

Nutrient Management and Water Quality Best Management Practices for the West Virginia Poultry Industry

Updated September 2008



Wilkins Poultry Farm, Lost River, WV

Photo courtesy of WVDA

Best Management Practices for the West Virginia Poultry Industry

September 2008

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Cooperating Agencies:

- Potomac Valley Conservation District
- USDA Natural Resources Conservation Service USDA
- USDA Farm Service Agency
- West Virginia Department of Agriculture
- West Virginia Conservation Agency
- West Virginia University Extension Service
- West Virginia Poultry Association
- Chesapeake Bay Program
- Grant, Hardy, Hampshire, Mineral and Pendleton County Commissions
- Pilgrim's Pride
- Perdue Farms, Inc
- Tyson Foods
- George's Inc
- Virginia Poultry Growers Cooperative
- Avigen Turkey
- Cargill Turkey Inc

Foreword

Over the past fifteen years, the poultry industry has worked to implement Best Management Practices and protect water quality in the Potomac and Greenbrier Valley Regions. The proper management of manure, site selection for new poultry houses and cost share programs has all contributed to this success.

The poultry producing areas in West Virginia are seeing an increase in population and this increase brings new neighbors who are unfamiliar with agriculture and its practices. Impending federal regulations that could impact local poultry operations are the result of ever increasing scrutiny of the environmental impacts of agriculture. Agricultural producers must work together and be diligent in doing the right thing, being a good neighbor and protecting water quality.

This manual is intended to encourage producers to continue evaluating their operations and look for economical Best Management Practices that can benefit not only their trade but also protect the water quality of our downstream neighbors. This manual has been updated from the former version developed by the West Virginia Poultry Water Quality Advisory and Technical Committee. Its contribution was invaluable as a building block for the development of new programs and updates in the environmental management field.



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Nutrient Management Planning

A nutrient management plan is a written site specific plan which describes how the major plant nutrients (nitrogen, phosphorus and potassium) are to be managed annually. The goal of nutrient management planning is to minimize adverse environmental effects, primarily upon water quality, and avoid unnecessary nutrient applications above the point where long run net farm financial returns are optimized. The plan will address the most critical farm nutrient problems through measures to manage fertilizers and animal manures to reduce runoff, erosion and nutrient loss. A nutrient management plan should provide for the safe on-farm or off- farm transport of one-hundred percent of the animal manures produced or used on the farm.

Producers are encouraged to have a Nutrient Management Plan. A plan can be developed by a certified nutrient management planner or can be completed by the producer. A list of local certified nutrient management planners can be obtained from the West Virginia Department of Agriculture or by contacting the agencies listed at the end of this document.

The effective use of a nutrient management plan can increase environmental stabilization and decrease crop production costs by effectively utilizing nutrients produced on the farm and reduce the need for commercial fertilizer applications.

The components of a nutrient management plan can be found in *Appendix A*.



*Photo courtesy of
USDA NRCS*

Litter Utilization and Management

Litter utilization and management incorporates the proper storage and usage of poultry litter as it is generated on the farm. Determining the amount of litter produced annually is needed to plan for crop requirements and land application in a nutrient management plan.

Recommendations for litter storage and facilities include:

- Litter should be stored on a site with less than 15 percent slope and be located at least 50 feet from all drainage ways, surface or other seasonally high water areas. Litter should also be stored 100 feet from well heads and 50 feet from property lines.
- Litter should be protected to prevent water from entering the litter either from rain or storm water runoff. Coverage may include, but is not limited to litter or manure storage facilities and tarps or plastic. Water should also be diverted away from the storage sites to prevent excessive water in the piles.

Sufficient land is needed to correctly utilize the nutrients in poultry litter and manure and reduce the chance of run off into the nearby waterways. A nutrient management plan should include guidelines for proper land application and recommendations for dealing with excess poultry litter on a farm. For land application, poultry litter should be applied based on crop requirements. Manure should be applied following best management practices and recorded in the nutrient management plan.

Documentation of who, when and how much litter transported should be recorded when poultry litter is removed from the farm and kept as part of the nutrient management plan. Litter that is removed from the farm on a public road must be covered during transport and producers should provide the receiving farm with a current manure analysis for their record keeping.

Nutrient Application

Nutrient application incorporates the usage of animal manures and commercial fertilizers to provide for crop nutrient requirements. Conscientious application of both nutrient sources will reduce excessive nutrient loading to crop and pasture land.

Land application guidelines should be based on an assessment of the farm's nutrient status of nitrogen or phosphorus. Application should not be based on field access, storage capacity or the lack thereof. Annual production estimates should also be considered. A manure analysis should be performed annually. Information on submitting a manure sample and interpreting your analysis can be found in *Appendix B*. A soil analysis should be performed every three years when your nutrient management plan is updated. Information on taking a soil sample and interpreting the analysis can be found in *Appendix C*.

Guidelines can be established by:

- Reviewing or establish field histories including previous crops produced and the amount of fertilizer or manures used.
- Determining the type of crops to be produced for the current year.
- Determining the crop nutrient requirements based on reasonable yield expectations, goals or yield history.
- Determining the amount of off farm nutrients that are needed to meet crop yield goals, if needed.
- Before land application, spreader calibrating is necessary. *Appendix D* outlines how to properly calibrate your spreader.
- Incorporation of litter on crop land improves utilization and retention of the nutrients.
- When surface applying litter or manures on hay or pasture land, fields should have adequate vegetative cover.

For land application it is recommended:

- Manures or litter should not be applied to land with more than 25 percent slope unless sufficient vegetative cover is present to retain and utilize the applied nutrients.
- Manure or litter should not be applied within 50 feet of any water source or sink-hole or within 100 feet of a well head.
- Timing should be based on nutrient requirements of the crop, field conditions and weather.
- Land application on fallow, dormant crops or frozen/snow covered or saturated land is not recommended.

- Application should not be at more than 100 percent of the demonstrated need of the crop, based on the previous crop usage, yield estimates or recommendations based on litter and soil tests.

Best Management Practices that may be utilized in a nutrient management plan to reduce nutrient runoff include, but are not limited to:

- Conservation tillage practices to improve crop residue management and increase soil tilth and organic matter. Such practices may include no-till and minimum tillage practices.
- Crop rotation to utilize legume nitrogen credits and nutrient residuals in the soil.
- Use of cover crops for fallow land or over-wintering of crop land.
- Vegetative buffer zones and grassed filter strips for stream and sink hole protection. This should be a 25 foot minimum.
- Strip cropping and contour farming to slow surface water runoff.
- Diversion systems to route storm water away from facilities and storage sites.
- Applying manures and fertilizers 50 feet from property lines is recommended but not required.



Photo courtesy of USDA NRCS

Mortality Management

Poultry mortality can be disposed of by the approved methods of composting, rendering, incineration or sanitary landfill. Composting is the preferred method of disposal based on environmental soundness, biosecurity and effectiveness. Composting can also result in increased nitrogen stabilization, aids in elimination of disease, the abatement of flies and odors and the reduction of potential surface and ground water contamination. Incineration, sanitary landfill and rendering are effective and acceptable mortality disposal methods, but they are more expensive than composting.

If a grower is going to take birds to the rendering plant or landfill, carcasses must be kept in cold storage. Transportation poses a biosecurity risk and a high level of biosecurity must be maintained. Carcasses must be contained and covered when transported on public roads.

West Virginia law prohibits the feeding of unrendered poultry mortalities to other livestock. Poultry producers installing a new incinerator must register it with the West Virginia Department of Environmental Protection Division of Air Quality at 304-926-0499.

Appendix E contains information on how to properly build and maintain a mortality compost pile.



Environmental Considerations for New Construction

Before beginning any new construction, it is the landowner's responsibility to check local and state regulations concerning permits, zoning and fees associated with building permits and land disturbance.

