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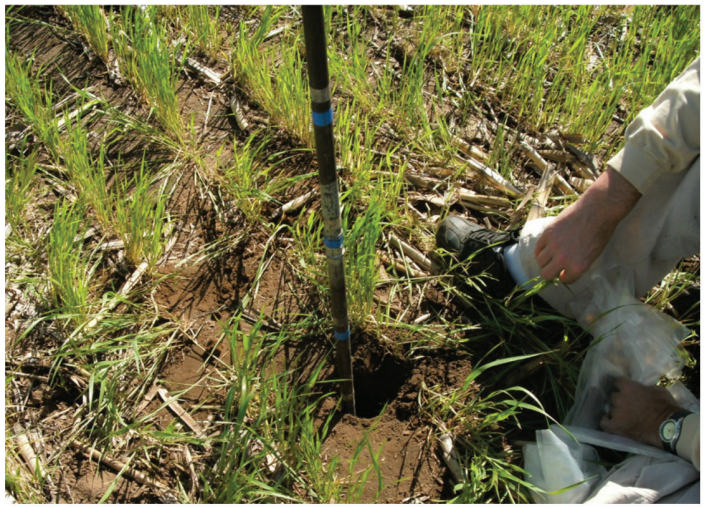
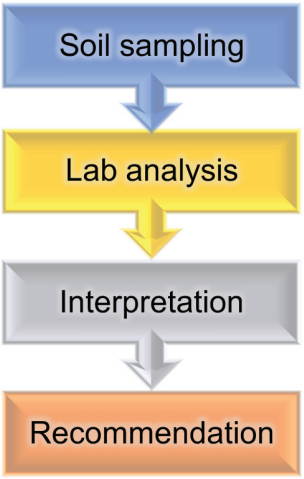
SOIL SAMPLING:
the beginning of a RIGHT diagnosis





The steps to diagnosing soil fertility status and determining a nutrient recommendation.

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4R Nutrient Stewardship is fundamentally based on the diagnosis of soil fertility. This is because soil sampling is commonly the first and critical step in identifying the soil fertility status of any field or management zone.

To add perspective, while sampling a 30-ha field, the 0 to 20 cm layer weighs between 72 to 84 million kg, but we are only collecting 0.5 to 1.0 kg for lab analysis. To be successful, our soil sample must be representative of over 100 million times the amount of soil in the field. Avoiding errors during sampling does much to improve the final result achieved by the lab.

Basic recommended soil sampling procedures include:

1. Separate samples for each distinct management areas
2. Get 15 to 20 cores per sample
3. Adjust sampling when banding fertilizers
4. Sample to proper depth(s)
5. Adjust time of sampling
6. Handle the sample properly. Mix well and take a sub-sample for the lab
7. Use clean equipment
8. Avoid contamination
9. Clearly identify each sample

The first step in the list—the process of **separating distinct management areas**—involves the identification of spatial variability. Areas of a field might differ because of natural (e.g., topography) or managed (e.g., previous crop) causes. Sampling method can vary from a random pattern, to a rigid grid, to a sampling pattern based on the farmer's management strategy.

As a general guide, **15 to 20 separate cores** or sample points should be obtained and well mixed before taking a subsample for submission to the lab. A large number of cores or sample points per sample improves both precision and accuracy.

If a farmer is **banding fertilizers** in a field, soil sampling requires special consideration. In such cases, random sampling may give a poor result if only a few bands were included in the sample. Where the locations of the bands or drill rows are known, research has suggested

