

TECHNOGUIDE IN SOIL MANAGEMENT & CONTOURING USING A-FRAME



CARING FOR THE SOIL

SOIL MANAGEMENT

Soil which is a natural body consisting of layers composed of mineral materials, organic materials, air and water, is very critical in ensuring a good and successful agriculture. It is a natural medium for the growth of plants (FAO.org). The healthiest soils produce the healthiest and most abundant food supplies.

However, health of soils declined over time depending on how they are treated by the farmers. Among the main reasons in the deterioration of soil nutrients, a common problem in various agricultural countries like the Philippines, is the overuse of chemical fertilizers and unbalanced fertilizer application.

Various agriculture-related agencies and groups particularly the Department of Agriculture is then promoting methods or tested practices to improve the soil's quality and productivity for sustainable food production. These methods/practices include the application of organic matters and fertilizers, crop rotation and organic farming, among others.





Another important activity that the farmers must consider is the conduct of soil testing or sampling in their respective farms. Soil testing enables the farmers to know what is the current status of the soil in their farm areas specifically its nutrient content.



Knowing the status and available nutrients in one's farm allows the farmer to conduct a good fertilizer management to maintain the soil's productivity, thus, improving the quality of their crops. Soil testing also promotes more efficient fertilizer use at a lower cost, and prevents environmental pollution from excess fertilizer. Crops which are provided with the nutrients they need at the required rates are stronger, healthier and more resistant to pests and diseases.



This technoguide then hopes to guide the farmers in collecting soil samples ready for analysis to have a grasp of how their farm's soil look like at present. With this, they would be able to act accordingly either improve or maintain the productivity of their soil.

Moreover, some practical guides or techniques in testing as well as managing the soil and its surrounding environment are presented in this techno-guide for information and/or reiteration among the farmers.



IMPROVING SOIL'S HEALTH:

SOIL MANAGEMENT WITH EMPHASIS ON SOIL SAMPLING AND TESTING

Soil considered best for agriculture contain as many as the following:

- allow both water and air to move through and get to roots;
- have a diverse population of microorganisms;
- dark in color because they contain a lot of organic matters (dead plants, animals), and
- contain an abundance of readily available nutrients.

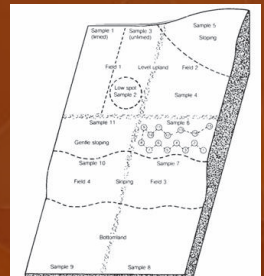
**Source: Soil Science Society of America*

PROCEDURES IN COLLECTING SOIL SAMPLES

1 Prepare the following materials: pail, shovel, bolo, plastic and meter stick. Ensure that the equipment are clean. Do not use galvanized pails and tools because it may contaminate the samples.



2 Divide your farm according to the kind of crops grown, the type of soil (sandy, loamy, or clayey) and topography (level, flat, sloping, or hilly). Collect soil samples separately from the different soil unit areas and place them in separate containers.



3 Brush or remove away stones, rubbish, trash and other foreign materials on the surface of the land before collecting a sample.



4 Using the shovel, push it down the surface or topsoil to a depth of approximately 15cm and get a slice of soil sample which is 2cm thick and 5cm wide. Place it in a container.



5 Get similar samples at random from as many as 10 sites and mix them in a container. Make sure that the sample depth is consistent because many soils are stratified, and variation in depths will cause errors in the soil analysis.



Get a composite soil sample of about 1kilo to represent the soil unit area. Composite soil sampling refers to the combination of a number of separate samples collected to make a single homogenized sample for the purpose of analysis while soil unit area refers to the section of the farm where the soil type, its topography and vegetation are more or less similar.

6 For areas to be devoted to orchard, get subsoil samples from below the 25 cm down from where the topsoil sample was taken. A composite subsoil sample is also required for permanent crops/fruit trees.

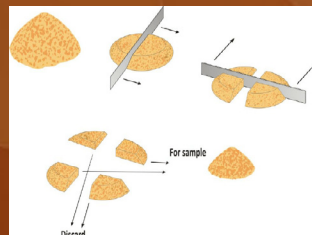
For fruit trees, soil samples should be taken directly below the rim of the crown of the tree.

- 0 to 25 cm depth for shallow rooted plants like rice, corn and vegetables
- 25 to 30 cm depth for fruits trees/permanent crops like coconut.

7 Air dry the soil samples by spreading them in clean paper or mats under the shade or indoor. Be sure to avoid contaminations among the samples and keep them away from dirt or foreign matters especially cigarette ash.

