

# Sampling Poultry Litter for Nutrient Content

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## Introduction

Poultry litter is the mixture of bedding materials (rice hulls, sawdust, wood chips, etc.) and materials excreted from the animals during production (Figure 1). Poultry litter is used as fertilizer because it contains significant amounts of the essential plant nutrients: nitrogen (N), phosphorus (P) and potassium (K) (Figure 2).

Testing litter is the most reliable means of accurately determining its nutrient content. The University of Arkansas' Agricultural Diagnostic Lab provides litter testing for a small fee. Collecting a small composite sample of litter can be difficult but is critical to ensure that the nutrient analysis results are representative of the primary litter source. Following litter sampling guidelines will help ensure that analytical results are as accurate and precise as possible. This publication presents the University of Arkansas Division of Agriculture's

recommendations for sampling poultry litter in-house as well as in intermediate storage (e.g., stacked) (Tables 1 and 2 inside).

## Why Test Poultry Litter?

The nutrient content of litter is quite variable and is dependent on management and numerous other factors. For a given house, the litter nutrient content can vary greatly from location to location and from year to year. Testing poultry litter for nutrient content is necessary to determine proper application rates for optimum crop production, soil management and environmental stewardship. Applying poultry litter without knowing its nutrient content is similar to applying commercial fertilizer without knowledge of its nutrient content (e.g., % N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O).

In Nutrient Surplus Areas (Figure 3 inside), litter sampling is required by law. All poultry operations must submit one litter sample per



Figure 1. Close-up view of poultry litter



Figure 2. Poultry litter being spread as a fertilizer for pasture

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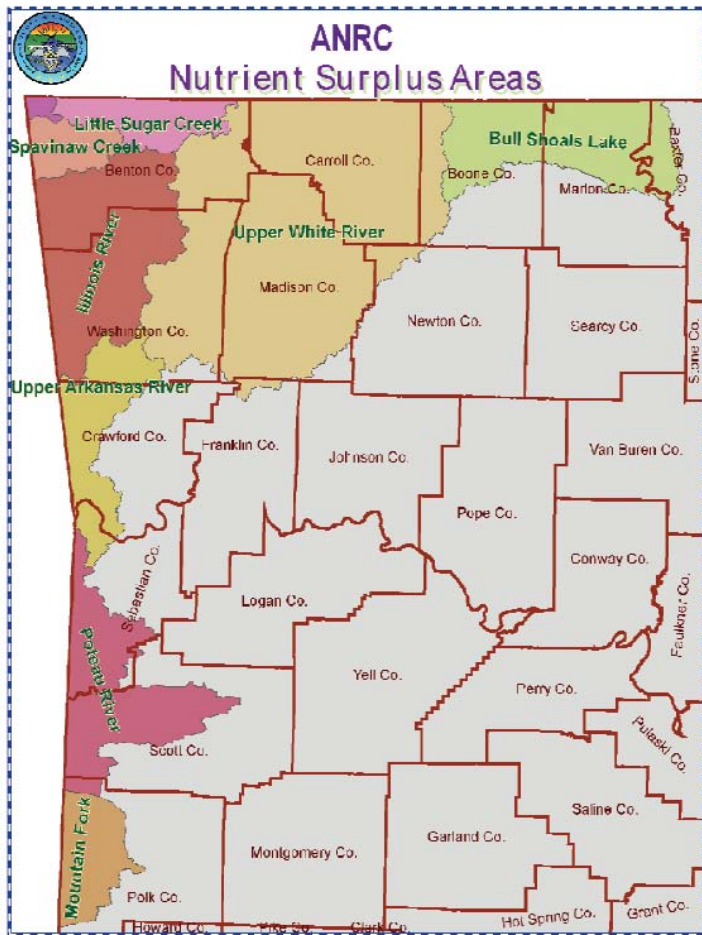


Figure 3. Map of the Nutrient Surplus Areas (shaded in various colors) in Arkansas

farm every five years for N and P analyses for the purpose of developing or updating a nutrient management plan. Litter should also be analyzed to determine its water-soluble P content. A copy of the test results should be given to the county conservation district office where the farm is located and be retained by the producer for five years. If the operation requires a nutrient plan, the sample's nutrient analysis report should be kept with the nutrient management plan records.