Site and set back regulations as control measures are based on air and ventilation requirements, vehicle maneuverability around facilities and environmental stability. It is recommended that poultry houses, litter sheds and composter be at least (These recommendations are only accurate if there are not local ordinances in place :

- 1000 feet from a school, public well, public spring, public water intake or town. Excluded are residential dwellings used for home schooling.
- 400 feet from a single residential dwelling in active use, place of retail business, church or public building.
- 150 feet from any property line. This can be reduced with adjoining landowners notarized written consent.
- 75 feet from the near edge of the right of way of any public road.

Site construction (eg. houses, roads, litter shed, composters, etc.) involving more than 1 acre of land disturbance requires the completion of a National Pollutant Discharge Elimination System (NPDES) permit as dictated by the West Virginia Department of Environmental Protection. There is a charge for these permits and in some cases an engineer will be needed for the application process. Information can be found at <http://www.wvdep.org/dwvm/stormwater/index.htm>. For construction involving less than one acre of land disturbance, a Sediment and Erosion Control Plan is recommended. This application and information can be obtained from your local Conservation District.

Site construction involving stream disturbance requires a Public Lands Corporation Permit as dictated by the West Virginia Department of Environmental Protection. Information can be found on the above website or by calling the WV DEP offices listed in the Appendix of this booklet.

Complete listings of information on best management practices that may be utilized to reduce sediment and erosion can be found at your local NRCS Office. Listed below are examples:

- Seeding and maintenance of highly erodible area with a permanent vegetative cover.
- Use of rain gutters and downspouts where needed or appropriate.
- Basin systems for sediment collection.
- Diversion systems to route storm water around facilities and storage sites.
- Vegetative filter zones in riparian areas.

Neighbor Relations

Adapted from Casey Ritz, Ph.D. The University of Georgia College of Agricultural and Environmental Sciences

Problems between neighbors can and do arise as the boundaries between rural and urban life blur. A number of issues can cause contention between neighbors, often the result of differing viewpoints. From the farmer's point of view, increases in road traffic and trash, trespass from pets and people, and constraints about normal farming practices may become an issue. For non-farm neighbors, dust and odors, insect pests, noise and obstructed views may become sources of irritation.

Conflict prevention measures can be both tangible and intangible in nature. Communication skills and disseminating information may be as important as minimizing odors or pests through improved management practices. The following are practices and suggestions that can help poultry farmers maintain or improve neighbor relations. Proper manure handling practices are foremost points to consider in avoiding potential nuisance complaints or court action.

- **Get to know your neighbors.** This is perhaps the most important and simplest action you can take. People are more open to discussion with individuals they know. Be neighborly and a good listener. As a result, your neighbors will be more likely to come to you with a complaint instead of reporting you to an authority or enforcement agency. A lack of good will between neighbors is a contributing factor in most nuisance complaints.
- **Operate your poultry farm as if you were the next-door neighbor.** Try understanding their viewpoint as non-farm neighbors living in a farming community. Recognize that neighbors have the right to enjoy their property without the nuisance of flies, odor and dust. Properly maintained and operated poultry farms do not need to be, and should not be, a nuisance to neighbors.
- **Small things matter in maintaining good relationships, such as a wave and a smile.** Be particularly mindful of sensitive neighbors. Little gestures of friendliness go a long way toward fortifying goodwill. Reward tolerant neighbors with a token of your appreciation — perhaps free poultry litter for their gardens, a neighborhood barbeque, a holiday turkey or something similar.
- **Invite neighbors over the fence.** “Show and tell” your farming operation, explaining the need for some practices that perhaps are unappealing or objectionable. The general public has no idea of what it takes to put food on their tables.
- **Screen some things from public view.** Since people often “smell” with their eyes, screen from public view production, manure storage and composting facilities with the use of tree lines or shelterbelts. Minimizing visibility helps

- reduce the suggestion that the farm might be a source of odor, flies or other nuisances.
- **Cover manure that is transported on public roadways to prevent spillage and blow out.** Not only is it a sensible practice toward maintaining good neighbor relations, but most states by law require that any material that can blow out during transport, such as poultry litter, must be covered and contained.
 - **Cover stored manure** in accordance with best management practices for nutrient retention and water quality protection. A stack house structure for storing poultry litter is the ideal method for coverage. If such a structure is not available, cover litter with a tarp, keeping it away from roadways, waterways and property lines. Uncovered litter can be a potential water quality problem.
 - **Be considerate when land applying poultry manure.** Poultry manure from well-managed dry production systems will have minimal odor, but always consider the prevailing winds and weather conditions when spreading manure near neighbors. Allow a little flexibility in your spreading schedule to accommodate unfavorable spreading conditions. Windy or wet conditions can displace nutrients from where they were intended, causing poor fertilization uniformity and potential contamination problems on adjacent properties. Incorporate manure into the soil wherever and whenever possible to maximize the fertilization benefits from the available nutrients and to minimize odor dispersion and potential nutrient runoff due to storm water.
 - **Land apply manure in the morning hours to allow for greater odor dissipation and manure drying throughout the day.** Applying manure in the late afternoon and evening hours allows the still night air to trap and spread odors close to the ground, a common complaint of poultry farm neighbors.
 - **Inform neighbors when you intend to spread manure.** Be willing to be flexible with your spreading schedule to avoid disrupting special occasions such as a backyard wedding, family reunion, etc. Maintain no-spread buffer zones at the property line and avoid spreading on weekends or holidays when neighbors are more likely to be out-of-doors.
 - **Keep manure, feed and other organic material around poultry facilities as dry as possible.** Wet materials generate more odors and flies than do those that are kept dry. Clean up spilled feed and manure around the facilities and roadways to prevent an increase of flies, rodents, and odors.
 - **Make your farm appealing.** The appearance of the farm plays an important part in what others in the community think of you and your farming operation. Eyesores create less goodwill and public sympathy if problems arise. Farm appearance can easily be construed as a reflection of a farmer's professionalism, competence and concern for neighborhood conditions.
 - **Maintain property line fences.** Safe advice continues to hold true that "good fences make for good neighbors."
 - **Develop manure and odor control management plans.** Make sure all employees understand the importance of appropriate manure handling and odor control. Use manure management practices that reduce the release of offensive odors

such as composting or transfer of excess manure off the farm. Maintain records of manure application rates and timing as evidence of adhering to appropriate Best Management Practices for manure use.

- **Communicate plans for new construction or expansion with neighbors.** Show how you have taken their concerns about manure management and odor control into consideration. At times this may go further than just being neighborly. It may actually be a requirement where county ordinances stipulate the need for a public hearing or comment period prior to construction or expansion.
- **Give prompt and genuine responses to complaints or problems when they arise.** Be sympathetic and understanding of neighbors' concerns and avoid being uncaring or arrogant. Sometimes it is better to bite your tongue to do what is best for your farm over the long term. Ignoring issues, whether you feel they are relevant or not, can quickly drive a neighbor to seek legal action. Maintaining open lines of communication will always help resolve issues when they arise. Inform your poultry company of any potential nuisance situations with a neighbor and seek their advice on the issue. Solving the problem may be as simple as making a management change.
- **Consider new alternatives and technologies for manure handling and odor control.** A small investment now may prevent large legal expenses later on.
- **Comply with applicable federal, state and local environmental regulations.** Don't give neighbors legal reason to investigate or sue over environmental infractions.
- **Conduct an environmental self assessment** using the Farm*A*Syst program, or have a third party help you identify environmental concerns before they become a nuisance or legal problem.
- **Be active in the community.** Better educate the public by supporting agricultural education activities and outreach programs. Be active with the local government, promoting pro-agriculture public opinion, legislation and regulation. Get to know your local representatives and community decision makers and keep them informed about your business.

Developing and improving neighbor relations can be one of the most important activities that help farming operations survive in our changing rural environment. By helping neighbors understand the activities associated with agriculture, farmers may help shape how they feel about agricultural practices and avert needless conflicts and animosity. Treating neighbors with concern and respect will help ensure continuation of appropriate, responsible farming practices in the future.