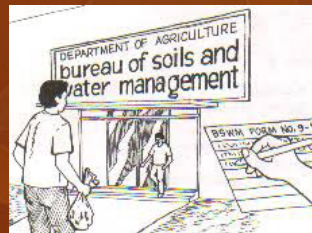


8 Divide representative soils samples into four (4). Remove soil samples 1 and 3 and retain soil samples 2 and 4. Repeat the process four (4) times until you obtain one (1) kilo.



9 When air-dried, get at least one (1) kilo from each composite soil sample and place it separately in a clean paper bag. (1 kilo of air-dried soil = 3 cans of condensed milk can-full of soil)

10 Label the soil samples properly and send them to the nearest regional or provincial soils laboratory.



PRACTICAL TECHNIQUES IN TESTING YOUR FARM SOIL

The following are practical techniques that could be done in testing the quality of the soil:

1 Check earthworm activity. The presence of earthworm casting, an important macro element required by crops, shows that the soil is alive. Where there is earthworm, there is a sufficient organic matter in the soil and there are substantial volumes of nitrogen, phosphorus and potassium (NPK).

2 Determine type of soil in the farm. One must identify the type of soil (clay, sandy or loam) at present. Knowing the right soil type in your farm will give the farmers better view on what solutions/management to be done to correct the present state of the soil.



For easy identification of soil type, squeeze test can be applied. This is done by getting a handful of soil then squeezing it lightly.

INTERPRETATION OF RESULT:

Clay soil: 70% - 80% of the soil is clumped together

Loam soil (ideal soil type): 50%-60% of soil is clumped together

Sandy soil: 20% - 30% of soil is clumped together

“Any type of soil can soon turn into loam soil if properly managed. Accordingly, application of organic matter is the key answer to improving the soil.”

-Dr. Silvestre Kudan, Professor at Benguet State University

3 **Conduct a water test.** Water testing is conducted primarily to identify the irrigation activity of the soil and assess its effectiveness in the farm.

Steps in conducting water test:

- a. Water a bed traditionally.
- b. Let it stand for two hours.
- c. Dig a hole of six (6) to eight (8) inches deep.
- d. Feel the moisture in the three-inch, six-inch, and eight-inch level. Low moisture level below three (3) inches indicates that water is insufficient. Also, it shows that the watering technique is wrong. It must be noted that moisture level should be high at six inches and deeper because it is where the roots are most active.



...To correct the water holding capacity of the soil, one can apply organic matter. Organic matter serves as a reservoir to control moisture and the micro elements present in the soil.



4 Conduct an undercover test.

It is important to determine the depth or thickness of the topsoil and humus. Every three (3) inches of humus is equal to 100 years of organic matter accumulation. The thicker the humus, the lesser initial intervention is needed to fix the soil.

Steps:

- a. Dig a hole of 24 x 24 x 24 inches.
- b. Determine the depth or thickness of the topsoil and the black soil or humus.
- c. Check the root depth of grasses or weeds because it also indicates the penetration depth of the plant roots.
- d. Note the soil color.

All soil colors except blue green is considered good because blue green soil indicates the presence of crude oil in the soil, thus, crops cannot grow in it. Blue green soil cannot also be corrected.

Here are some practices that the farmer can do in taking good care of the soil and its surrounding environment (www.soil.org):

- A.** Monitor levels of nutrients in the soil.
- B.** Apply nutrients and water only where they are needed.
- C.** Grow more crops on the best soil. For the weaker or poorer soils, allow them to 'rest' for a certain period called fallow period.
- D.** Rotate crops to improve diversity of produce.
- E.** Do not fill or plow the fields when the soil is too wet as it causes soil compaction.
- F.** Do not disturb the soil too much. Excessive soil tillage is associated with soil degradation processes such as compaction or decrease in soil stability and structure, and increased soil erosion.
- G.** Keep the surface covered to reduce erosion.
- H.** Monitor watering so that salts do not accumulate in the soil.

SOIL CONSERVATION

CONTOURING

Contouring is a central element of soil conservation particularly in sloping lands; and involves the correct establishment of contour lines. Correct establishment of contour lines is very crucial because it can trigger soil erosion when incorrectly established.

A contour line is a level line from one end of the field to the other that is found around the hill or mountain at a constant elevation. Contours may curve from side to side to stay level but it should never upslope or downslope.

Established contour lines serves as guide in the establishment of hedgerows, fodder grass strips, natural vegetative strips (NVS), and drainage canals or gullies.

There are also accurate instruments for leveling or pointing out the contour lines such as hand-held levels or tripod-mounted levels used in surveys by geodetic engineers and even carpenter's level but these are generally unavailable and too complicated for the farmers.

This techno-guide then presents how to make and use an A- Frame level which is a simple instrument that can be easily built. This is tested and proven effective to be convenient and accurate when used by the farmers themselves.