### What Are the Basic Principles of Litter Sampling?

Some things should be noted about the University of Arkansas' philosophy of sampling and utilizing test results before discussing specific sampling recommendations:

- 1) When used as fertilizer, litter should always be tested before applying. For example, if litter is applied annually, then it should be sampled annually, prior to application, to account for any nutrient changes over time.
- 2) Litter application should be guided by a nutrient management plan written by a qualified professional even in areas not designated as Nutrient Surplus Areas.

Table 1. Steps for Taking In-house Litter Samples

Step	Procedure	
1	Survey sampling area.	
2	Take 15 to 20 subsamples from one poultry house – full depth of the litter.	
3	Thoroughly mix the subsamples (composite sample).	
4	Repeat steps 1 to 3 for each individual poultry house.	
	If houses are managed differently:	If houses are managed similarly:
5	Collect 1 pint of composite sample per house.	Combine equal amounts of composite sample from each house and mix thoroughly.
6	Put sample in sealable freezer bag.	Put one pint of sample in sealable freezer bag.
7	Label bag with: <ul style="list-style-type: none"> <li>• Sample name/ID</li> <li>• Date sampled</li> <li>• Number of flocks raised on litter</li> <li>• Size of birds raised</li> <li>• Bedding material</li> <li>• In-house litter sample</li> </ul>	Label bag with: <ul style="list-style-type: none"> <li>• Sample name/ID</li> <li>• Date sampled</li> <li>• Number of flocks raised on litter</li> <li>• Size of birds raised</li> <li>• Bedding material</li> <li>• In-house litter sample</li> </ul>

**Table 2. Steps for Taking Stockpiled Litter Samples**

Step	Procedure
1	Survey sampling area.
2	Take several subsamples at different depths and locations around the stack to adequately represent the entire stack.
3	Thoroughly mix the subsamples (composite sample).
4	Collect 1 pint of composite sample.
5	Put sample in sealable freezer bag.
6	Label bag with: <ul style="list-style-type: none"> <li>• Sample name/ID</li> <li>• Date sampled</li> <li>• Number of flocks raised on litter</li> <li>• Size of birds raised</li> <li>• Bedding material</li> <li>• Stockpiled litter/how long litter has been stored</li> </ul>

- 3) The goal of sample collection is to obtain a representative sample of the litter that will be applied. Litter sampling procedures can influence the accuracy of results more than any other step of litter testing.

Litter is normally sampled in-house before cleanout or after it has been stockpiled in a stacking shed or other storage facility. Although the recommended procedures for collecting samples differ for these two scenarios, some general principles of sample collection apply to either situation.

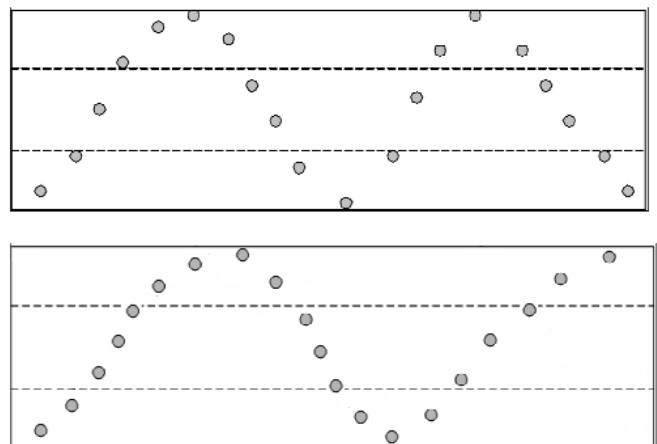
### How Do You Sample In-house Before Cleanout?

The first step in litter sampling is to determine the representative area that is needed to achieve testing objectives. For example, if each poultry house is managed differently, then each house should serve as its respective representative sampling area with each house requiring its own composite sample. If several houses are being sampled and have been managed the same, then all houses could serve as the representative area by taking a composite sample from each house individually and thoroughly combining equal volumes from each house to obtain a composite sample across several houses.

