

MISSISSIPPI SOYBEAN PROMOTION BOARD

SAMPLING SOIL FOR FERTILITY AND NEMATODES

Sampling for Soil Fertility

Ensuring that soil nutrients are available to a growing crop is an important initial step for producing a profitable crop. Replenishing soil nutrients according to soil test results and recommendations will allow realization of the full yield potential of a healthy soybean crop.

High-yielding soybeans require large amounts of plant nutrients that are supplied by the soil. A significant portion of the soil's nutrients are removed in the harvested seed, while some amount may be lost to leaching and erosion.

Soil sampling and testing are the most important steps for successful determination of the amount of soil nutrients that have been depleted by a crop, and subsequently, what amount should be added to attain the desired level for anticipated yield of the following crop. Results from proper conduct of these two steps will serve as the most reliable indicator of how much of a particular nutrient is available to the crop. Use the below tables as a guide for determining the level of nutrient removal and replacement related to crop yield, and expected yield at indicated soil test levels.

Corn:Soybean Yield	Nutrient Removal			Fertilizer Replacement		Value
	P ₂ O ₅	K ₂ O	S	TSP*	MOP**	
<i>bu/acre</i>	<i>--lbs. across the 1:1 rotation--</i>			<i>---lbs. product---</i>		\$
150:40	85-95	85-95	19	178	143	85.36
180:50	100-120	105-115	23	217	175	104.34
210:60	120-140	125-135	28	254	208	123.32
225:70	130-160	140-150	31	283	233	137.58
250:80	145-175	160-170	34	317	265	154.98

*Triple-super phosphate. **Muriate of potash.

Expected yield of soybeans at various soil test levels of phosphorus and potassium expressed as a percentage of maximum yield.

Soil test level	Expected yield <u>without</u> fertilizer		Fertilizer needed for maximum yield	
	Phosphate	Potash	Phosphate	Potash
	<i>-----% of maximum-----</i>		<i>-----lbs./acre-----</i>	
Very low	35-80	50-80	120	120
Low	75-95	75-95	60	60
Medium	85-100	85-100	30	60
High	100	100	0	0
Very high	100	100	0	0

From [Nutrient Management Guidelines for Agronomic Crops Grown in Mississippi](#), MSU Extension Service Publication 2647

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A soil testing program for nutrients consists of several steps.

- Use the correct soil sampling technique, which includes sampling when soil moisture conditions are suitable for tillage, using a soil map to delineate the areas with different textures, sampling from the top 6-8 inches of soil, sampling between rows of the previous crop, and proper compositing of samples.
- Only composite samples from each distinct area (e.g. upland vs. lowland, silt loam vs. sandy loam, light-colored vs. dark-colored, low- vs. high-fertility as indicated by growth of the previous crop) in a field.
- The collected sample must represent only the area that is being tested.
- A representative sample from a distinct area should be composited from 15 to 20 soil cores.
- Soil cores that are to be composited should be gathered at random within each area.
- Dry collected samples at room temperature, and thoroughly mix the soil in each composited sample.
- Collect one pint from each composited sample and place in a container that is available from or provided by the chosen testing laboratory.
- Each field or area should be sampled in the same month each year.
- Keep accurate records that include a sample identifier such as a number, and

the location from which each labeled sample was collected each year.

- Sample each field at least every 3 years. More frequent sampling may be necessary in fields that do not have a history of soil test information (especially where high seed yields have been harvested), in fields that grow multiple crops or crops in rotation, and to determine and monitor trends in fertility levels.

A soil test report should include pH, lime requirement, and cation exchange capacity (CEC—an indicator of soil texture), plus extractable levels of phosphorus, potassium, calcium, magnesium, sodium, and zinc. Organic matter and estimated reserve sulfur should also be reported.

For samples that are submitted to the Mississippi State University Extension Soil Testing Laboratory, submit each sample along with a completed MSU Extension Form 76 (for example form, see [MSU Extension Service Information Sheet 346](#)).

Sampling for Nematodes

Soybean producers in the Midsouth must contend with nematode pests, several species of which may inhabit a single field. Significant yield losses caused by soybean cyst nematode (SCN), southern root-knot nematode (RKN), and reniform nematode (RN) can occur in Mississippi soybeans.

The change in cropping systems in Mississippi in recent years has led to increased concerns about nematode infestations of soybeans. The effect of these changes are:

- Increased acreage of corn that may be

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rotated with soybeans has led to heightened concern about soybeans being infested with RKN.

- Growing soybeans on sites once devoted to cotton has led to heightened concern about soybeans being infested with RN.

Because of these cropping system changes, the need to sample for nematodes has become even more important because of the added risk of infestations from RKN and RN, as well as SCN. Consider the below points.

- Properly collected and evaluated soil samples are the best tool for detecting the presence and species of nematodes in the soil.
- To assess potential damage from nematodes in soybean fields, growers must determine which nematode or nematodes are present to make appropriate nematode management decisions.
- Accurate identification of the nematode species and population levels present in a field requires that soil samples be collected and sent to a diagnostic lab for evaluation.
- Properly analyzed samples will indicate where control practices are not needed, and conversely will indicate where control practices are needed to protect yield potential.
- Predictive sampling (sampling to determine if nematode problems are likely to affect a future crop) should be done when population densities are high to decrease the risk of not detecting the presence of a damaging species. Thus,

the best time to sample is generally near or just after harvest. Sampling in the fall will allow enough time for analysis so that results can be used as a guide for variety selection or choosing an alternative crop for the next growing season.

Mississippi soybean producers may submit soil samples for nematode analysis to the Mississippi State University [Extension Plant Pathology Lab](#). Instructions for sample submission and associated costs are contained in their brochure.

- If test results indicate that the above nematode species are not present in a field, care should be taken to prevent their introduction since nematodes can be moved from field to field by soil that is transported on field equipment.
- If test results indicate the presence of nematodes, the management goal is to keep the nematode population as low as possible since they are very difficult to eliminate.
- Soil texture affects movement of SCN in the soil and also may affect its reproduction and development. Basically, major damage to soybean by SCN infestation occurs when the crop is grown on medium- and coarse-textured soils. Apparently, damaging populations of SCN are not sustainable in soils series classified as clay.
- RKN tends to be associated with sandy soils on sites that have previously been devoted to cotton production in the Midsouth, where the combination of root damage and the reduced water-holding capacity of the soil can result in wilting of

infected plants during the heat of the day.

- Determination of the density and race or type of SCN present in individual fields is required to prevent losses and determine management and control practices to apply. Determination of the race or type is especially important because the different SCN resistance sources convey differing levels of resistance against the varied races or types.
- Sampling for nematodes should be considered as important as sampling for soil fertility. This is especially true if there is no history of nematode sampling on either old or new soybean production sites. Once documentation of the absence or presence of nematodes is established for given fields, then appropriate [management options](#) can be adopted.

Proper sampling protocol for [soil fertility](#) and [nematodes](#) is provided by MSUcares.

Sources

Crouse, K. [Soil Testing for the Farmer](#), MSU Extension Service Information Sheet 346, July 2012

Oldham, L. Introduction to Soil Testing, Chapter 4 in [Nutrient Management Guidelines for Agronomic Crops Grown in Mississippi](#), MSU Extension Service Publication 2647, Feb. 2012

Donald, P., Stetina, S., and Heatherly, L. [Managing Nematode Pests in Soybeans](#), www.mssoy.org, Mar. 2014

Allen, T. [Soybean Cyst Nematode](#), MSU Extension Service Publication 1293, Jan. 2012

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