ESTABLISHING CONTOUR LINES USING A-FRAME LEVEL

A-frame level is usually made of local materials like wood or bamboo nailed or tied together in the shape of capital letter “A”, a string as the “line”, and a stone providing the weight of the line.

Benefits of contouring:

- plowing and planting following the contour lines can help prevent soil erosion
- promotes even irrigation of ditches
- prevention of ravine and gully formation
- more water and nutrients becomes more available to both soil and planted crops



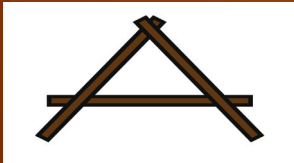
HOW TO MAKE A-FRAME TOOL

MATERIALS:

- Two straight wooden poles (1.5-2 m long), and one straight pole (1-1.5 m long)
- String, hammer, nails, pencil, saw or bolo
- A round stone

STEPS:

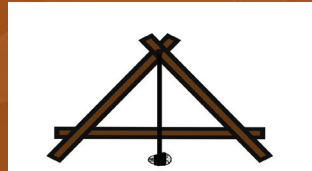
1 Lay the sticks out in the shape of a capital letter "A".



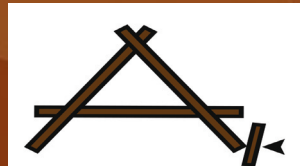
2 Tie together the upper ends of the longer poles using nails.



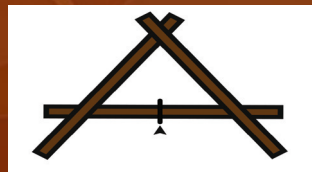
3 From the top nail, hang a thin string with the round stone tied at the bottom.



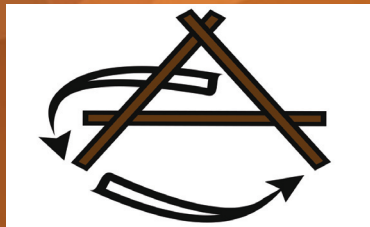
4 On level ground, make a mark where the feet touch the ground.



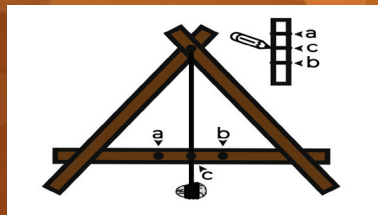
5 Then make a mark where the weighted string touches the horizontal stick.



6 Without moving the marks on the ground, lift the A-Frame, turn it around and place it so the opposite feet are in the same place on the marks on the ground.

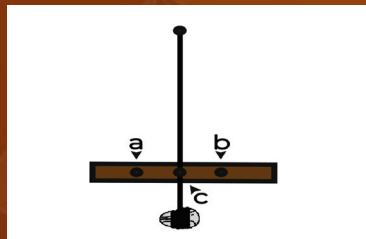


7 Again, mark where the string touches the horizontal stick.



8 Now there are 2 marks, a. and b. Make a third mark, c. exactly in between a. and b. When the string touches c, you know that the feet are on exactly level ground.

9 When marking a contour, the feet of the A-frame are levelled when the freely hanging vertical string is touching the midpoint c.



HOW TO USE THE A-FRAME TOOL

1 Cut all the grasses or remove any obstructions so that you can easily move and mark the contour lines. Two people will make the work much easier and faster. One will operate the A-Frame level while the other person marks the contour lines with stakes.

2 Make a study of the area for which contour lines are to be determined. Begin marking contour lines near the highest point. Let the A-Frame level stand on the ground. Without moving the rear leg, lift the front leg. Then put the front leg down on the ground that is on the same level with the rear leg.

3 The two legs of the A-frame are on the same level when the air space in the carpenter's level stops in the middle. When this happens, it means that you have found the contour line which is a level line between the two legs of the A-frame. Mark with a stake the spot where the rear leg stands.



4 Move the A-frame forward by placing the rear leg on the spot where the front leg stood before. Adjust the front leg again until it levels with the rear leg. For every two to three meters of contour line you find, mark it with a stake. Follow this procedure until you reach the entire length of the contour line which is the other side of the mountain or hill.

Try to locate as many contour lines as possible. The contour lines should be spaced from four to six meters apart. It should be noted, however, that the farther the contour lines from each other, the more potential erosion occurs. Closer contour lines means more nutrient rich biomass produced and made available to the crops growing in the alley.

Note: Prepare the marked contour lines by plowing and harrowing until ready for planting. The stakes will serve as your guide during plowing.

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**some photos were lifter from the internet*

**This technoguide has undergone technical review by Ms. Freda Pacsi, Agriculturist II (High Value Crops and Development Program) and Mr. Landes Teofilo, Senior Science Research Specialist (Research Division) of the Department of Agriculture-RFO-CAR*

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