2. SOIL AND LEAF SAMPLE COLLECTION FROM COCONUT BASED CROPPING SYSTEM FOR ANALYSIS

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Proper and judicious collection of soil sample is the most important step in any nutrient management program. To collect a true representative sample of the field, the following steps should be followed

Collection of representative soil samples

- Collect samples from 20 - 30 sites per hectare
- Samples should be collected randomly in a criss-cross manned to cover the field
- Pool these samples depth wise if the area is uniform

Note:

- If slope, colour, texture, crop growth, yield and management practices in the field differs, each different area should be sampled separately
- Avoid sampling from recently fertilized/manured plots, near roads/bunds, channels, marshy spots and areas near compost piles etc.

Soil sampling for Coconut

From a uniform and levelled field:

- A composite sample from 10-20 sites would be good enough for an area of one ha.

From an undulating field

- The bottom lands, uplands and slopes have to be sampled separately.
- The soil samples should be collected from the coconut basin and also from interspace in case of standing coconut plantation

Sampling tools required

- Soil tube auger/Screw type auger/ Spade

(*Note*: For micronutrient analysis tools made of (or) coated with iron and copper should be avoided.)

Sampling Procedure

With a tube or screw type auger

- This will be convenient to collect soil samples from more than 30 cm depth.
- Remove the weeds and other litters from the surface of the sampling point
- Insert the auger upto 30 cm depth, then remove and collect the sample from the auger.
- Then place the auger in the same hole and further insert upto 60 cm depth, remove the auger this will give 30-60 cm depth soil sample.
- In the same hole again insert the auger upto 90 cm depth, remove the auger and the sample collected will be from the depth 60-90 cm.

With Spade

- If the tube auger is not available, first dig 0-30 cm pit and collect uniform slice of the soil from the exposed sides to the full length of the pit. In the same pit, further dig for 30-60 cm depth and collect soil from the newly exposed surface (from 30 cm depth to 60 cm depth)
- Continue the process until the required depth of sampling is completed.
- Collect the samples of each depth separately.

Soil sampling in Coconut mono-cropping

At Coconut basin

- Collect soil samples at a distance of 1m away from the bole of the palm and from two depths viz., 0-30 and 30-60cm

At inter space

- Collect inter space sample from the centre of four palms

Soil sampling in Coconut intercropping

Coconut basin

Similar to that of mono-cropping

Soil sampling from Intercrops

- The root penetration depth of intercrops is to be considered for determining the depth of sampling.
- For Shallow rooted crops are sampled up to 0-30 cm

- For deep rooted crops, collect from each 30cm soil depths vertically up to the extent of the active root zone of the crop

For shallow rooted inter crop:

- Cut a V-shape pit of 30cm depth and uniform thick slice of soil should be collected from the exposed surface.

Processing and labelling the sample

- Break the big clods with hand or wood and then thoroughly mix the soil samples on a clean piece of plastic sheet.
- Remove the undecomposed plant tissue or foreign material
- Spread the sample and divide it into 4 equal parts, then reject the 2 opposite quarters, mix the remaining 2 portions;
- Then, again spread and divide the remaining soil into 4 parts and reject the opposite quarters and then mix the remaining two parts,
- Continue the same process until reducing the sample into half kilogram.
- Immediately after collection, spread the soil in a clean sheet and dry under shade
- Pack the dried samples in separate clean, dry polythene bags and label with the details like name of farmer, depth, crop etc. and end to the laboratory.

(Note: - Avoid fertilizer or manure or other chemical contamination to the soil sample during the process)

Leaf sample collection

Collect samples during the end of dry season for diagnosis of mineral nutrient deficiencies.

Adult palms

- Collect the leaflets from the 14^{th} frond (counted from the fully opened youngest frond), if the palm containing around 28 fronds.

Young palms

- Collect 4th leaf up to 4 years old palm, 9th leaf from 5 to 7 years old palm.

Note: In general, if the crown has N number of leaves then the N/2 or $(N+1)/2^{th}$ frond counted from the youngest fully opened frond should be selected for the sampling.

Time of Sampling

Leaf samples must be taken at the right time of year because nutrient concentrations within leaves continuously change. For analysis the leaf samples should be collected from the young and mature trees during April-May and September –October. The preferred time of collection of sample is morning hours up to 11.00 AM. It is also important to keep samples free of soil contamination. In plantations without irrigation, the samples should be collected at the start of the dry season and between the hours of 7 and 11 am. If there has been a rain of more than 20 mm, it is necessary to wait 36 hours, to avoid variations caused by nutrient leaching.

Sample collection

Nutrient composition is also affected by leaf position. In young plants, leaves number 4 and 9 may be used. Leaves 4 and 9 can be found as follows: the leaf that has not yet opened, known as the arrow, is leaf zero. The leaf immediately after this is number 1 and so forth until numbers 4 and 9 are reached. Leaf 14 can be found as follows: find the leaf where the most recent open inflorescence is developing in the axial (space between the trunk and the leaf stalk); this is leaf number 10. On the opposite side is leaf number 9, below which is leaf number 14. To collect leaves, the plantation should be divided into homogenous areas, taking into account the plant's ages, nutritional status and plant health, as well as soil variability. In each homogeneous area, which should not exceed 10 ha, leaflets should be collected from a minimum of 20 plants. The exception to the rule of the most-recently-matured leaf is the analysis of Ca, Cu, B, and S, which are relatively immobile in the plant. Therefore, an analysis of the mature leaves in this case may not reveal the Ca, B, Cu, or S deficiency in the younger leaves. When a nutrient deficiency of this nature is suspected, young (not fully expanded) leaf tissue is needed for analysis.

Sample preparation and Processing

Once the sample leaf has been identified, three leaflets are taken from each side at the central part of the 4^{th} and 14^{th} leaves, avoiding damaged leaflets. From Individual palm, even side-by-side leaves, may have a considerably different nutrient status. Therefore, by sampling a sufficiently large number of plants, the error due to this variability can be minimized. More accuracy in determining the actual nutrient status is derived from a larger sample size. From each leaflet, only the central 10 cm are taken and placed in a

paper bag whose identification should contain the location of the sample, the date, tree number and the position of the leaf. If it is not possible to send the samples to the laboratory on the same day, they should be placed in a refrigerator, avoiding freezing. In the laboratory, the 10 cm central segments are cleaned with cotton soaked in distilled water, and both the central vein and the laminar edges, about 2 mm, are discarded. The samples are dried in a forced air circulation oven at 70 to 80°C for 48 hours to a constant weight and grind into fine powder. Temperatures exceeding 105°C should be avoided to prevent N losses. The ground samples are to be kept in labeled butter paper bags for further analysis.