water; loss of top soil; surface erosion; gully erosion; chemical soil deterioration; fertility decline and reduced organic matter	Agronomic and Vegetative Measures; Prevention and mitigation	Reduction of slope angle; reduction of slope length; control of dispersed runoff; increase infiltration and increase soil fertility	500 -1500	1500-3000	footslopes; hillslopes	rolling-hilly	20
3	12. Rainfed paddy rice terraces	highland	Annual cropping, rainfed	Soil erosion by water; loss of topsoil/surface erosion; chemical soil deterioration; fertility decline and reduced	Structural Measures (Bench Terraces); Prevention and mitigation	Control of dispersed runoff: retain trap; increase/maintain water stored in the soil; reduction of slope angle; reduction of slope length;	1500-2500	1500-3000	mountain slopes	hilly - steep	80 lov

DS | Techno-Ecosystem | Techno-Measures | Techno-Function by ecosystem | Approach | Tech | Tech1 | Financial Analysis

Ready 80%

Decision support to select SLM options by Ecosystem

SLM Decision Support Tool (NEW) - Microsoft Excel

G65 =IF(C65=1,HYPERLINK(Tech1!A4),IF(C65=2,HYPERLINK(Tech1!C4),IF(C65=3,HYPERLINK(Tech1!E4),IF(C65=4,HYPERLINK(Tech1!G4),IF(C65=5,HYPERLINK(Tech1!I4),IF(

	B	C	D	E	F	G	H	I	J	K	L
64	*(Please fill in the number of SLM selected)*					*(To access details, please click the cell below if internet is not available)*		*(To access details, please click the cell below if internet is available)*			
65	**SELECTED SLM OPTIONS:**	**29**	**Compact farming for vegetables production**			SLM Technolgy copies\compact-farming-for-vegetables-	**or**	http://bswm.da.gov.ph/philcat-slm/slm/getslmtech/34/compact-			
66											
67	**SPECIFIC FEATURES:**										
68											
69	**Landusers are organized into a group or association to undertake jointly activities in the farm which include operation, input procurement, and marketing of produced crops.**										
70	In Compact farming, farmers cultivate vegetable on a contract growing scheme. Some of the farm practices consist of growing vegetables and fruits using indigenous organic materials as soil conditioner and livestock raising. Vegeta and fruits are cultivated in divided parts but in the same area. Compact farming was organized to enhance group interactions and leadership among members of the association.The aim of the landusers in growing organic vegetables revive and sustain soil fertility and maximize waste management practice. Marigold was also planted in between plots within the farm to prevent and control insect and pest manifestation. Landusers in the barangay were empowered through farming and conservation of the forest area. Through this technology, marketability and available markets for the produced commodities were increased. The association received numerous award in the regional and provincia because of their demonstration of a productive and profitable farming system in the upland area. basis among members of the association. Most of the farmers cultivated one parcel with size ranging from 1000-2000 square meters. ownership and land use right is communal. The farm production is managed by the cooperative composed of small scale land users. Members of the association are enganged in off-farm activities such as hunting and hired labor for additional income.										
71	Establishment activities: Clearing of the area. Establisment cost: 10,400 P/ha. Maintenance and recurrent activities: Plowing, harrowing, establishment of Plots, Organic Fertilizer Application; transplanting, watering spraying of bota pesticide, and harvesting. Maintenance and recurrent costs: Labor - 11, 400 P/ha; Agricultural inputs (seedlings and fertilizers) - 7,850 P/ha. Total - 19,290 P/ha										

DS | Techno-Ecosystem | Techno-Measures | Techno-Function by ecosystem | Approach | Tech | Tech1 | Financial Analysis

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Decision support to select SLM options by Type of Measures

SLM Decision Support Tool (NEW) - Microsoft Excel

K15 =IF(E10=1,Tech!GJ3,IF('Techno-Measures'!E10=2,Tech!GX3, IF(E10=3,Tech!HL3,IF(E10=4,Tech!HZ3,IF(E10=5,Tech!IN3,IF(E10=6,Tech!JB3," "))))))

Sustainable Land Management (SLM) Land use Planning Decision Support Tool

PARTICULAR:

SLM PRACTICES (Approach OR Technology):	Technology

(Project Website)

http://bswm.da.gov.ph/philcat-slm

CONSERVATION MEASURE CATEGORIES: 1- Agronomic; 2- Vegetative; 3 - Structural; 4 - Management; 5 - Agronomic & Vegetative; 6 - Other combination of measures	3

