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USDA LTAR Common Experiment measurement: Crop scouting for pests and diseases

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Brook J. Wilke[1]

[1]W.K. Kellogg Biological Station, Michigan State University, Hickory Corners, MI

Lori J Abendroth
USDA ARS

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We use this protocol and it's working

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Abstract

Measuring pest and disease frequency and abundance can be cumbersome but contributes to important knowledge for research and management of cropland sites. Most LTAR Sites are assumed to lack the combination of knowledge and time to appropriately monitor crops for pests and diseases across the growing season. This protocol provides a format for hiring a contracted crop scout to monitor pests and diseases throughout the growing season.

Guidelines

Crop scouts will generally develop pricing based on the number of acres and different crops they are asked to survey. Include all details about the number of crops and expected locations for each visit so the crop scout can develop an appropriate price and time structure.

Expect each crop scout visit to last at least two hours and up to eight hours, depending on the number of treatments and crop entry points studied.

Sample collection, processing, and analysis

1 Hire a professional crop scout to observationally scout all treatments every other week throughout the growing season.

- During each visit, include one replication at the plot and field scale for all treatments and rotation entry points. Rotate to a different replication at each subsequent visit so that all replications are visited equally over the year.
- Project managers should have continuous monitoring of pests and diseases to inform these visits, and at least one manager should accommodate the crop scout during each visit.

2 Crop scouts should be monitoring crops for:

- fungal diseases
- viral diseases
- insect pests
- vertebrate pests
- weed invasions

Note

Note the presence of pests or diseases, and when possible, quantify disease or pest levels using multiple random and replicated sampling sites in the plot or field examined to provide numerical data for each pest or disease identified.
- An example might be if cereal leaf beetles are observed in a winter wheat plot, note that they are present, and then survey a minimum of four sample sites within the plot for the average number of cereal leaf beetles on each wheat flag leaf.
- The scout should provide advice on management decisions related to the pest.

3 The scout may advise sending samples to a laboratory for diagnosis, as some diseases and pests may be unidentifiable in the field.

4 LTAR Sites may choose to monitor specific pests or diseases more intensively. This activity could include a pest or disease that is particularly impactful to the crops grown at the site or occurs in narrow windows of time not accurately captured by the bi-weekly crop scout visits.

- Site staff should develop a sampling plan including observations by the crop scout but layers more intensive observations and sampling by site staff.

Covariate metrics to be sampled concurrently

5 Scouts should also make other crop observations while examining the plots and fields, including:

- GPS coordinates for observation locations
- crop phenological stage
- abiotic stress (e.g., drought and soil crusting)
- plant population
- nutrient deficiencies
- other crop observations

Calculations

6 The calculations vary depending on the disease or pest the crop scout identifies. When feasible to quantify disease or pest levels, the site may want to calculate this level based on a unit of area or other units commonly used to make management decisions.

- For example, some management thresholds may involve the number of insect pests per plant, whereas others may be calculated per acre or hectare. The most important aspect is documenting the pest level for scaling according to future needs.

Quality assessment and quality control

7 Follow similar protocols within and across seasons. If different scouts are hired over time, ensure consistency in monitoring protocols is sustained.

Archiving

8 Record and save a paper or digital log of each visit. Some diseases or pests may be archived for future investigation or curation. The specifics of these archives are up to each site.

Protocol references

Example crop scouting reports from the KBS LTER are available at **https://lter.kbs.msu.edu/internal/scouting-reports/**