Full text of this document can be found at:

<http://pubs.caes.uga.edu/caespubs/pubcd/B1263.htm>

Frequently Asked Questions (FAQ's)

Does composted poultry mortality generate flies and odors? Composting is an approved method of handling poultry mortality. Properly managed compost should not result in additional flies or odors.

What are appropriate set backs from property lines for poultry houses? Individual counties may have recommendations or regulations that define set backs for agricultural operations. Check with your local Planning Office and/or poultry company for local regulations or suggested set back requirements.

What about litter storage recommendations for other users of poultry litter? Producers who sell or redirect poultry litter from their operations to others should strongly encourage the recipients of the litter to comply with all recommendations regarding handling, storage and application of the litter.

Are annual updates required for nutrient management plans? Nutrient Management Plans should be updated every three years unless there is a notable change with the operation such as an increase or decrease in production which would require a modification to the current plan. Future regulations may constitute annual reporting to a government entity within the State of WV.

Are poultry growers required to obtain a Sediment and Erosion Control permit for new construction? If more than an acre of land is disturbed a NPDES permit which includes a Sediment and Erosion Control plan is required. This information can be found by contacting your local WV Department of Environmental Protection Office.

Are incinerators required to have secondary burners to eliminate odors in West Virginia? Incinerators are an approved method of disposal of poultry mortality in West Virginia. The requirements of the WV Air Pollution Control board do not currently require a secondary burner. Composting is the preferred method of dealing with poultry mortality.

Must litter piles be covered in the field before application? Poultry litter that is to be left in the field for some extended period of time, before spreading, should be covered with an impermeable cover. Eliminating the infiltration of water into the litter pile is desirable for several reasons. Obviously, preventing water from entering the pile eliminates the potential of surface water contamination by runoff. Water can cause volatilization of ammonia and thus the loss of valuable N to the atmosphere.

How much does litter cost? There are changes in costs associated with the purchase of poultry litter. Fuel costs associated with transportation and application increase the cost of the litter. The price of commercial fertilizer realized today makes poultry litter an economical source of N, P and K.

Is there a need to be concerned about hormones in poultry litter? The feeding of hormones and steroids have been banned in poultry feed for over fifty years. Preventing runoff is always a recommended practice to reduce nutrients, bacteria and hormones from entering the surface waters. Runoff studies have shown that poultry litter will lose estradiol to the environment. Further study is needed to more clearly understand operational differences and movement of hormones from animal wastes.

What are the "rules of thumb" for land application of poultry litter? Land application of poultry litter should be based upon soil tests and the requirements of the crop being grown. A field history that includes yield data should be used to determine application rate. There are several publications that can give information on nutrient removal for various crops. Generally it is recommended that 1.5 to 2.0 tons per acre be applied for pasture or hay land. For corn for grain or silage a 3.0-3.5 ton per acre rate is a general recommendation. Again, actual yield data and histories for individual fields should be recorded for proper planning. Use of the Phosphorus Site index to reduce the risk of losing phosphorus to the environment in vulnerable areas of a farming operation is recommended for all fields that are targeted for poultry litter applications.

Where can I go with questions to find answers about Nutrient Management Planning? A good source of information is a West Virginia Certified Planner. A list of these individuals can be obtained from the WV Department of Agriculture. You can also contact your local Conservation District, WVU Extension Agent or NRCS Field Office.

What is a phosphorus-based (P based) nutrient management plan? A P-based nutrient management plan is one that restricts the level of phosphorus application to the land based upon soil analysis and existing P levels. A P based plan can be used to reduce the potential of a loss of phosphorous to the environment on sites that are high or very high in phosphorous.

Does poultry litter have weed seeds? Poultry litter does not contain an appreciable amount of viable weed seed. However, it does enhance weed growth as well as desirable plant growth. The change of fertility after an application of poultry litter may bring on weeds that have always been there. Scouting fields for weeds and pests should be a part of the farms annual operational plan.

Appendices

Components of a Nutrient Management Plan

- A. Plan Identification
 - 1. Producer's name and address
 - 2. Planner's name and address
 - 3. Acreage of each crop under the plan
- B. Map or Aerial Photo
 - 1. Plan map identifying farm location, tract and field boundaries with acreage
 - 2. Identify unique features such as sinkholes, water course, wet areas
- C. Nutrient Recommendations
 - 1. Planned crop
 - 2. Realistic yield goal
 - 3. Field specific using:
 - a. soil test
 - b. residual nitrogen credits
 - c. manure analysis
 - 4. Nutrient application rates
 - a. nitrogen
 - b. phosphorous
 - c. potassium
 - 5. Amount of manure applied
 - 6. Lime recommendations
 - 7. Amount of manure produced annually
 - 8. Identification and utilization of excess manure produced
 - 9. Sequence of crop rotation
- D. Plan Maintenance
 - 1. Updated every 3 years
 - 2. Checklist of BMP's
 - 3. Signature of planner and certification number

Future regulations could require additional information to be included in a nutrient management plan.

Nutrient Management

Thomas J. Basden, WVU Extension Specialist

Sample Collection Procedure for Manure Analysis

Collecting a **representative** sample is the key to an accurate nutrient analysis. If you have a history of analyzed samples and a sample comes back that is significantly different from your previous submitted samples and you have not changed your feed or storage methods, resubmit another sample and tell the lab you have received unexpected results. If farmers are to depend upon manure to supply needed crop nutrients, a periodic manure sample should be taken and sent to the lab.

Sample Collection

Semi-solid Lot Manure (Dairy or Beef)

Scraped directly from lot into spreader:

After manure has been loaded into the spreader, collect manure from several different locations within the spreader. Thoroughly mix and fill sample container **one-half full**.

Form Storage:

Collect a representative sample of relatively fresh manure from under the surface crust. Avoid collecting a disproportionate amount of bedding materials with the manure. Mix well and fill sample container **one-half full**.

Collection Tool:

Construct a device similar to a soil auger, using a three foot length of thin walled pipe. Sharpen the bottom end of the pipe, drill the top end so a dowel can be fitted as a handle and cut a four foot piece of a broom stick to push manure out of the tube.

Liquid Manure Slurry

Under-slotted floor pit:

Use a length of ½” conduit that is open at each end but can be easily sealed on one end by placing a hand of thumb over the end of the conduit. With both ends of the conduit open, extend it into the manure to the pit floor. Seal the upper end of the conduit trapping the manure that has entered the lower end, remove and empty into a bucket. Collect samples from at least five locations or at least enough for a total of 1 quart of slurry. Thoroughly mix this slurry and fill sample container **one-half full**.

Exterior storage basin or tank:

Appendix B- Collecting, Submitting and Interpreting Manure Analysis

Make sure the manure has been well mixed or homogenized with a liquid manure chopper-agitator pump or propeller agitator. Take samples from five locations in the pit, from the agitator pump, or from the manure spreader and place in bucket. Mix well and fill jar **one-half full**.

Broiler or Turkey Litter

In-house litter:

Visually inspect the litter for areas of varying quality, such as feeders or watering systems, and estimate the percentage of floor surface in each of those areas. Take five proportionate samples of litter at locations that represent the different areas. At each location sample a 6' by 6' area down to the earth floor or concrete. Place in bucket and mix well. Fill sample container one-half full.

From stockpiled litter:

Collect samples from five locations around the pile at least 18 inches into the pile. Thoroughly mix and fill sample container one-half full.

Sample Preparation and Transfer

Manure **will** expand as it travels to the manure lab, so never fill the jar to the top and make sure that the lid is screwed on tightly.

Complete the submission form, sample date, producer name and address, manure type and storage type. This information is important for the lab.

