November 2010

Extension Service Monthly Message

ROOTS of PEACE

CHAMP@rootsofpeace.org

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FROM THE AMERICAN PEOPLE

Commercial Horticulture and Agriculture Marketing Program (CHAMP)

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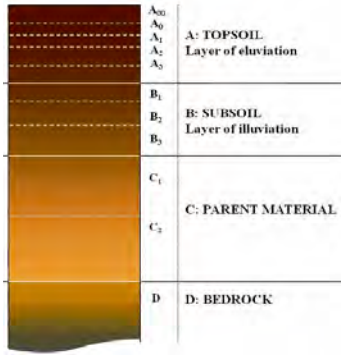

The Gardener

A monthly newsletter for the agricultural community

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The Soil

Soil is composed of a mixture of particles from 2µm to small gravel and stones. These mineral fractions are known as soil separates. According to the size of the particle, they can be sand, fine sand, silt, or clay particles. Normally the smaller particles are "glued" together by organic mater, iron oxides, and other substances. We call the products of this aggregation aggregates. These can be natural aggregates, which are called "peds," or artificial aggregates, called "clods", which are evidence of human intervention. The grouping of soil aggregates together produces the soil structure.

There are five types of soil structure:

Platy structure: Subsurface soil, where the platy layers separate more easily. Normally this soil is the result of leaching and compaction.

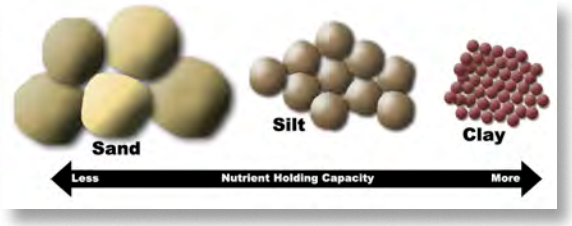
Blocky structure: Common in sub-soils or surface soils with high clay content. When the surface dries up, it shows features of cracking and peeling of the clay.

Massive structure: An Amorphous material with a coherent mass showing no evidence of any distinct arrangement of soil particles; separates into clusters of particles, not peds (Clay-like soils).

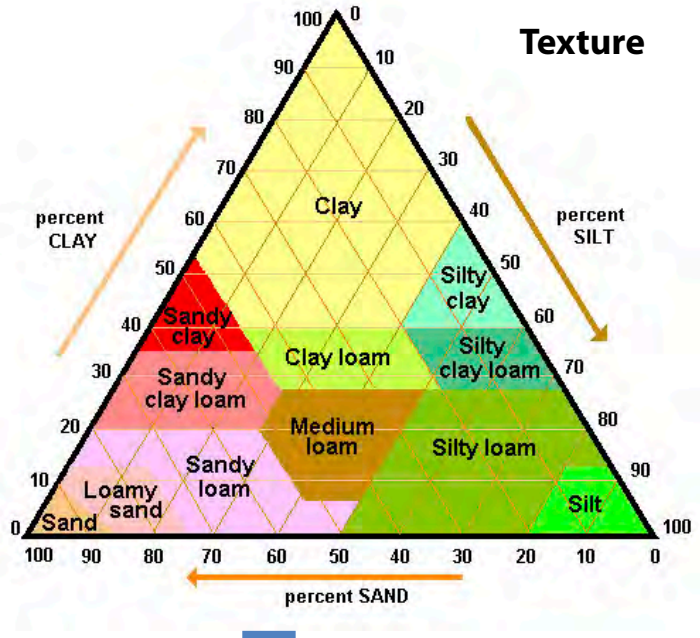
Prismatic structure: Typical in "B" horizon. The prisms are very dense, therefore these types of soils are not fertile.

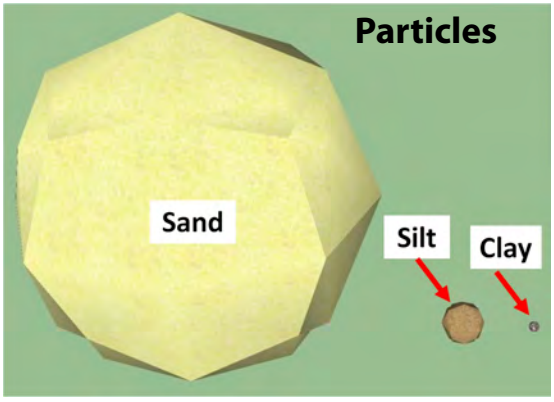
Unstructured soils: Typical in wind blown or Aeolian sands. There are no discernible peds.

