M O D U L E  4   L A N D  M A N A G E M E N T

S e s s i o n  2   S o i l  a n d  W a t e r  C o n s e r v a t i o n
In the Uplands

S e s s i o n  O b j e c t i v e s
At the end of the session, the participants should be able to:

1. Articulate and explain the role of soil and water in upland agriculture and their effects on the lowlands;

2. Discuss the problem and the factors affecting soil erosion and degradation in the uplands;

3. Discuss the different practices of soil and water conservation, including their advantages and limitations;

4. Determine the appropriate soil and water conservation options for specific needs or problems; and

5. Demonstrate different SWC methods and practices.

S u g g e s t e d  M e t h o d s
Site visit, workshop, sharing of experiences, discussion, lecture, inventory and assessment of existing SWC practices, and on-site planning

L e a r n i n g  M a t e r i a l s
Transparencies or PowerPoint presentations overhead or LCD projector
Flipcharts, photographs realia/object media, papers, pencils cartolina or manila paper, crayons A-frame, slope indicator, stakes (madre de cacao branches or bamboo), flamengia and/or
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rensonii seeds, bolo, work animal (for demonstrating NVS, others) and evaluation form/tool or rating sheet for the plan and demonstration and handout

Evaluation Methods
Graded fieldwork/demonstration

Time Allotment
5.0 hours

Content
1. The role of soil and water in upland agriculture
2. Soil erosion and the factors affecting it
3. Principles and strategies of soil conservation
4. Soil and water conservation options for upland farmers

IMPORTANT:
After presentation of group outputs, the Resource Person further discusses the topics to emphasize or include what have been left out in the discussions based on the following details of session contents:

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>CORE MESSAGES</th>
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<tbody>
<tr>
<td>Role of soil and water in upland agriculture</td>
<td>1. Soil and water are the primary resources in agriculture. Both are vital resource for plant growth.</td>
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<tr>
<td></td>
<td>2. Water constitutes 80 to 90 % of agriculture as it is needed by crops and animals for growth and development. When water is limited, agricultural</td>
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</table>
3. Nutrients, whether applied or naturally occurring, are mostly found in the topsoil. Soil organisms that are beneficial to plants are also found in the soil.

4. When not properly managed, water can become a threat to the soil.

5. When the top soil is washed away by run-off, the nutrients are also removed, thus, depriving the plants of the needed elements.

6. Eroded soils settle on river beds, lakes, irrigation canals or on low-lying fields, usually in the lowlands.

Soil erosion

Soil erosion is the detachment of soil by rainfall or other agents such as wind and gravity.

What is removed during erosion is the topsoil, the most fertile part of the soil profile.

Large amounts of soil humus and available nutrients are lost resulting to loss of soil fertility.

Loss of soil fertility as a result of erosion has been identified as the major cause of poverty in the uplands.

(Note: The Resource Person presents the diagram showing the effects of soil erosion on soil fertility and productivity and its impact on poverty.)

Factors affecting soil erosion

1. Rainfall
2. Slope
3. Soil erodibility/soil type
4. Vegetation
5. Farming practices

Soil and water conservation:

Erosion can be controlled by (a) protecting the soil, (b) reducing soil susceptibility or (c) combining protection and reducing susceptibility.
principles and strategies

susceptibility.

1. The soil can be protected by canopy or groundcover provided by trees and crops.

2. Reducing the length and steepness of slope reduces velocity of runoff, thus, protecting the soil also.

3. Improved soil management such as incorporating crop residues, animal manure and other forms of organic fertilisers improves soil structure, thus, increasing water holding capacity.

4. Minimising tillage or cultivation and proper cropping sequence and arrangement protects the soil and reduces vulnerability to erosion.

Soil and water conservation practices: options for upland farmers

A. Agronomic practices

Diversified or integrated farming - different components in appropriate parcels or parts of the farm such that cultivation in steep slopes is minimised while providing barriers to erosion in gentle slopes.

Multiple cropping - cultivation of two or more crops on the same piece of land to increase farm productivity, diversity and soil stability.

a) Intercropping - growing two or more crops simultaneously in the same field with the period of overlap being long enough to include the vegetative stage.

b) Relay cropping - planting of two or more annual crops simultaneously such that the second crop is planted between the rows of a standing crop with minimum soil disturbance after the latter has flowered or nearing its harvest.

Agroforestry - planting of trees on farm to increase farm productivity and profitability
while protecting sloping lands and regenerating degraded soils.

**Alley or strip cropping** - growing crops in alleys or strips between leguminous hedgerows or other barriers along contour lines. With alley cropping, soil erosion is minimised as sediments are trapped at the base of the hedgerows or other barriers that also reduce surface runoff velocity. The barriers facilitate the eventual formation of bench terraces over time.