General Description: **Structural Measures**

Count No.	SLM No and Name of the Technology	Location	Land Use	Land Degradation	Conservation Measures & Stages of Intervention	Technical Function	Altitude, meters, above sea level	Annual Rainfall, mm	Landform	Slope	Soil Dep Fertility
1	5. Small farm reservoirs	lowland; upland	Annual cropping	soil erosion and excessive runoff; limited water supply	Structural Measures: Prevention and rhabilitation	Water harvesting/ increase water supply; Control dispersed runoff, retain/trapped; contol concentrated runoff: retain/trap.	< 100; 100-500	1500-2000	plains/hillslopes	rolling	20-50; lov matter co

DS | Techno-Ecosystem | Techno-Measures | Techno-Function by ecosystem | Approach | Tech | Tech1 | Financial Analysis

Ready 80%

Decision support to select SLM options by Functions within specific ecosystem

SLM Decision Support Tool (NEW) - Microsoft Excel

Sustainable Land Management (SLM) Approaches and Technologies Search Tool

PARTICULAR:

SLM PRACTICES (Approach OR Technology):	Technology

(Project Website)

http://bswm.da.gov.ph/philcat-slm

MAIN FUNCTION: 1- Soil Fertility Mgmt (1a-lowland, 1b-upland to hillyland,1c-highland); 2- Water Mgmt (2a-lowland; 2b-upland to hillyland; 2c-highland); 3 - Runoff Mgmt & Erosion Control (Structural) (3a-lowland, 3b-upland to hillyland, 3c-highland) ; 4 - Runoff Mgmt & Erosion Control (Vegetative) (4a-lowland, 4b-upland to hillyland, 4c-highland); 5 - Enrichment & Protection of Vegetative Cover (5a-coastal/lowland, 5b-upland to hillyland, 5c-highland); 6 - Fire and Wind Breaks (6a-lowland, 6b-upland to hillyland, 6c-highland); 7 - Biological Pest Control (7a-lowland, 7b-upland to hillyland, 7c-highland); 8 - Others (8a-lowland, 8b-upland to hillyland, 8c-highland)

5a

Objective: Enrichment and/or Protection of Vegetative cover to address vegetation degradation in the coastal/lowland area

RANGE OF ALTERNATIVE OPTIONS:

Count No.	SLM No. and Name of the Technology	Location	Land Use	Land Degradation	Conservation Measures & Stages of Intervention	Technical Function	Altitude, meters above sea level	Annual Rainfall, mm	Landform	Slope	Soil Depth, cm & Fertility Status
1	32. Mangrove as buffer against natural hazard	Coastal area	Forest/woodlands; crustaceans breeding ground	Reduction of vegetation cover; loss of habitats	Vegetatative measures; prevent land degradation	Conserve ecosystem; preserve improve biodiversity; reduce disaster; adapt to CC; mitigate	0.00- 100	1,500 - 2,000	Coast	0-2	Low

DS | Techno-Ecosystem | Techno-Measures | Techno-Function by ecosystem | Approach | Tech | Tech1 | Financial Analysis

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Decision support to select SLM options by Functions within specific ecosystem