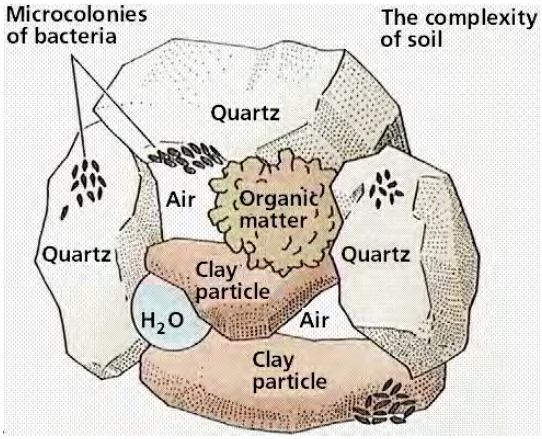
The soil profile, a vertical cross-section, shows four main fractions of the soil. The top level is the topsoil (A horizon) divided into two main fractions: loose litter, and below it, fermented litter. Both are divided into sub-fractions, and are indicated as follows: A00, A0, A1, A2, A3. Topsoil is high in organic matter and clay content; it also contains a mass of microbiological life forms—more than any other soil fraction. The subsoil (B horizon) lies beneath the topsoil. This fraction is rich in accumulated minerals and lime. Like topsoil, it is generally divided into different sections: B1, B2, B3. The third main fraction is called parent material (C horizon), and is the result of mechanically weathered rock. The last fraction is the bedrock (R horizon).