Mail sample as soon as collected or freeze the sample until it is mailed. Do not leave a sample at room temperature. The nutrient composition will change due to microbial action. To avoid the samples sitting in the post office over a weekend, mail samples on a Monday or Tuesday.

Send Manure Samples To:

West Virginia Department of Agriculture
Moorefield Field Office
60B Industrial Park Road
Moorefield, WV 26836

References:

- 1) University of Maryland Cooperative Extension Service, Manure Analysis Instruction Sheet, Solid Wastes and Poultry litter. Nutrient Management Program, Reference Manual.
- 2) Virginia Tech Extension Service, Sample Collection section of Nutrient Management Manual.

Appendix B- Collecting, Submitting and Interpreting Manure Analysis

LITTER AND MANURE ANALYSIS SUBMISSION FORM

To be completed by Sampler and Submitting Producer

Date Sampled: _____ Time Sampled: _____

Sampled by (print): _____

Relinquished to agency or lab by (sign): _____ (Date) _____ (Time) _____

Received in agency or lab by (sign): _____ (Date) _____ (Time) _____

Manure Type (check one)

<input type="checkbox"/> 1- Broiler Litter	<input type="checkbox"/> 4-Breeder	<input type="checkbox"/> 7-Semi-Solid Beef
<input type="checkbox"/> 2- Turkey Litter	<input type="checkbox"/> 5-Liquid Dairy	<input type="checkbox"/> 8-Liquid Swine
<input type="checkbox"/> 3- Layer	<input type="checkbox"/> 6-Semi-Solid Dairy	<input type="checkbox"/> 9-Other (Specify) _____

Storage Type (check one)

<input type="checkbox"/> A- House	<input type="checkbox"/> E- Earthen Liquid Dairy
<input type="checkbox"/> B- Uncovered-Stack	<input type="checkbox"/> F- Semi Solid Stack (Dairy or Beef)
<input type="checkbox"/> C- Covered Stack	<input type="checkbox"/> G- Silo or Concrete Liquid Dairy
<input type="checkbox"/> D- Roofed Storage	<input type="checkbox"/> H- Other (Specify) _____

Producer Name and Address: _____

Enter email address for results: _____

To be completed by Submitting Agency

Sample Submitted By:
Give complete mailing address of submitting agency.
Analysis will be returned to this address. *Add web address for results by email.*

Individual or Agency _____

Street Address _____

City, State, Zip _____

Phone / email: _____

Relinquished by (sign): _____ (Date) _____ (Time) _____

Received in lab by (sign): _____ (Date) _____ (Time) _____

Send Samples To:

W.V. Department of Agriculture
Moorefield Field Office
60B Moorefield Industrial Park Rd.
Moorefield, WV 26836

For Lab Use Only:

Lab Number: _____
Date Received: _____

Appendix B- Collecting, Submitting and Interpreting Manure

Understanding Manure Analysis

Introduction

The West Virginia Department of Agriculture's (WVDA) manure analysis report is designed to provide the information needed to calculate manure application rates. It is becoming increasingly important to have current manure nutrient information available. Being aware of the nutrient content of the manure can help landowners take advantage of this valuable resource. There tends to be a considerable amount of nutrient variability from farm to farm depending on different management practices. By repeatedly using an "average" value, landowners may be applying more nutrients than originally intended. If landowners underestimate nutrient content, over application can occur creating a nutrient build-up over time. If landowners overestimate nutrient content, they deprive the crop by not supplying the nutrients it requires for optimal growth, thus risking lower yield. Being aware of the nutrient content of manure can help prevent over application which can lead to ground and surface water pollution.



Reading the Manure Analysis

WVDA's Laboratory Analysis Report is divided into three sections. The first, or top portion of the page, is descriptive information about the customer, including customer identification and the person or agency that submitted the sample, sample identification and description, and the date the sample was collected, received by the lab, and when the results were reported. The information provided on the sample submission form is essential for the laboratory to provide accurate results.

The second section of the report contains the analytical results. This section is divided into six columns. The first column lists the test parameter (e.g. Nitrogen (TKN)). The second column provides the result of the test in pounds per ton or pounds per thousand gallons, depending on whether the sample is in liquid or solid form. The percent value is converted to pounds per ton for the purpose of calculating application rates

LABORATORY ANALYSIS REPORT

WVDA Nutrient
Management Lab
Moorefield Field Office
60B Industrial Park Road
Moorefield, WV 26836
304-538-2397

Date Received: June 28, 2005

Date Sampled: June 22, 2005

Date of Report: July 1, 2005

Submitted by: NRCS
223 North Main Street
Moorefield, WV 26836

Land Owner: John Smith
or Operator: Rt. 2 Box 1910
Somewhere, WV 10002

Sample ID Number: 06250501

Sample Description: Broiler litter

Test Parameter	lbs/ton	%	Test date	Method	MDL
(N)Nitrogen (TKN)	53.63	2.68	7/1/2005	351.3 EPA	0.372
(P)Phosphate (P2O5)	47.91	2.39	6/30/2005	365.2 EPA	0.017
(K)Potash (K2O)	51.71	2.58	6/30/2005	3111B STM	0.109
*Moisture	****	30.07	6/30/2005	2540 STM	0.831
Ammonia	14.27	0.74	6/30/2005	350.2 EPA	0.032
C:N Ratio	21.25	***	7/1/2005	*****	***
Copper	0.631	0.0315	6/30/2005	3111B STM	0.011
Calcium	42.10	2.11	6/30/2005	3111B STM	0.236
Magnesium	8.89	0.44	6/30/2005	3111B STM	0.028

*Calculations based on Total Solids

**Not a certifiable method

When surface applied this sample will
supply plant available:

Nitrogen (N) 19.40 lbs/ton
Phosphate (P2O5) 47.91 lbs/ton
Potash (K2O) 51.71 lbs/ton

Additional nitrogen is available 14.27 lbs/ton if incorporated or injected immediately.

Approved By _____

Appendix B- Collecting, Submitting and Interpreting Manure Analysis

or nutrient credits. The third column provides the percentage of the test parameter for that sample. This percentage represents the nutrient content for that sample on a wet weight basis, not a dry matter basis, because manure is applied "as-is." The fourth column indicates the date the sample analysis was performed. The fifth column lists the test method used for the determination of that particular test parameter. The sixth column lists the method detection limit for the test method used. The units for the method detection limits are in parts per million, not the same as the percentage units in column three.

The third section includes estimates of nutrient availability for nitrogen, phosphorous, and potassium. This section takes the sample results and converts them to units you can use on the farm. For example, if there are 52 lbs/ton of P_2O_5 (phosphate) and you apply 2 ton per acre, you have applied 104 pounds of P_2O_5 (2×52 lbs./ton). The amount of organic nitrogen that will mineralize during the first year is the organic nitrogen multiplied by a mineralization factor. The mineralization factor is the amount of organic material that is converted to an inorganic form by soil microbes. The total plant available nitrogen can be calculated by adding the ammonium nitrogen value from the manure analysis to the organic nitrogen available the first year. Nitrogen availability is based on animal species, manure storage and handling system, application method and timing, days until manure incorporation, and other factors. Practically all of the phosphate (P_2O_5) and potash (K_2O) in manure is available to the crop the same as supplied by fertilizer. A key element in application management is incorporating the manure immediately after it is applied. This practice will prevent ammonia loss to the atmosphere which reduces the value of the manure.

Using the Information from a Manure Analysis

The information on the manure analysis is only one part of the information needed to ensure proper nutrient application. You will also need to know the crop nutrient needs (Figure 1) from a soil analysis. The following tables can help in calculating the amount of manure required to meet crop needs.

Nutrient	lbs. needed/acre
N	60
P_2O_5	40
K_2O	80

Figure 1: Example of soil test recommendations.

Nutrient	lbs./ton of manure
Nitrogen (TKN)	31
Ammonium nitrogen	17
Phosphate (P_2O_5)	59
Potash (K_2O)	56

Figure 2: Example of manure analysis.