SLM Decision Support Tool (NEW) - Microsoft Excel

The Highly Diversified Cropping in Live Trellis System is a traditional or local farmers' nitiative technology widely practiced in Brgy. Bukal, Nagcarlan, Laguna situated in the area of Mt. Banahaw. The area with rolling to hilly terrain is receiving an annual rainfall of 1000-2000 mm. Each of the farmers who practiced the technology has 0.5 to 1.0 ha production area. Moreover, the community is accessible to infrastructures such as chools and market. Soils in the area is relatively good for agriculture cultivation. Kakawate, a small to medium-sized, thornless tree which usually attains a height of 10-12 m is being used as live trellis or "balag" to various annual crops such as tomato, cucumber, chayote, beans, and ampalaya in the community. The cropping system is highly diversi□ed since crop rotation is being practiced throughout the year. Aside from being an anchorage for annual crops, kakawate also stabilizes sloping lands and reduces soil erosion due to its strong roots which can grow 3-5 meters laterally, thereby holding the soil firmly. They are planted in a row of approximately 2-3 meters making it more effective in preventing soil erosion. Furthermore, kakawate is being trimmed and maintained every 3-6 months or as needs arise to a approximate 3 meters high as live trellis, the trimmed leaves are very rich in nitrogen and will eventually serve as compost or crop cover. These will help in improving soil quality and moisture in the soil. In addition, kakawate has multiple uses and benefits; they can serve as hardwood or firewood when matured, as materials in making furniture and anchorage for □owering plants like orchids. In establishing the live trellis system, kakawate trunks/or cuttings "quick sticks" with at least 2-meter height are planted in a row. An estimate of 0.5 to 1 meter planting distance within a row and also between rows is used. When the kakawate trunks are already set up and planted, they are interconnected using a metallic wires. Along these wires, plastic straws are tied in a vertical position whereby crops can utilize this straws for creeping/ climbing . Finally, the desired crop will be planted according to their cropping pattern. Maintenance of the technology includes: weeding and trimming. During infestation, application of pesticide is done but in minimal. The technology requires manual works resulting to elimination of machines that contributes to soil compaction. The technology has been a practice in the community for a long time, and land users continue to adopt the technology because of it's easiness and inexpensiveness to establish, and low cost in terms of maintenance activity. Adding up to this is the variety of plants to be grown, making their market more pro□table. Gliricidia normally grows in tropical countries like the Philippines and is being utilized as hedgerows for erosion control measures. Over the years, its effectiveness as erosion control is known, and an increasingly used forage crop in cut-and-carry systems.

Establishment activities: Manual labor for weeding, planting, fertilizer applicatio, harvesting and hauling - P3,600/ha; Planting materials - P2,550/ha; Fertilizers and biocides - P10,030/ha; Construction materials - P3,880; Total cost - P20, 060. Maintenance activities: Labor for weeding, trimming of kakawate, application of ferilizers, spraying - P4,500/ha

ASSESSMENT OF THE TECHNOLOGY:

Production and Socio Economic Benefits (2.68-4.40)	Socio-cultural Benefits (2.52 - 3.97)	Ecological Benefits (3.22-4.25)	Offsite Benefits (2.67-4.04)	TOTAL (11.09-16.66)
4.20	3.50	4.00	3.50	15.20
High	Medium	High	Medium	Medium

Specific and Total Benefits are assessed as high, medium, little or negligible

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Financial and Economic Analysis as basis in making decision

SLM Decision Support Tool (NEW) - Microsoft Excel

C. Project Profitability Indicators

Financial Analysis			Sensitivity Analysis: +20% in Cost	Sensitivity Analysis: +20% in Cost -20% in Benefit
1. Net Present Value (NPV)*:	1,947,931.36	P	1,578,291.42	819,065.22
2. Benefit - Cost Ratio (BCR)*:	2.05		1.71	1.37
3. Internal Rate of Return (IRR):	60.671	%	45.146	29.710

3.1 Trial Method for IRR Calculation	*Assumed Discount Rate:*	*Total Present Value*	
Lower Rate:	60 %	5,998.11	(Positive NPV)
Upper Rate:	64 %	(29,766.08)	(Negative NPV)

3.2 Sensitivity Analysis:

20 % increase in cost			*20% increase in cost and 20% decrease in benefit*		
Assumed Discount Rate (%):		*Total Present Value*	*Assumed Rate:*	*Total Present Value*	
Lower Rate:	45	2,204.66	29	16,596.12	(Positive NPV)
Upper Rate:	46	(12,927.08)	30	(6,765.99)	(Negative NPV)

Note: IRR is a discount rate that makes the NPV of all cash flows equal to zero.

Decision points >>>	NPV ≥ 0	BCR ≥ 1	IRR ≥ relevant discount rate

Techno-Measures | Techno-Function by ecosystem | Approach | Financial Analysis

Ready

Conclusion

- Soil and water conservation should be examined in the general framework of sustainable development goal that addresses
  - environmental challenges (e.g. climate change, land degradation, bio-diversity loss),
  - attainment of economic targets, and
  - provision of social needs;

Conclusion

- **WHAT WE NEED>>>>>>>**

  - Effective knowledge management and decision support tools to contribute in up-scaling, replicating and mainstreaming SLM practices into Local Government Development Plan;

  - Enabling environment in terms of a unified soil/water-related policies, institutional arrangements, financing and marketing support, and incentive mechanisms to broaden the implementation of sustainable land management, specifically soil and water conservation.

Thank You and Good Day!