Soil Properties

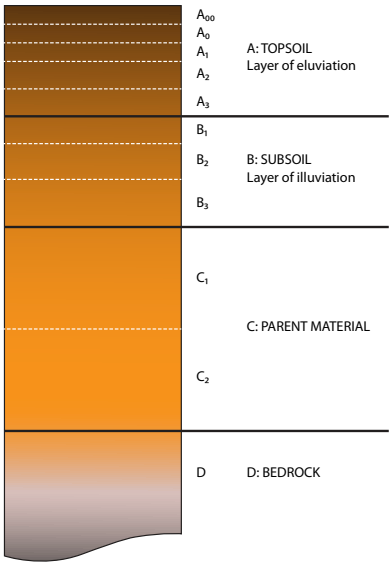






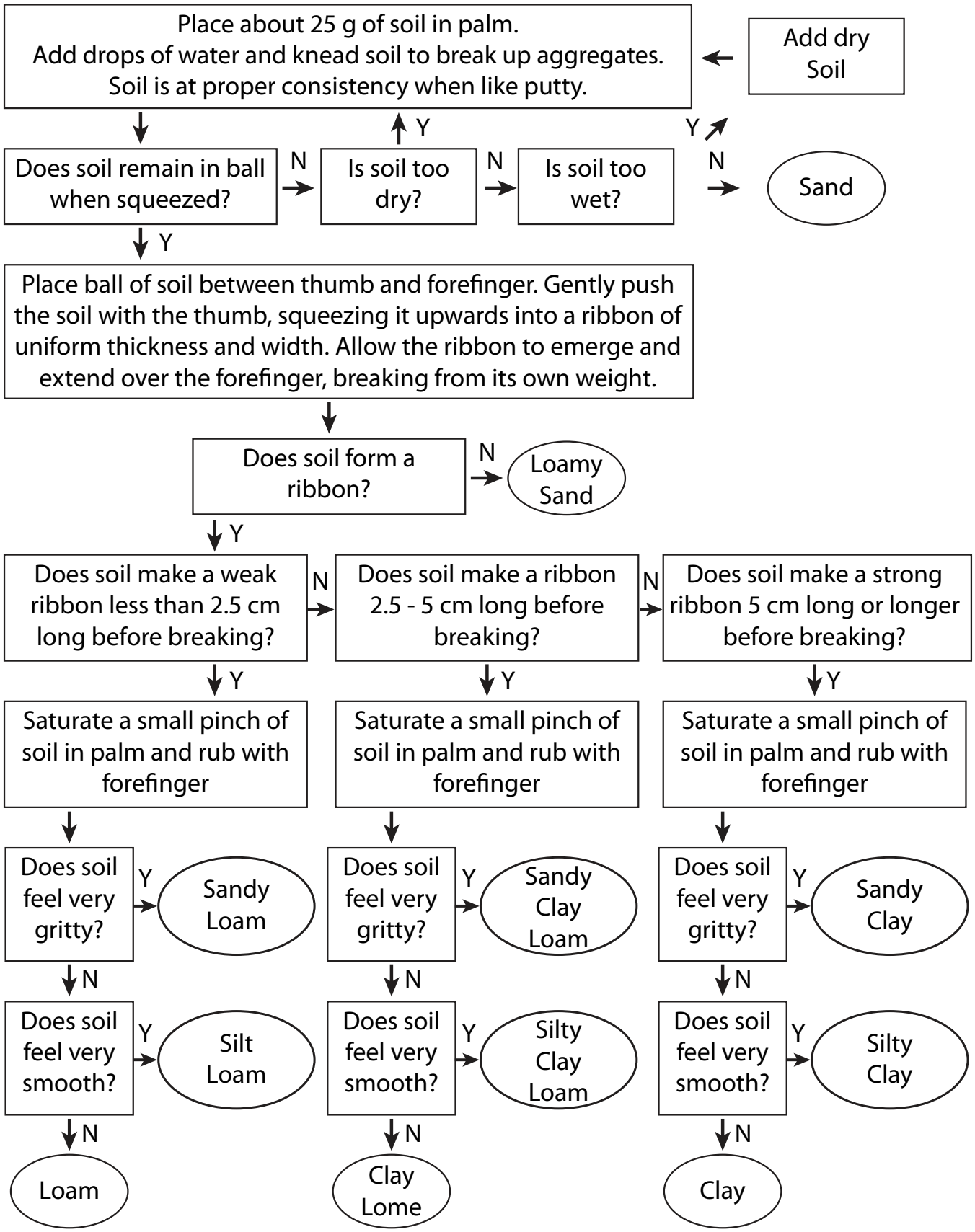
Aggregate

Structure



Profile

Hand Texturing Guide



Soil Structure

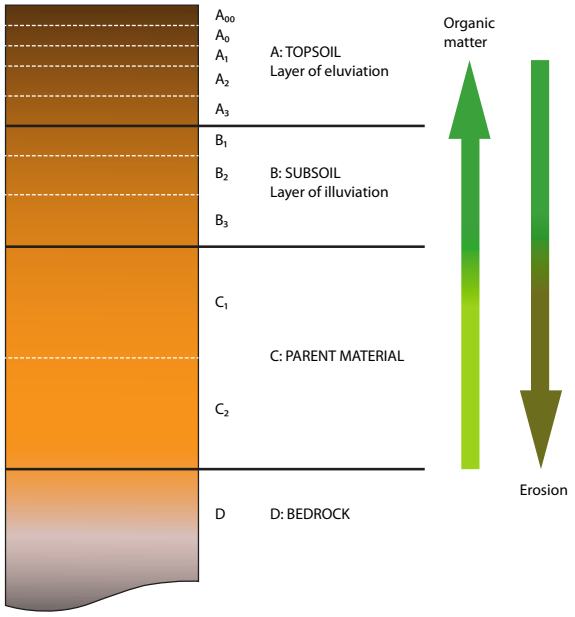
Code	Description	Details
BK	Blocky	Irregular blocks that are usually 1.5-5.0 cm in diameter. Peds bounded by flattened, rectangular faces intersecting at relative sharp angles or bounded by slightly rounded, sub-rectantular faces with vertices of their intersections mostly sub-rounded.
GR	Granular	Spheroidal peds bounded by curved or very irregular faces that do not adjoin those of adjacent peds. Resembles cookie crumbs with less than 0.5 cm diameter. Typical structure for surface horizons.
PL	Platy	Peds flat or plate like, horizontal planes more or less well developed. Usually found in compact soils.
PR	Prismatic	Vertical faces of peds well defined and vertices angular (edges sharp), prism tops essentially flat. Frequently found in lower horizons.
COL	Columnar	Vertical edges near top of columns not sharp (vertices sub-rounded); columns top flat, rounded or irregular. This type of structure is common in arid areas.
SGR	Single Grained	Loose, incoherent mass of individual primary particles, as in sands. No soil in class.
MA	Massive	Amorphous, a coherent mass showing no evidence of any distinct arrangement of soil particles; separates into clusters of particles, not peds. No soil class.