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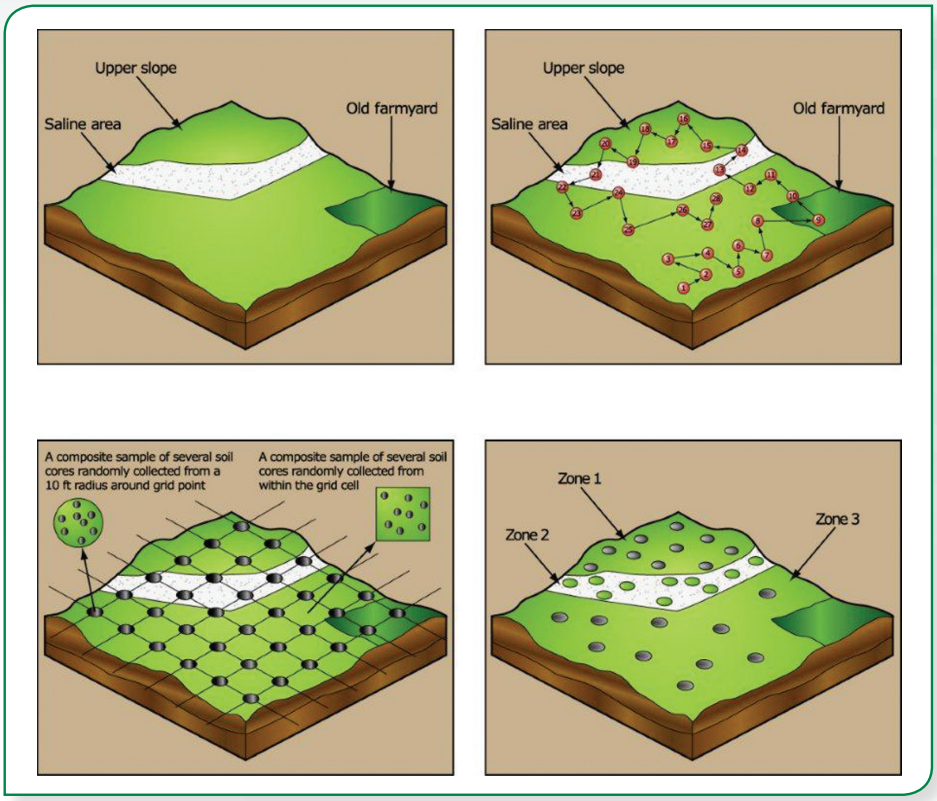

Examples of sampling methods for a field with contrasting zones.

that a sampling ratio of 1:20, 1:16, and 1:8 (i.e., number of in-the-band vs. between-the-band cores) be considered for 76 cm, 61 cm, or 30 cm band spacings, respectively. An alternative is to take a slice of soil across the rows to include banded and non-banded soil. Where the location of the bands is unknown, it is always recommended to increase the number of separate cores (above 20) per soil sample. Alternatively, research from the U.S. Great Plains suggests a paired sampling approach. In this sampling strategy one sample consists of cores taken at random, and the second sample consists of cores taken at a distance of half the band spacing from each of the first cores, perpendicular to the direction of the bands. Since the greatest deviation from the 'true' soil test concentration occurs when the band location is over-sampled, the sample with the lower soil test level is likely to be most representative.

Accurate and consistent depth of sampling is needed and it should follow the protocol used in local calibration testing to facilitate the interpretation of soil test results. Generally, less mobile nutrients such as phosphorus (P) are sampled at upper soil layers (i.e., 0 to 15 or 0 to 20 cm), while mobile nutrients such as nitrate-N are sampled at a deeper depth (i.e., 0 to 60 cm). Keep in mind that nutrients generally concentrate in the upper soil layers due to stratification.

Time of sampling should also follow the protocol used in local calibration testing. Soil nutrient dynamics are affected by temperature and moisture availability, especially for nutrients with significant reserves in soil organic fractions such as N, P, and sulfur (S).

Soil samples should be **handled properly** after they are obtained and sent as soon as possible to the lab. If there is an unavoidable delay, it is wise to keep the samples at a low temperature in a refrigerator or cooler.

Care should be given to **minimize any possible contamination** source such as dust, handling by bare hands (wearing of latex gloves can help prevent hand-borne micronutrient contamination), or presence of rodents or other small animals or birds. Be sure to keep sampling tools clean and in good condition.

A last important issue in submitting to the soil testing lab is the careful **identification of each sample.** Its critical to record sampling date, farm, field, management zone, and the GPS location if available. Be sure to attach any supplementary information required by the soil testing lab.

A successful diagnosis of soil fertility status is key in 4R Nutrient Management. To apply the right source at the right rate, time, and place we need to know the potential soil nutrient supply for the next crop.

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