**Minimum tillage** - growing of crops with minimum soil cultivation and disturbance.

**Cover cropping** - planting of leguminous cover crops such as forage peanut (*Arachis pintoi*) and kudzu (*Pueraria phaseoloides*) to protect the soil from erosion, help conserve soil moisture and provide nitrogen.

**Mulching** - utilising materials from the farm such as dried leaves that can be used to cover the soil for erosion control, weed control and moisture conservation, and eventually as organic matter for soil improvement and plant growth.

**Contour farming** - cultivation and planting along the contour. Using devises such as the A-frame, contour lines are established and used as guides in tillage and planting operations.

**Application of organic matter** - increasing the organic matter content improves soil structure thus enhancing the water holding capacity of the soil.

### B. Vegetative barriers

**Contour hedgerows** - shrubs are planted along the contour line to serve as barriers to soil erosion.
Natural Vegetative Strip (NVS) - simply leaving a half-meter grass strip along the contour during land preparation.

C. Non-vegetative/Physical barriers

Bench terrace - construction of benches along the contour (or across the slope) using the “cut and fill” method to break the flow of runoff water.

Rock wall - piling of rocks following the contour line in order to establish a physical barrier to soil erosion.

Pole barrier - construction of fence-like structure along the contour using ipil-ipil or other locally available poles. The poles can be reinforced with twigs, branches and other farm materials.

Trash bund - piling of farm trash such as stems, branches and twigs of trees and shrubs; banana stems and coconut husks along the contour line to help minimise erosion.

D. Drainage and diversion structures

Contour ditch/drainage canal - following the contour line, construct ditches to serve as drainage for water and minimize erosion losses. It is better to start constructing ditches at the upper portion of the slope. The distance between ditches depends on the slope. This may follow the hedgerows or vegetative strips. As a general rule, the steeper the slope, the closer the ditches.

Making the right choice

There is no limit as to what and how many methods should a farmer use. The choice depends on sound farm plan, crop match, practicability and appropriateness of one or combination of methods, with the farmer’s decision and choices anchored on full understanding of SWC.
Session and Activity Guide

SOIL AND WATER CONSERVATION IN THE UPLANDS

I. Introduction to the Session

II. Session Proper

Activity 1 Site Visit

Duration: 1 hour

Objectives:

1. Give participants first hand exposure to upland farming environment
2. Bring the session in the context of land management and sustainable agriculture.

Materials: Manila paper, cartolina/meta cards, marking pens, and masking tape or adhesives

Procedure:

A. Field Observation (30 minutes)

1. Divide the participants into 4 groups of 4 - 6 members each.
2. Take the groups to one portion of the Learning Site (or to nearby upland/sloping field)
3. Based on the field situation and their own experiences and observations, ask the groups to determine what could have been the flow of nutrients in that kind of situation (how nutrients are utilized or how nutrients are lost during farming or cropping season) Give the groups 10 minutes to observe and discuss
4. Ask the groups to go back to their respective places.
5. Give them a set of the materials listed above.
6. Tell them to organize their observations by illustrating the nutrient flow, utilization and loss.
7. Ask the participants to list down what must be done to make nutrient use efficient, or to keep soil loss minimal.

B. Presentation of Outputs (30 minutes)

1. Gather the participants in a plenary.
2. Ask each group to present the outputs for activity 1.
3. Ask each presenter to emphasize on the most critical points where nutrient loss is believed to be highest, and the ways to make nutrient use efficient, or to keep soil loss minimal/tolerable.
4. Ask for additional comments or additional information from the other participants.
5. Process and synthesize learnings.

Activity 2  Workshop/Small Group Discussion

Duration: 1 hour and 30 minutes

Objectives:

1. Measure participants, level of awareness and appreciation of the role of soil and water in sustainable agriculture;
2. Get the participants’ knowledge on soil erosion problems; and
3. Get the participants knowledge, experiences and practices in soil erosion prevention and/or control.

Materials: Manila paper, cartolina/meta cards, marking pens, and masking tape or adhesives

Procedure:

1. Refer to the same groupings in activity 1.
2. Give each group a set of the materials listed above.
3. Assign the groups separately to discuss the following topics:

NOTE: If there are more than 4 groups, one topic may be broken down to maintain small groupings and ensure adequate participation given limited time. Duration of workshop/discussion: 30 minutes
Group 1 Topic 1: The role of soil and water in upland agriculture and poverty alleviation

Guide the participants in listing down the benefits of soil and water conservation to agriculture and poverty alleviation.

Group 2 Topics 2: The Effects of Irresponsible Use of Land for Farming

In the context of both upstream and downstream, ask the participants to enumerate or illustrate the effects irresponsible use of land/farms on the following:

a. Landscape  
b. Lives of people

Group 3 Topic 3: Factors Affecting Soil Erosion

Guide the participants in listing down the factors that cause or accelerate soil erosion, by order of importance (or extent to which a factor causes the problem).