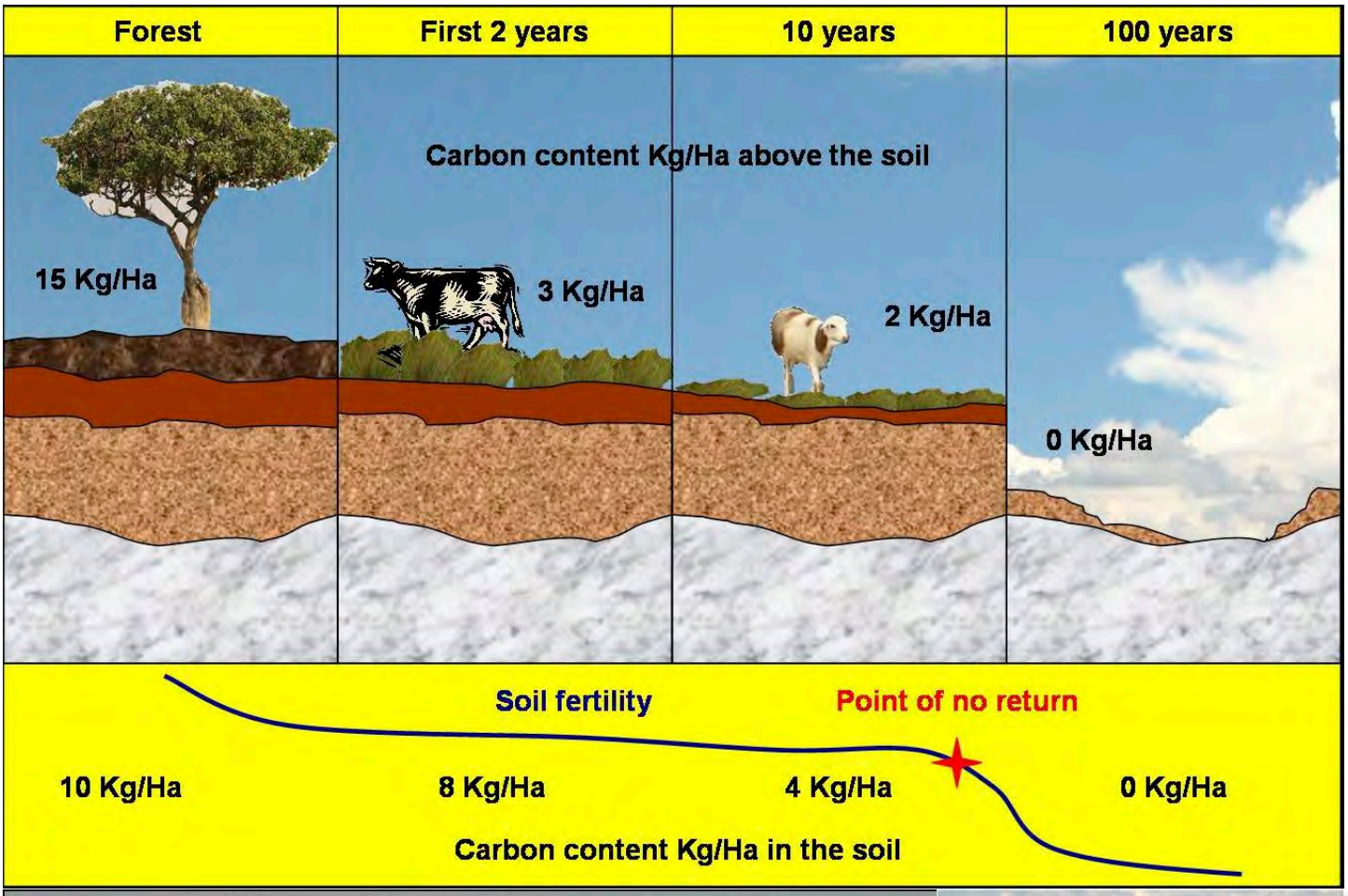
Soil Erosion

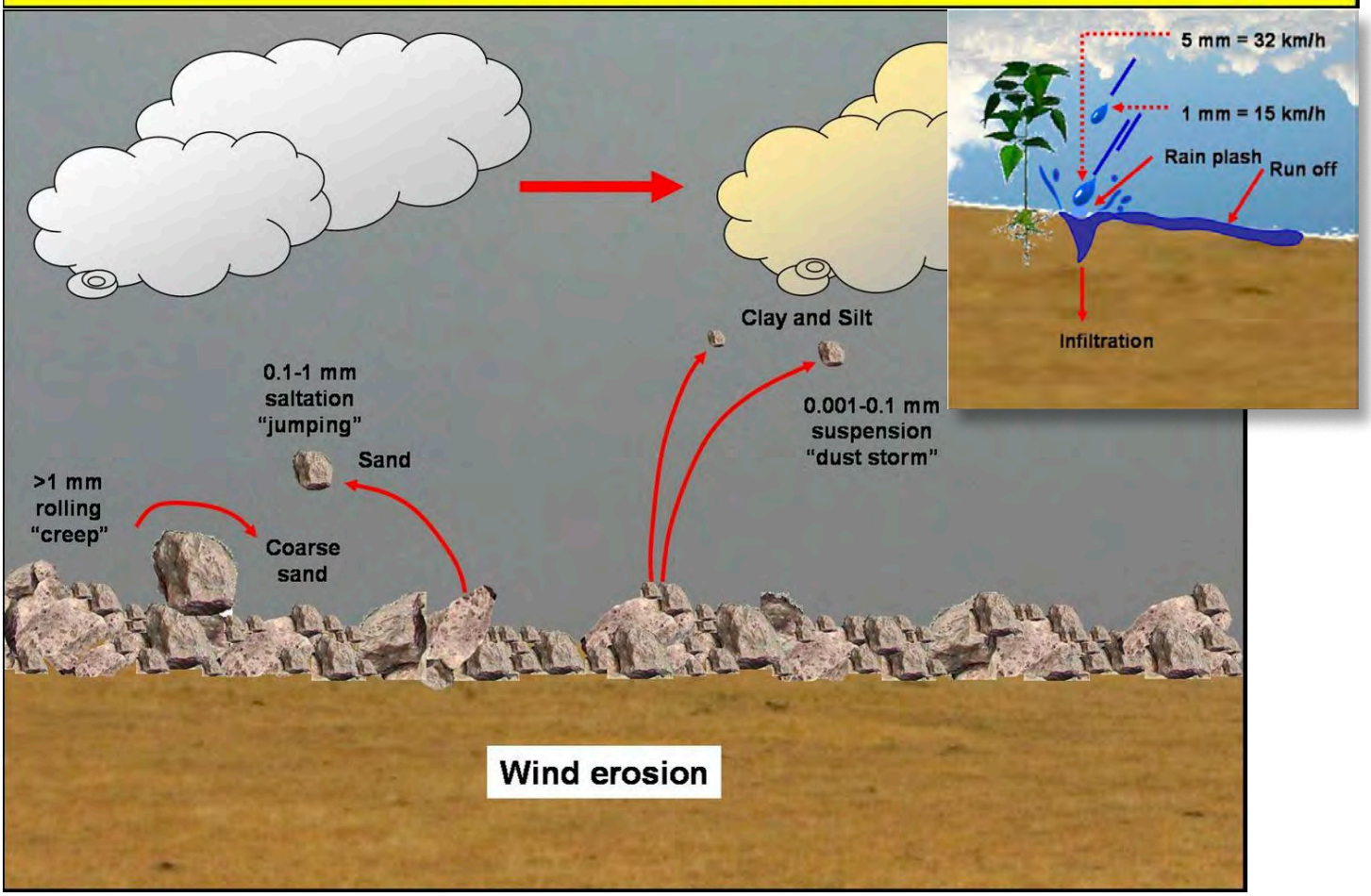
The landscape changes by natural processes of geological erosion. In normal conditions the landscape evolves extremely slowly, and the loss of soil is balanced by the process of soil formation. However, when soil quality declines, the erosion process accelerates, which increases the rate of damage to the soil considerably, and depletes it. Accelerated soil erosion, typically the consequence of human intervention, removes more soil from the land than the soil forming process is capable of replacing, and brings about a gradual decline in soil quality.

Soil erosion is caused by either wind or water. The effect of wind erosion is not as visible as that caused by water, however huge volumes of soil can be removed by wind annually. The loss of 2.5 cm of soil reduces the harvest by 5-10%.

Water erosion is caused by rain splash or run-off. Rain splash means the impact of individual drops of water falling fast; the drops detach and disperse soil particles and the infiltration capacity of the soil is reduced when the surface crusts over. Run-off flows over the ground surface and transports detached soil particles and/or scours out large rills and gullies. In summary, rain splash causes sheet erosion, and run-off causes the erosion in the form of rills and gullies as well as sheet erosion.




Forest
First 2 years
10 years
100 years
Carbon content Kg/Ha above the soil
15 Kg/Ha
3 Kg/Ha
2 Kg/Ha
0 Kg/Ha
Soil fertility
Point of no return
10 Kg/Ha
8 Kg/Ha
4 Kg/Ha
0 Kg/Ha
Carbon content Kg/Ha in the soil


5 mm = 32 km/h
1 mm = 15 km/h
Rain plash
Run off
Infiltration
Clay and Silt
0.1-1 mm
saltation
"jumping"
Sand
0.001-0.1 mm
suspension
"dust storm"
>1 mm
rolling
"creep"
Coarse
sand
Wind erosion

