

allowed to graze in a pasture area more than what it can normally support also known as grazing capacity. In this situation, the animals does not only compact the soil but usually deplete the existing vegetative cover leaving the soil bare.

4. Up-and-down cultivation. This involves land preparation by plowing the field along the slope of the land. The practice is only done to ease land preparation. However, this makes the soil more vulnerable to detachment and makes the transport of particle carried by rain water running down the slopes in a much higher velocity.



Sustainable land use management is very essential in developing the potential of marginal upland for agricultural production. This is achieved by utilizing the land in a way that will provide maximum protection of natural resources.

Erosion control measure and soil fertility improvement are soil conservation practices that can make up an integrated approach to vulnerable upland farm management. These practices focus more on agronomic principles through vegetative means to control overland flow, soil movement and improved soil fertility. The strategy involves the management of crop cover, modification of cultivation and establishment of supplemental structures to protect the soil from raindrop impact and overland flow. Practices include:

1. Contouring.

It involves establishment of contour lines which can be laid out with the use of an **A-frame** made of wooden or bamboo poles nailed or tied together in the shape of capital letter



A, a string and stone.

2. Vegetative barrier. This is the modification of slope length and gradient to reduce the velocity of water brought about by heavy rains that run down the slope. The most common vegetative barrier in the country is hedgerow inter-cropping. It is an agro-forestry technique that involves the planting of tree/shrub and crop species along the contour line in a double row. Another simple practice is the natural vegetative strips (NVS), where a small portion (1 meter in width) of the farm with natural vegetation is left unplowed.



3. Supplementary structure.

These are structures established in association with the main vegetative soil conservation measure to prevent and stabilize gully formation and are usually found in localized portions of the farm. A good example of this structure is brush dam made of bamboo.



4. Agronomic measures and fertility improvement.

This involves the management of crop cover and modification of cultivation practices to protect the soil from raindrop impact and overland flow. In many areas these practices are implemented to supplement other soil conservation practices (i.e. crop rotation, multiple and/or inter-cropping, contour and/or minimum tillage).



THE **SOIL** AS A NATURAL RESOURCE



Department of Agriculture
BUREAU OF SOILS AND WATER MANAGEMENT

For further information, please contact:

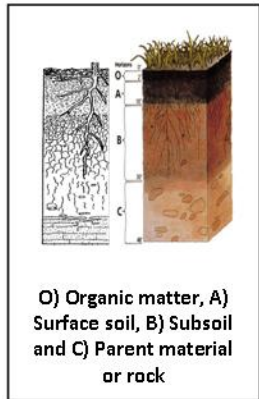
Soil Conservation and Management Division
Bureau of Soils and Water Management
Elliptical Rd., Cor. Visayas Ave., Diliman, Quezon City
Telefax: (02) 923-0459

WHAT IS SOIL?

Soil is the upper thin layer of the earth's surface derived from the weathering of rocks and minerals. It was formed in a very slow process and takes a hundred years to develop a thin layer of about 2.5 centimeters. Careless use of the land can lose this much soil in just one heavy rain. This, then, emphasizes the need for proper use and conservation of our land.



Topsoil is the upper, outermost layer of soil, usually the top 2 inches (5.1 cm) to 8 inches (20 cm). It has the highest concentration of organic matter and microorganisms where most of the Earth's biological soil activity occurs.



The supply of inherent nutrients in the soil for plant growth is exhaustible. These nutrients are subject to continuous removal either through harvest or crop removal, volatilization, leaching and erosion. All of these are greatly influenced by destructive human activities that contribute to land degradation. For this reason, sustainable land use management and soil conservation approaches focusing on erosion control and fertility improvement must be the concern of everyone.

COMMON CAUSES OF LAND DEGRADATION

About 45% of arable land in the Philippines has been degraded triggering the movement of subsistence farmers to marginal lands with the hope of meeting their day to day food requirement. The most common cause of land degradation in the Philippines is **harvest/crop removal** and **soil erosion** that pose detrimental effects to soil physico-chemical and biological properties resulting to fertility decline.

Harvest and/or Crop Removal

Crops absorb soil nutrients from the time of germination to harvesting. Nutrients that are absorbed and not utilized by the plants are retained in its biomass (i.e. rice straw, corn stalks, grain, fruits). These nutrients are considered lost, particularly if crop residues are removed or sometimes burned after harvesting. Thus, soil fertility can be maintained to sustain crop production when nutrients removed from the soil in the harvested parts of the plants are replaced.

Nutrient loss due to crop removal can be avoided through proper crop residue management. Nutrients that are absorbed and not utilized by the plants can replenish the soil fertility if returned to the soil and decayed. It can be done by **composting**; incorporation during land preparation for the succeeding crop and when used as mulch.



Composting



Residue incorporation

Soil Erosion

Soil erosion is an undesirable process in agriculture that causes land degradation. It is a natural phenomenon that washes off our land thereby resulting to nutrient losses, low productivity, low farm income, high cost of production and bigger floods. It is a resultant effect of the interaction of the bio-physical and human factors. The heavily and seasonally concentrated rainfall, slope and very vulnerable soils in the Philippines are conducive to high erosion risk. Soil erosion is likewise predominantly caused by destructive human activities. These activities are:

1. Slash-and-burn agriculture or shifting cultivation (Kaingin). This is a common



practice by upland dwellers who cut down and burn the remaining forest and existing vegetation to farm and plant the area to agricultural crops (i.e. rice, corn, vegetables). Before the plants could provide sufficient vegetative cover, the area is subject to the impact of rainfall and overland flow. When this people continue on cultivating the soil, the situation worsens.

2. Indiscriminate cutting of trees. This activity includes the removal of forest trees by loggers and firewood gatherers for various uses like charcoal making.



3. Overgrazing. This is a practice where a large number of animals are