N form	lbs./ton	% available	lbs.available
Ammonium	17	100	17 lbs./ton
Organic N (total N minus ammonium)	14	50	7 lbs./ton
Total N available			24 lbs./ton

Figure 3: Total and available nitrogen.

Nutrient need	divided by	Nutrient content	Rate to apply
60 lb. N/acre	/	24 lb. N/ton	2.5 ton/acre
40 lb. P_2O_5 /acre	/	59 lb. P_2O_5 /ton	0.7 ton/acre
80 lb. K_2O /acre	/	56 lb. K_2O /ton	1.4 ton/acre

Figure 4: Rate of application.

Since nitrogen is commonly the most limiting nutrient for crops such as corn, the rate actually applied is determined by the nitrogen requirement. From the information above, this means that the P_2O_5 will be over-applied by 106 lbs./ton and the K_2O will be over-applied by 61 lbs./ton. In the long term, this nutrient overload can lead to the manure only supplying nitrogen for the crop while wasting the P and K that could be used on another area. This is why a good knowledge and understanding of a manure nutrient analysis is important in applying conservation practices on the farm. The goal of manure nutrient management is to maximize the dollar value of this resource, while at the same time reducing its potential as a contaminant.

For more information, contact:
West Virginia

Department of Agriculture
Regulatory & Environmental Affairs Division
Moorefield Agriculture Complex
(304) 538-2397
www.wvagriculture.org

Understanding Manure Analysis



Ensure proper nutrient
application and prevent
overapplication.



Gus R. Douglass,
Commissioner

This publication was funded in
part through a grant from the
Chesapeake Bay Program Office.



How to Take Good Soil Samples

To obtain a good soil sample, please follow these instructions:

WHEN? Soil samples taken in late summer and fall are better than those taken in winter through early spring because they come closer to representing the nutrient status in the soil as it affects crops. Avoid taking samples when soil is wet or frozen because of the difficulties encountered in handling and mixing. Do not take soil samples immediately after applying lime or fertilizer. Wait several months, or even longer if dry weather prevails. Don't sample if you recently treated your soil. Just a pinch of fertilizer or lime in a sample will give misleading results.

Send samples well in advance of the need for recommendations. Allow about three weeks for processing the samples and returning the information to you. Samples sent to the laboratory between March and June may take longer to process. Avoid delays by sending sample between July and December.

WHERE? To adequately assess the average fertilizer which plant roots encounter in soil, a minimum of 15-20 randomly selected soil borings should comprise the composite sample submitted to the laboratory. If the field is large, subdivide it in 10-acre sections and take at least 30 borings from each 10 acres. Seven to 10 borings will suffice for small areas such as lawns and gardens.

Exclude or take separate sample from areas not characteristic of the field, lawn, or garden: wet spots, eroded areas, bare spots, back furrows, field edges. If your field has several different soil types or crop conditions, send a separate sample for each. No single sample should represent an area larger than 10 acres.

HOW? Using an auger, shovel, or spade, and a CLEAN PLASTIC pail or container, take small uniform cores or thin slices from the soil surface to recommended depth (as given in the following paragraph). Gently crush the soil and mix it thoroughly, discarding any roots or stones. Wet soil must be AIR-DRIED in a shady spot and on a clean surface before mailing. DO NOT HEAT THE SAMPLE. Send at least ½ pound of the DRY soil to the laboratory in the special plastic bag which is in the envelope of the soil test mailer and enclose inside the cloth bag. Do not send wet soil as it costs more to mail and will delay your results. Fill out the information sheet completely, including your name and address written legibly.

HOW DEEP? Sample the soil layer in which your crop roots will be (or are) growing. PERMANENT PASTURES – Remove organic debris from soil surface, then

Appendix C- Collecting, Submitting and Interpreting Soil Analysis

sample top 2 inches. MEADOWS – Sample top 4-6 inches after removing surface organic debris. ROW CROPS – Sample soil to depth of tillage. NO-TILL CROPS – Sample to depths: a) top inch; b) from 1-6 inches. VEGETABLE GARDENS & PLANT BEDS – Sample the soil to tillage depth. LAWNS & TURF – Sample top 2 inches in established lawns and turf, 4 to 6 inches in soil in which a lawn or turf is to be established. Remove organic debris from soil surface prior to sampling. If you are preparing a new lawn or turf as recommended in WVU Misc. Pub. 405 “New Lawns” the subsoil should be tested separately at a depth of 6 to 12 inches.

HOW OFTEN? ROW CROPS & MEADOWS? – Every one to two years or whenever crops are rotated. PERMANENT PASTURE – At establishment and every three to four years. VEGETABLE GARDENS – At establishment and in fall of each year. LAWNS & TURF—At establishment and every three to five years.

A soil test mailer is good for having ONE soil sample analyzed for pH, lime requirement, and tests for available phosphorus, potassium, calcium and magnesium. Upon request and for a nominal fee, test for other elements can be made. Contact your WVU County Extension Agent for details, or write WVU Soil Testing Lab., Morgantown 26506-6108. You can make inquiries on lab results by calling 293-6258.

Interpreting the West Virginia Soil Test Report

(Adapted)
Devinder K. Bhumbla

West Virginia University Extension Service

The West Virginia University Soil Test Report is an important tool in making fertilizer and lime application decisions for field crops and forage production. This guide will help you understand the soil test report and make the results more useful in your farming operation.

The three components to soil testing are: a) soil sampling, b) laboratory analysis, and c) interpretation of results and recommendations for soil fertility management. Improper soil sampling and limited information about field history and intended use of the soil test may severely limit the usefulness of a soil test report.

The first part of the soil test report contains information that identifies the soil sample with the field or sample location. This information includes the field name or number, field size, soil texture, tillage method, liming history, and previous crop in the field.

The second part of the soil test report contains information on soil test results. The regular soil test includes information on soil pH, phosphorus, potassium, calcium, magnesium, cation exchange capacity, base saturation, and lime requirement. In addition to the above listed elements, the micro-nutrients zinc, copper, and manganese are also analyzed when a request is made for that analysis.. The values for these nutrients are given in pounds per acre. In addition to the numerical values for the nutrients (P, K, Ca, and Mg), soil test values are classified into "low", "medium", "high", and very "high" categories.

The soil test report also contains a section marked " for office use only". The information in this section is used for interpreting soil test results. This section contains information on relative amounts of nutrients in the soil. This information is useful specifically for making recommendations for magnesium application. If a soil has a very "low" magnesium saturation (magnesium saturation less than 10%), recommendations are made for using dolomitic limestone. This section also has information on cation exchange capacity (CEC) of soils and percentage base saturation (BS) of a soil.

The numerical values for a given nutrient depend upon the method used to extract and determine soil nutrients. Thus, laboratories using different extraction methods can have very different numerical values for the nutrient content of a soil. These values are used as a check on the accuracy of the procedures in the laboratory. An explanation of each of the measurements in a soil test result follows.

Appendix C- Collecting, Submitting and Interpreting Soil Analysis

SOIL - pH is an indicator of the acidity or alkalinity of a soil sample. A pH below 7.0 is acidic and pH above 7.0 is alkaline. "Low" soil pH is an indicator of acidity, but does not by itself predict lime requirement. For most crops, optimum pH levels are between 6.0 and 7.0. Crop production may be severely reduced in soils with a pH at or below 5.0.

Pounds per acre extractable phosphorus (P) is an index for determining phosphorus availability. The test results are expressed in pounds of elemental P per acre. This test is a measure of relative availability of phosphorus for plant growth. The test does not measure the total amount of phosphorus that may be available to a crop.