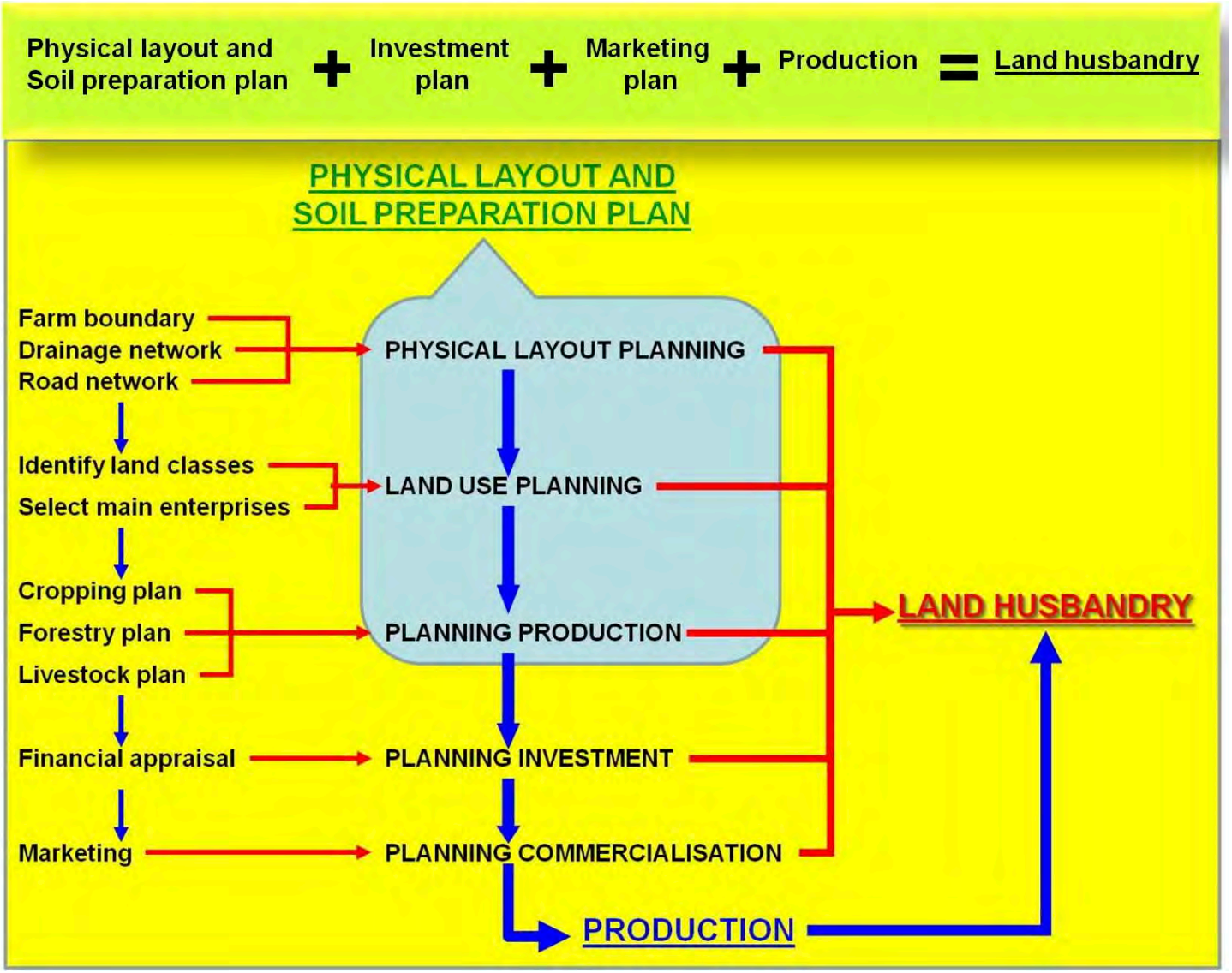
Land Husbandry

Land husbandry can be defined as land use management, or looking after the land. The main concepts of land husbandry are:

- Maintenance of soil health, including erosion control
- Water management and conservation
- Woodland and rangeland management

The fundamental strategy to maintain healthy soil is to avoid biological, chemical and physical degradation. Accelerated soil erosion, mainly as a consequence of human intervention, removes more soil from the land than the soil forming process is capable of replacing, which in turn brings about a gradual decline in soil quality. The relationship between forest and the local community seems to be mutually damaging. The destruction of natural resources undermines the socio-economic security of the population.

Any action taken to resolve the problem should only happen after farmers and members of the community have been sensitized on how to take care of their environment. This is a daunting challenge since individual and collective responsibility tends to be ignored when it comes to the use of natural resources, and this abuse is widespread.



Land Preparation

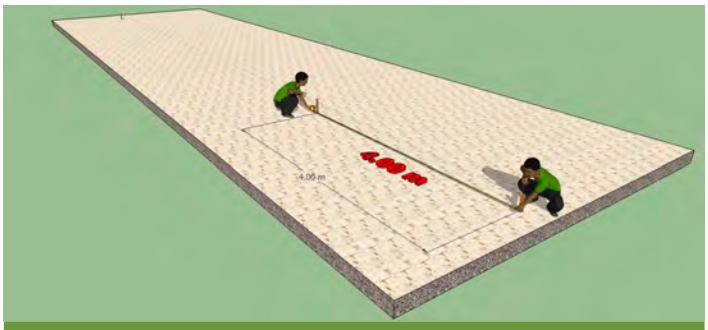
Annual ridging or building basins by hand-tools is a common practice. Since the farmers cultivate in basins and ridges, they tend to channel water, which aggravates runoff and erosion. Graded bunds, contour ridges, and bunds ridges reduce this problem. Bund ridges and water drainage channels are built as guides to realign planting ridges and basins. The borders of fields and plots can be clearly marked as a framework for the building of cultivated land areas. In each plot and field, physical conservation layout should be established to protect the soil against erosion and to maintain or improve the soil conditions. These are either contour or graded physical conservation layouts. Generally both systems are used in building a farm as part of the practice of mixed physical conservation layouts. The graded physical measurements are taken from the true contour of a grade or gradient, so excess water is able to flow gently along them. The typical bund is the graded bund, which is formed as a channel. Graded bunds for basin or ridges require well leveled land.