Group 4 Topic 4: Practices to Prevent or Minimize Soil Erosion

Guide the participants in listing down soil conservation or soil prevention practices they have observed, taught or personally adopted in their areas. Encourage them to illustrate or draw the practices.

4. Give the groups 30 minutes to discuss and write/illustrate their outputs using manila paper or meta cards.

C. Presentation of group outputs (45 minutes)

1. Gather the participants in a plenary.  
2. Ask each to group to present their outputs for activity 2.  
3. Ask the presenter to emphasize on the most critical points  
4. Ask for additional comments or additional information from the other participants.

D. The Resource Person processes and synthesizes learnings. Then, he/she fills the knowledge gaps by adding information that the groups may have missed. (15 minutes)
Using appropriate visual aids, the Resource Person discusses other available practices that are applicable under local conditions. Particularly for practices that depend on the contour, a demonstration on the construction, calibration and use of instruments used in determining contour lines, such as the A-frame, is suggested. The applicability, advantages and limitations of each must also be presented.

Activity 3  Fieldwork (On-site planning & demonstration)

Duration: 1 hour and 30 minutes

Objective: Enhance participants’ skills in planning and using/implementing SWC interventions

Materials: Cartolina or manila paper, crayons, A-Frame, slope indicator, paper, pencil, stakes, madre de cacao, seeds of flamengia, bolo, plough and farm animal (for demonstrating NVS, others), evaluation form/tool or rating sheet for the plan and demonstration

Procedure:

1. Refer to the same groupings in activity 1 workshop.
2. Assign each group a specific land parcel or parcels of the Learning Site or nearby farm (preferably a vacant one and used during the STOP session)
3. Instruct the groups prepare a soil and water conservation plan for the assigned parcel or parcels, using their knowledge on STOP.
4. Using the evaluation tool, EVALUATE the plan. Correct as appropriate. Give go signal to implement, after corrections have been made.
5. Using the evaluation tool, EVALUATE implementation by group, then by individual.
6. Process the experience and emphasize critical points and correct common mistakes.

III. Summary/End of Session
IV. Evaluation (if any, aside from the graded/corrected hands-on)
SWC Field Guide

ESTABLISHING CONTOUR LINES

Contour lines are usually established with the aid of surveying equipment, but practical instruments could also be used. A simple, easily constructed and most commonly used instrument is the A-frame. This is cheap and could be constructed using locally available materials.

I. Making an A-frame

1. Secure the following materials:
   - three wooden or bamboo poles about 4 cm in diameter, two of which should be around 2 m in length and the other about 1 m
   - sturdy string for tying or nail
   - a rock about the size of a fist or any similar heavy object to serve as bob

2. Tie tightly or nail the two longer poles at one end, about 10 cm from the end. The poles will serve as the legs of the A-frame. Make sure the poles are securely fastened to prevent them from slipping.

3. Spread the A-frame’s legs and brace them with the shorter pole to make a figure “A”. Tie tightly or nail the crossbar (about 10 cm from each end) to the middle of the legs of the A-frame. The crossbar will support the legs of the frame and will serve as guide in determining the level ground position.

4. Tie one end of the string to the midpoint where the two legs of the A-frame are joined.

5. Tie the other end of the string to the rock or any object for weight to serve as bob. The object should be heavy enough so that when suspended, it will not sway with the wind. The rock should hang about 20 cm below the crossbar.

II. Calibrating the A-frame

Before using, it is necessary to calibrate the A-frame to ensure accuracy. Calibrating the A-frame is finding its level mark. The following are the procedures in calibrating the A-frame:
1. Locate a reasonable level ground and place the A-frame in an upright position. Mark the spots where the legs (A and B) touch the ground. Mark on the crossbar where the bob string crosses.

2. Reverse the position of the A-frame’s legs such that leg A is exactly on the same spot where leg B was and vice versa. Again, mark on the crossbar crossed by the bob string.

3. If the two marks are exactly on the same spot, this means that you have found the level mark of the A-frame and that the A-frame is standing on level ground. If the two marks are separated, mark the midpoint between them and that becomes the level mark of the A-frame.

4. Two points on the ground touched by the A-frame legs are of the same level if the bob string crosses at the level mark of the frame.

5. Check calibration from time to time.

III. Establishing the Contour Lines Using the A-frame

1. One person holds the A-frame while another marks the located contour lines.
2. Drive the first stake at the boundary of the area and position one leg of the A-frame beside and just above it.

3. Locate a spot in the ground that is of the same level with the first leg by adjusting the location of the second leg, such that the bob string crosses at level mark of the A-frame. Mark this point on the ground by driving another stake just below the second leg.

4. Make the A-frame and place the first leg to exactly where the second leg previously was. Repeat steps 1-3 until the contour lines are determined for the whole area.

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Suggested References:

