SAMPLING TO ASSESS PRODUCTION PROBLEMS

Crop producers often face production problems that will reduce yield and require remedial action. Sampling either before or during the season is necessary to identify the cause of these problems and assess their severity so that proper remedies can be applied.

Types of sampling

Predictive sampling, or sampling before the crop is planted. Sampling for nematodes in the fall following harvest is an example. This sampling is done to detect potentially damaging conditions.

Diagnostic sampling, or sampling to determine the cause of a problem after it occurs. Sampling to determine disease and insect presence and/or damage during the growing season is an example. This sampling is done to collect data that can be used to correct short- and/or long-term problems that arise.

Interconnected parts to sampling

Recognizing the need to sample. That is, is there an obvious problem? An example is assessing the health and uniformity of a recognized poor soybean stand to help decide if replanting is necessary.

Selecting and properly applying correct sampling technique(s). That is, once a problem is identified, how can it be assessed? For example:

Grid sampling is a popular and widely used method for site specific soil and crop management. However, there are deficiencies with this method.

- Grid sampling may result in data being collected across dissimilar soil types and thus being inappropriately averaged.
- Defining the appropriate grid size is arbitrary. It should be done according to the boundaries of the different soil series that may be in an individual field.
- Uniform grids may be subject to errors associated with field topography, drainage, and other physical factors, as well as management history.

Sampling within defined field areas can be used in lieu of grid sampling. With this method of directed sampling, the target area or field is divided into units based on the variability within the field. Prior knowledge of the area or field based on experience, aerial crop imagery, soil series maps, and maps of past yield, sample, and management history can be used to define sample units.

Nowadays, drones with cameras can be used to perform such tasks as crop health monitoring and weed and pest detection.

Correctly assessing and analyzing collected data so that proper and effective action can be taken. For example, is the problem widespread in a field or only in isolated areas, is it uniform in affected areas, is it at a threshold level, is it static or increasing with time, etc.? Sampling by drones that are equipped with cameras can help determine this.

Sampling components

Selecting or defining the proper sample unit. This may involve dividing a field into its soil series components or sampling field sections based on crop performance history. The objective is to ensure that the targeted problem or occurrence is sampled in units that are environmentally and agronomically uniform in order to reduce variability not associated with the sample target.

Determining how large a sample unit should be and how many samples should be taken from each unit to accurately assess the situation. Samples should be large enough to capture the intended target, but small enough to manage for analysis. Several samples from each defined unit are usually required to determine the variability of the sample target within the unit.

It is too expensive to collect more sample data than are needed to assess a perceived problem, and it also too expensive to collect samples and not use them to their fullest benefit. For example, knowledge of the complete nutrient status of a soil should be determined from soil samples in order to address possible interacting nutrient deficiencies and thus get the most information from collected samples.

Determining if sampling should be repeated at some later date to further assess the problem or the effect of an applied remedy. Treatment of some problems is only effective for a short time, and re-sampling may be needed to determine if the problem recurs at a treatable level. Also, re-sampling may be the only way to determine if an applied remedy was effective.

Designating the sampling protocol. Often, there are defined procedures for collecting crop and soil samples. Examples are guidelines for determining soil nutrient status [MSU Pub. 3858], and nematode [MSU Publication 1293] and insect [MSU Insect Control Guide] infestation levels. Protocols for measuring other management categories such as plant population [line intercept sampling] are available as well [Willers et al. 1999].

Summary points

Know or define why you are sampling and ensure that your sampling procedure will accomplish the intended goal or detect the intended target.

Realize that variability exists in all fields and plant communities. Do not combine or composite samples unless there is evidence that the entity you are sampling is uniform within the defined sample unit. Compositing can mask problems by diluting occurrences that may be in isolated areas at severe levels.

Keep a record of results from all samplings in a field within and across years and build a map of occurrences that the samples detect. Often, problems that affect crop performance in a given field or sample unit interact with each other or change with time. This can be determined by evaluating sampling records that cover the same area over a period of time.

Application of poor sampling methods may produce false data. This can result in erroneous conclusions about the problem or occurrence and lead to the application of improper remedies that will waste time and resources.

Application of proper sampling methodology can improve problem-solving and crop management.

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