The process includes four activities:

1. Marking the base line
2. Establishing the correct angle
3. Marking the secondary base line
4. Establishing the layout pattern

After the process of physical layout, according to the layout pattern, the farmer can build the graded bund and water channel.

1



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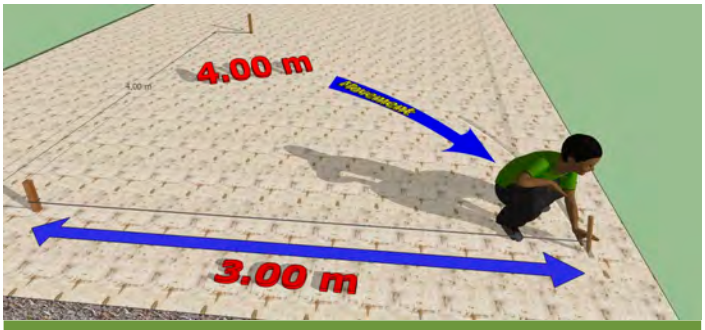

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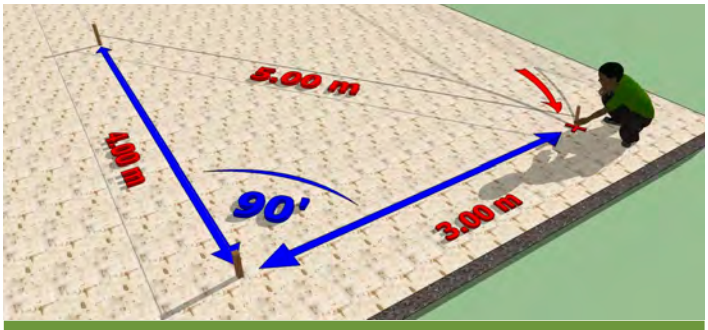

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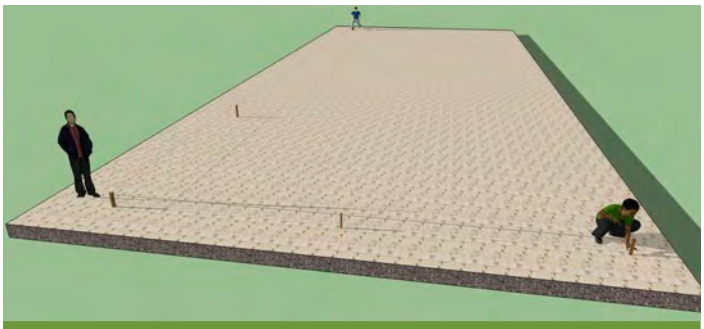

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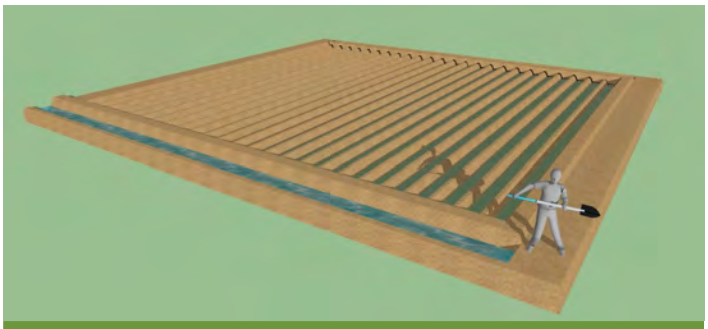