Pounds per acre extractable potassium (K), Calcium (Ca), and Magnesium (Mg) is an index for determining the availability of these three nutrients over the next growing season. The ratings of potassium soil test levels are similar to those made for phosphorus. Liming is recommended to supply these two nutrients. Magnesium is recommended if the present soil test level is below 10% saturation of the cation exchange capacity of a soil. The most common and most economic source of magnesium is dolomitic limestone. Quite often when lime is not needed, no magnesium recommendation is made. Cases of acute magnesium deficiency in crops are quite rare, and the cost of other sources of this nutrient is often prohibitive. In most cases, it is acceptable to wait until lime is needed again and then apply a magnesium lime (dolomitic). Where forage is grown on "low"- magnesium soils, the cattle must be fed a magnesium-containing mineral mixture.

Lime requirement (LR) is determined by a buffer pH value. Limestone recommendations are made to correct the problem of soil acidity. The lime requirement determines the amount of ground limestone that should be added to a soil to raise its pH to 6.5. WVU liming recommendations are based on soil test and crops to be grown.

The third part of the soil test report is "recommendations to landowner for agricultural limestone and fertilizers." These recommendations are based on soil test values, previous cropping history of the field, yield goals, and estimated nutrient removal by crops. Recommendations are made for agricultural limestone, nitrogen, phosphorus, and potassium. Agricultural limestone recommendations are in tons/acre of calcitic limestone required for pH correction. **Recommendations for nitrogen fertilizer are not based on soil testing.** These recommendations are based on expected crop removals and fertilizer use efficiency. You should pay attention to the yield goals for which nitrogen recommendations are made. If expected yield in your field is different than those given in soil test report, you need to correct the recommended fertilizer rates for your situation. Credit should also be given for any manure added to the soil and contribution of a previous legume crop such as alfalfa or soybeans.

Phosphorus and potassium recommendations are based on soil testing. Recommendations for these nutrients are given in lbs/acre of P_2O_5 and K_2O . It is important to understand recommendations made are not in terms of pounds of fertilizer that should be added to a given field. You will have to calculate the amounts of fertilizer based on the nutrient analysis of the fertilizer that you are using.

Appendix D- Calibration of Litter Spreader Equipment

Calibration of Litter Spreading Equipment

*Adapted from Potomac Valley Conservation District Poultry Litter
Nutrient Management and Application Guide*

Calibration of spreaders will allow producers to apply the designed rate of litter to their fields. The following materials will be needed: large plastic bucket, tarp (8'X8', 10'X10' or 10'X12') and handheld scales.

Tarp should be placed on a flat, smooth area far enough ahead of the spreading equipment to allow tarp to collect a normal, even rate of application. Collect all the litter spread on the tarp and place in the bucket. Weigh the bucket with the litter, then subtract the weight of the empty bucket. This will give you pounds of litter applied to the tarp. Refer to tarp size listed on the chart to get tons per acre of litter applied. This process should be repeated two to three times in order to gain a reliable average.

Pounds of Manure Applied to Collection Tarp	Tarp Size		
	8' X 8'	10' X 10'	10' X 12'
	Tons Litter Applied per Acre		
1	0.3	0.2	0.2
2	0.7	0.4	0.4
3	1	0.7	0.5
4	1.4	0.9	0.7
5	1.7	1.1	0.9
6	2	1.3	1.1
7	2.4	1.5	1.3
8	2.7	1.7	1.5
9	3.1	2	1.6
10	3.4	2.2	1.8
11	3.7	2.4	2
12	4.1	2.6	2.2
13	4.4	2.8	2.4
14	4.8	3.1	2.5
15	5.1	3.3	2.7
16	5.5	3.5	2.9
17	5.8	3.7	3.1
18	6.1	3.9	3.3
19	6.5	4.1	3.5
20	6.8	4.4	3.6
21	7.2	4.6	3.8
22	7.5	4.8	4

Poultry Mortality Composting Management Guide

Casey W. Ritz, Extension Poultry Scientist, University of Georgia
John W. Worley, Extension Engineer

Disposal of dead birds can be a problem for poultry growers. Typical methods of mortality disposal include burial, incineration, rendering, and composting. Many states have banned the use of burial pits that historically have been used to dispose of dead birds. Incineration can be costly and raise air quality concerns, and the decreasing number of renderers further complicates disposal.

Composting is considered a positive alternative method of processing dead birds in an environmentally sound manner. Composting though more labor intensive than other methods is the most widespread method used in states that have banned pits, and is considered by many as the best alternative for mortality management. The composting process converts dead birds into a useful, inoffensive, stable end product that can be field-applied for crop use and soil improvement. This relatively inexpensive method of using dead birds has gained wide acceptance throughout the poultry industry. Availability of cost-share funds to offset composter facility construction costs has contributed to the increase in the use of this mortality disposal method.

Principles of Composting

Composting is a natural, biological process by which organic material is broken down and decomposed into a stable end product. The composting process is carried out by bacteria, fungi and other microorganisms which digest the organic material and reduce it to humus. The principles of composting are quite simple. Provide the microorganisms with an environment conducive to their growth: a balanced diet, water and oxygen.

The essential elements for the microorganisms involved in composting are carbon (C), nitrogen (N), oxygen (O₂) and moisture (H₂O). If any of these elements are lacking, or if they are not provided in the proper proportion to one another, the microorganisms will not flourish and generate adequate heat for decomposition. These nutrients are best supplied from an ingredient profile that has a carbon to nitrogen ratio of approximately 30:1. Birds have a C:N ratio of 5:1, litter ranges from 7:1 to 25:1, straw 80:1, peanut hulls 50:1, and wood shavings are 300-700:1. A good carbon source will perform two functions: provide carbon and act as a bulking agent that creates pores

Appendix E- Composting Poultry Mortality

within the pile, allowing oxygen to flow through the material. If two parts by volume of litter and one part by volume of dead birds, along with adequate bulking agent is, contained in the litter or added prior to the carcasses, the C:N ratio should be adequate for the composting process to proceed.

The microorganisms best at composting are aerobic; that is, they require oxygen to live. During the composting process, oxygen is used up quickly by microorganisms inside the compost pile. Aerating the compost by turning re-supplies it with oxygen and allows the microorganisms to continue the composting process at a rapid rate.

Water is essential to the growth of all living organisms. Composting microorganisms thrive best in moist conditions. Desirable moisture levels in the composting materials should be 40 to 60 percent. Too much water can cause the compost pile to become soggy and anaerobic; too little water will prevent microorganisms from reproducing to adequately high numbers. The amount of water needed depends on the size of birds being composted and the moisture content of the litter and/or carbon bulking material. As a rule of thumb regarding proper moisture content, well-watered compost when squeezed into a ball will not drip water and will retain its shape when released.

Composter Construction and Layout

When siting a composter, choose a well-drained, graded and elevated location so ground water and surface runoff cannot enter the facility. The composter must also be located and graded such that it is accessible year round.

The size of a composter is typically based on the size of the poultry operation. For every one pound of dead bird, one cubic foot of primary compost space is needed. An equal amount of space is required for the secondary stage. The Natural Resources Conservation Service (NRCS) has standard designs and cost-share programs for composters of various sizes. Growers interested in composting and cost-share opportunities should contact their local NRCS office for funding information and design approval.

A typical poultry mortality composter consists of various sized bins constructed of treated lumber set on a concrete slab with a roof overhead. The roof helps maintain appropriate moisture levels within the compost. The concrete slab helps prevent leaching of nutrients into the soil, prevents vermin and pests from burrowing under the compost, and makes cleanup of the facility easier.

Typically the bins are constructed large enough to accommodate the equipment used to handle the material. Therefore, the width of the small bin composter must allow

Appendix E- Composting Poultry Mortality

the loader bucket to get into the bin. Normally these small bin composters will be 6-8 feet wide by five feet high and five feet deep. The depth of the bin may be limited to the reach capabilities of the front end loader in order to drop the composted material into the secondary bin, which may be located behind the primary bin. Moving the material from the primary bin to the secondary bin after 10 to 21 days is common for small bin type composters to mix in oxygen in the mass to promote additional heating. The oxygen is added to the mixture as it is moved from the primary bin to the secondary bin.

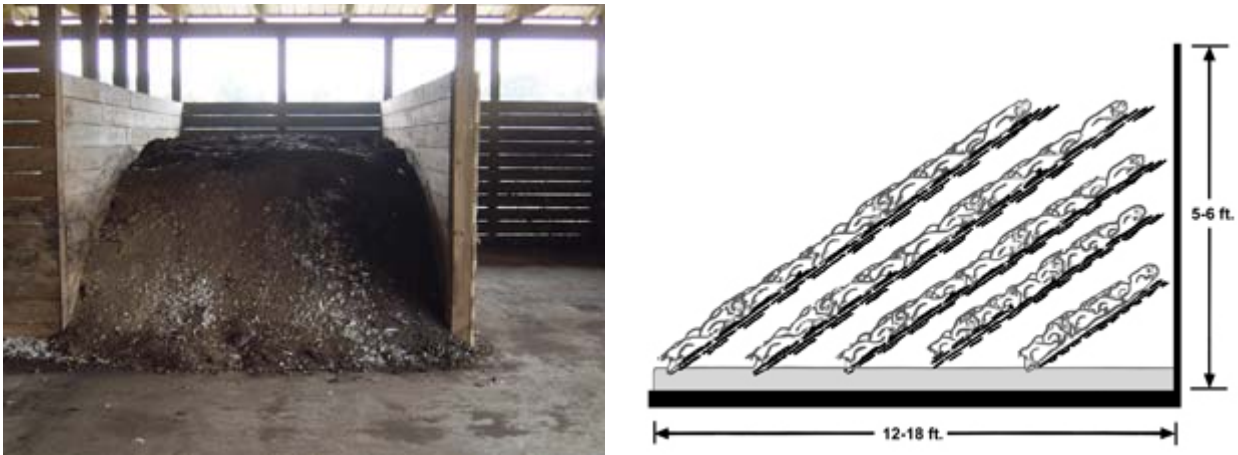


Figure 1. Bin composting on an angle can reduce time spent handling materials.

A modification to the small bin composter that is gaining in popularity is the use of a primary bin that is 5-10 feet deeper and with a front that is totally open. The compost material slopes back from the front of the composter at about a 45 degree angle (Figure 1). This design allows improved ingredient layering using a front end loader, so it requires less hand work. This modification can accommodate larger scale operations and material volumes. The primary and secondary bins are usually side by side or parallel to each other and built like a bunker silo. The big bin composter like the small bin type is filled to a height of 5 to 6 feet. Electrical power and a reliable water source are important necessities that should be made available at the composter to facilitate optimal year round composting.

Composter Operation and Management

The requirements for proper and complete decomposition of dead carcasses are reasonably simple and inexpensive. The materials needed (dead birds, litter, alternative carbon sources, water) are readily available on every poultry farm. Careful attention to proper management is essential for successful composting. Failure to manage the system will result in an odorous situation that attracts flies, scavengers and other vermin to the site. Proper management is vital for avoiding nuisance complaints.

Appendix E- Composting Poultry Mortality

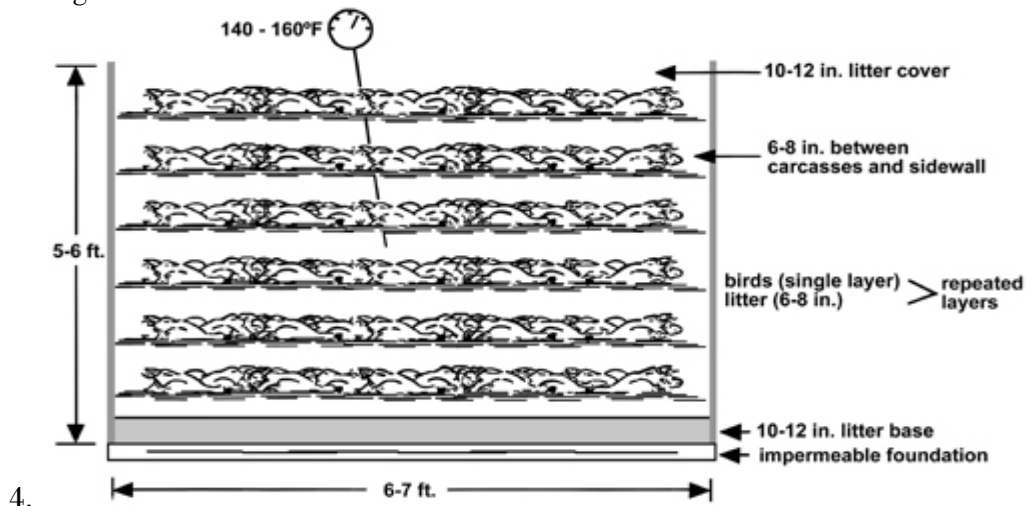
Decomposition of the dead carcasses and litter depends upon microbial activity. The greater the microbial growth, the faster the carcasses decompose. Anything that slows down microbial growth lowers the temperature of the composting material and slows the composting process. The more rapid the microbial growth, the greater the heat output within the composting mass and the more rapidly the mass breaks down. The microorganisms responsible for composting are initially supplied by active or fresh litter material. The microbes in the litter used in the composting process need to be kept alive and in sufficient numbers so the composting process can begin immediately to break down the carcasses and the litter. Litter that is too dry and too long removed from the house will contain lower numbers of microorganisms and its use slows the process of carcass decomposition. Keeping a small amount of active compost on hand to seed new compost bins is an excellent compost management strategy and efficient way to use finished compost.

Oxygen is initially supplied when the carcasses and litter are placed within the composter. If all the necessary requirements for composting are in the correct proportion, composting will begin immediately with a corresponding rise in temperature of between 130 and 150 degrees F within a few days. Temperatures that exceed 150 degrees F will eliminate pathogenic microorganisms and insect pests present within the compost. As oxygen becomes limited, the composting process and the temperature of the mass will decrease. The composting process can be sustained at higher temperatures by using a bulking agent which creates air pockets in the compost pile and thus supplies more oxygen to the composting process. A coarse material, such as wood shavings, straw or peanut hulls will ensure more oxygen, allowing higher composting temperatures for an extended time before it begins to drop. Adding more litter or litter cake increases heating. If litter cake is used, little or no bulking agents are needed. Finished compost can be used as the bulking material in place of new carbon-containing material up to 50 percent of the mix. If the litter is too fine, oxygen will be limited to the microorganisms, slowing their growth. Slower microbial growth causes a lower composting temperature with slower digestion of the birds. If the temperature of the compost does not reach at least 130 degrees F, birds nearer the walls where it is cooler will decompose very slowly. Proper management and operation of the composter is relatively easy when the basic principles are followed. The amount of labor required to compost birds is reasonably low.

Appendix E- Composting Poultry Mortality

Two-Stage System

In two-stage composting, the first stage generates heat and major tissue breakdown. The second stage after turning continues the process and homogenizes the material. Orderly loading of ingredients is necessary for efficient compost activity. Layer ingredients into the composter as illustrated in Figure 4.



4. Figure 4. Mortality composter profile.

- Place an initial layer of 8 to 12 inches of fresh litter on the floor. This litter will supply bacteria to start the process and will also help absorb carcass fluids or excess water that may be added to the composter.
- Next add a thin layer of bulking material such as peanut hulls, coarse shavings or straw. Litter cake, if used in the composter, can replace the need for adding this layer of bulking material.
- Now add a layer of bird carcasses. Arrange the carcasses in a single layer side by side touching each other. Place carcasses no closer than 6 inches from the walls of the composter. Carcasses placed too near the walls will not compost as rapidly due to lower temperatures there and this may cause odorous liquids to seep from the compost pile.
- A small amount of water may be needed after each carcass layer. Typically, thoroughly wetting the carcasses will add sufficient water to the mix to achieve the needed moisture level. If much water is needed, the litter can be too dry and low in live bacteria. Using finished compost material or fresh litter directly out of the chicken house can prevent this situation.
- Next, add a layer of litter. This layer should be twice as thick (8-10 inches) as the layer of carcasses underneath. If only a partial layer is needed for a day's mortality, the portion used must still be covered with litter. The rest of that layer can be used with subsequent mortality.