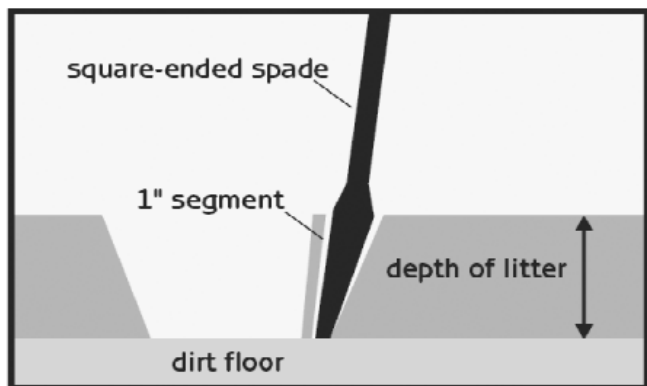
When sampling inside a poultry house, 15 to 20 subsamples should be collected to make a composite sample. The subsamples should be collected in a zigzag pattern down the length of the house (Figure 4). Subsamples can be collected using a soil probe if litter has high moisture content or a spade if litter is dry.

Sample shape should be cylindrical (equal diameter from top to bottom) and go the full depth of the litter. An acceptable alternate approach is to dig a hole in the litter, then use a spade to collect a slice (equal width from top to bottom) of litter from the edge of the hole and go the full depth of the litter (Figure 5, page 4). Be careful not to include any floor pad material in the sample. The total amount of litter collected will be dependent on the sampling tool used and diameter size needed to collect a proper sample shape.

Once all subsamples are collected, they should be mixed as thoroughly as possible to make a composite sample. The mixing can be done in a clean, five-gallon bucket or on a tarp, depending on the amount of litter. The final composite sample, which will be submitted for analysis, should be collected in a sealable freezer bag (a pint of litter is sufficient). Carefully label the bag with permanent marker to include



**Figure 4. Zigzag sampling pattern for in-house litter sampling**

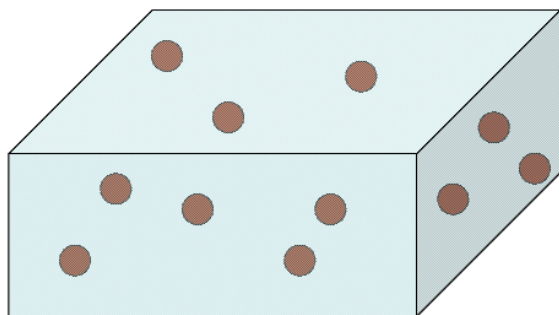


**Figure 5. Diagram of in-house sample collection** (courtesy of LSU Agricultural Center fact sheet, "Sampling Poultry Litter and Soil for Nutrient Analysis")

sample name/ID, date sampled, number of flocks raised on litter, size of birds raised, bedding material and that it was sampled in-house as opposed to an intermediate storage facility.

## How Do You Sample Stockpiled Litter?

Composite samples from litter stacks or piles are collected using subsamples from various locations and depths (Figure 6). The number of subsamples collected depends on the size of the litter stack. The rule of thumb is to take enough subsamples so that all depth (distance into the stack) and height (locations from top to bottom) increments are sampled. The litter on the surface of the stack will represent only a small portion of the total volume of the litter and should not be over-sampled.



**Figure 6. Sample pattern for litter stacked in intermediate storage**

Subsamples can be collected by hand using long exam gloves or by using a spade (Figure 7) to dig down to the appropriate depth. Collect all of the subsamples in a container (e.g., clean, five-gallon bucket), mix thoroughly and combine into one sample.



**Figure 7. Digging into stack for subsample**

The composite sample should be collected in a sealable freezer bag (a pint of litter is sufficient). Carefully label the bag with permanent marker to include sample name/ID, date sampled, number of flocks raised on litter, size of birds raised, bedding material and that it was taken from a stack or other intermediate storage facility.

## How and Where Do You Submit Samples for Testing?

Samples should be taken to the local county extension office. The extension office will collect any additional information needed to complete the submission form. A check in the amount of total analysis cost should be sent with the sample. As of July 1, 2006, the cost for routine litter analysis is \$20. A test for water-soluble P can be obtained for an additional \$8. Contact your local extension office for the most up-to-date costs of analysis. Sample analysis results are normally returned to the client by mail within two to three weeks of sample submission.

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