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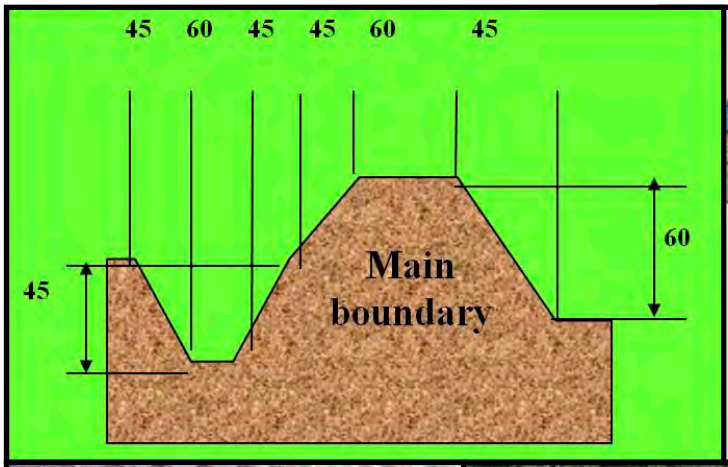
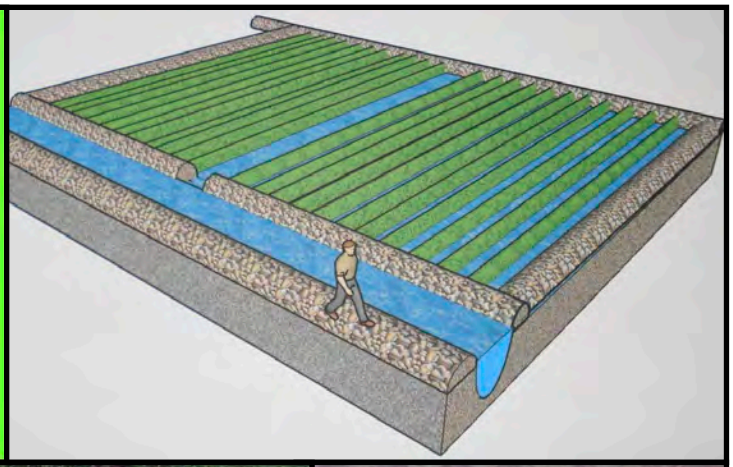
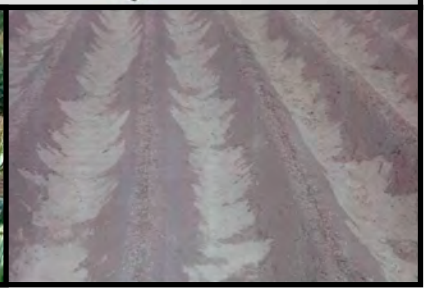

45 60 45 45 60 45
Main boundary
60
45

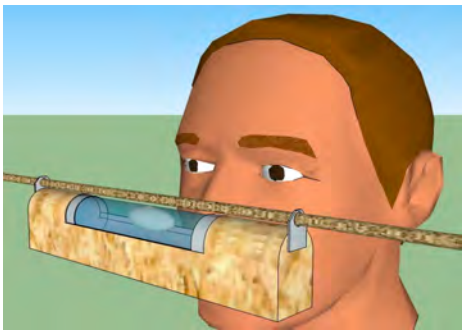




Irrigation ridge
Crop
Crop ridge
Crop ridge
Irrigation channel
Irrigation channel
Irrigation channel
30 cm
30 cm
60-80 cm
30 cm
30 cm
30 cm
30 cm
25 cm
25 cm
25 cm

The Best Conservation Practice is Using Contour Ridges

A line (spirit) level is a simple instrument for marking contour marker ridges. It consists of a spirit level that hangs from a taut string between two poles. Trim the ends of the sticks and cut a groove around each one at exactly the same height above the ground. The length of the poles should be around 1.2-1.6 m. Tie two knots in the center of the string, and hang the level between them. Tie the string ends in the groove of each pole. Two people (A and B) set the poles on a level surface with the string tight. A third person (person C) reads the level. Mark the exact position of the poles and read the level again. If the bubble is perfectly centered, start pegging at the top of the field, about 10-20 m below the upper corner of the field, first pegging the starting point (person A). The person who reads the level (C) instructs B to move 5 m along the estimated contour line with the string tight. Person C reads the position of the bubble and instructs B to move up or down the slope until the bubble is perfectly centered. They insert another peg at the precise location of B's pole. A moves past B to locate the next peg. When the bubble is perfectly centered, they insert another peg at A's position. They repeat the process until the end of the field is reached. When the end of the field is reached, the team moved down slope from the first contour line. The interval depends on the slope of the field, e.g., 20 m apart for gentle slopes, 15 m apart for medium slopes, and 10 m apart for steep slopes. The pegging of contour lines should cover the whole field. Pegged contour lines may be smoothed out to reduce sharp angles between pegs. However, do not smooth the contour line on irregular terrain, as it could cause runoff problems. The marked ridges serve as guides to realign planting ridges, and do not need to be bigger than the



other ridges if they are clearly marked. To improve realignment on the contour, first align the top half of the area with the top marker ridge, and then the bottom half with the lower marker ridge.

The bubble of the level should be perfectly centered