Appendix E- Composting Poultry Mortality

- After completing the initial layer, add subsequent layers of carcasses, bulk ingredients and litter until a height not exceeding 5 to 6 feet is reached. The last layer will be a cap of 8-10 inches of litter. Compost piles limited to 5 to 6 ft in depth, with adequate porosity and moisture levels, do not pose a fire hazard. Keep in mind, however, the potential for spontaneous combustion as temperatures are monitored throughout the composting process. Excessive height can induce higher compost temperatures that exceed 170 degrees F and increase the chance of spontaneous combustion.
- Larger birds may require extra care during composting. Additional water or carbon material may need to be added to better facilitate the decomposition process and additional heating cycles may be needed to produce an acceptable end product.

Bin composters are designed to accommodate normal mortality. And while they may successfully handle above-average losses, they are not designed for catastrophic losses that can be caused by excessive heat, building collapse, highly pathogenic diseases, etc. Catastrophic losses can be successfully composted within carefully constructed and managed windrows. Information on composting catastrophic mortality can be obtained from the Cooperative Extension Service.

Problems with operation of the composter can be solved by reapplying the concepts of good compost management.

Temperature

Temperature in the range of 130 to 150 degrees F inside the compost pile is evidence that a composter is working well and that the composter environment is suitable. These high temperatures are produced by the biological activity of the microorganisms that are breaking down the organic material in the pile. High temperatures enhance the growth and reproduction of thermophilic (heat-loving) bacteria that are especially good at digesting organic material.

The heat produced by the microorganisms not only contributes to their own growth, but also speeds up the decomposition process and helps kill pathogenic microorganisms that may be present. For the composter to work properly, temperatures need to be higher than 130 degrees F. When oxygen becomes limited, the temperature of the compost will begin falling. By the time it drops to 130 degrees F (about 7 to 21 days after capping), the compost can be turned. Moving the material aerates the mixture and revives the microorganisms so another heat cycle can occur, leading to a more complete breakdown of the compost. The movement to a second cell

Appendix E- Composting Poultry Mortality

will probably be necessary to get adequate decomposition if the birds exceed 4½ to 5 pounds.

The compost temperature should again rise to 150 degrees F within days. Delayed movement, poor aeration, poor mixing, or moisture above 60 percent or below 40 percent will prevent the mass from heating properly.

Once the temperature, as determined by daily monitoring, drops from 150 to 130 degrees F (7 to 21 days), the product can be moved again to await its use as a fertilizer and soil amendment in the same manner as poultry litter. **Do not store finished compost with dry litter.** The interface between the moist and dry material is an ideal location for spontaneous combustion to occur.

Pests and Pathogens

Fly larvae, pathogenic bacteria and viruses are destroyed through the combined effects of time and temperature during composting. Typical temperatures achieved during composting exceed the human waste treatment requirements of the Environmental Protection Agency (130 degrees F for 15 days). Because biocidal temperatures are not reached at the outer edges of the primary compost bins, turning and mixing the compost at least once is needed to ensure the destruction of pathogens and nuisance insects. Monitoring compost temperatures and maintaining good management practices throughout the entire process helps ensure the elimination of insect larvae and pathogens in the final product.

Rodents, scavenging animals and other pests are seldom a problem with a properly managed composter. The solid construction and concrete floor of the composter will discourage ground level entry. Habitual raiders can be kept from the compost with fencing or some other building material. Trapping of pests may be appropriate where legal.

Compost Use

Well composted mortality can be used as a soil conditioner and nutrient source for crops just as fresh poultry litter. Compost is typically lower in nitrogen and slightly higher in phosphorus and potassium than manure and is thought to release nitrogen at a slower rate and over a longer period of time than fresh manure. The soil-amending and plant food properties of compost make it a valuable byproduct of poultry production. Marketing the compost can provide producers with an additional income stream to their agricultural operations.

Appendix E- Composting Poultry Mortality

Users of compost are encouraged to obtain a nutrient analysis of the product prior to its use. If analysis data is not obtained or is not available at time of use, the following average values may be used as a reasonable estimate of the available nutrient content of dead bird compost:

Total Nitrogen (N):	44 lbs/ton
Phosphorus (P ₂ O ₅)	65 lbs/ton
Potassium (K ₂ O)	48 lbs/ton

We recommend that mortality compost not be spread on active pastureland or home gardens because of the potential for botulism poisoning in grazing animals or humans. Botulinum bacteria can survive for long periods of time, especially in bones. If bones have been successfully decomposed by the composting process, the threat of botulism is decreased. As a general rule, mortality compost should be spread on hay fields or cropland where grazing animals will have no opportunity to consume the material.

Appendix E- Composting Poultry Mortality

Troubleshooting Guide for Carcass Composting

Problem/Symptom	Probable Cause	Suggestions
Improper temperature	Too dry (less than 40% moisture).	Add water.
	Too wet (more than 60% moisture).	Add bulking material and turn pile.
	Improper C:N ratio.	Evaluate bulking material and adjust as necessary.
	Improper mixing of ingredients.	Layer ingredients appropriately.
	Adverse Environment.	Ensure adequate cover.
Failure to decompose	Improper C:N ratio	Evaluate bulking material and adjust as necessary.
	Carcasses layered too thickly.	Single layer the carcasses.
	Carcasses on outside edges.	Maintain 6-10 inches between carcasses and edges.
Odor	Too wet.	Add bulking material and turn.
	Too low C:N ratio.	Evaluate bulking material and adjust as necessary.
	Inadequate cover over carcasses.	Cover with 10-12 inches of bulking material.
Flies	Inadequate cover over carcasses.	Cover with 10-12 inches of bulking material.
	Poor sanitation conditions.	Avoid leaching from pile.
	Too wet.	Turn pile and add bulking material.
	Failure to reach proper temperature.	Assess C:N ratio, layering.
Scavenging animals	Inadequate cover over carcasses.	Maintain 10-12 inch cover. Avoid initial entry with fence or barrier.

Agency Contact List

USDA Service Centers

Grant County – 304-257-4702
Greenbrier County – 304-645-6172
Hampshire County – 304-822-3020
Hardy County – 304-530-2825
Mineral County – 304-788-2332
Monroe County – 304-772-3006
Pendleton County – 304-358-2285
Fayette County – 304-255-9225

West Virginia Conservation Agency

Moorefield Field Office – 304-538-7581
Charleston Headquarters – 304-558-2204

West Virginia Conservation Districts

Potomac Valley Conservation District – 304-822-5174
Greenbrier Conservation District – 304-645-6173

West Virginia Department of Agriculture

Moorefield Field Office – 304-538-2397
Charleston Headquarters – 304-558-3550

West Virginia Department of Environmental Protection

Charleston Headquarters – 304-926-0499
Romney District Office – 304-822-7266
Oak Hill District Office – 304-465-1919

West Virginia Division of Natural Resources

Romney District Office – 304-822-3551
Beckley Regional Office – 304-256-6947

West Virginia University Extension Office

Grant County – 304-257-4688

Greenbrier County – 304-647-7408

Hampshire County – 304-822-5013

Hardy County – 304-530-0273

Mineral County – 304-788-3621

Monroe County – 304-772-3003

Pendleton County – 304-358-2286

West Virginia Poultry Association – 304-530-2725

Virginia Poultry Federation – 540-433-2451

West Virginia Litter Hotline – 1-888-354-8837



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“Funding for this publication is being supported by the Chesapeake Bay Program”