



# Livestock Odor Management

## Introduction

Odors from livestock operations are unavoidable and are one of the major sources of conflict between producers and the general public. Farm odors are coming under increased scrutiny from neighbors due to the increasing population of nonfarm rural residents, the increased number of large concentrated farms, and the construction of more waste storage systems. Unfortunately, there is no complete and easy way to control odors from livestock operations. However, there are a variety of best management practices and management techniques that can be used to help reduce odors and improve public perception of a livestock operation. Best management practices could include: vegetated barriers, covered manure storages, or installing anaerobic digesters. Management techniques such as: timing of waste application, precision feed management, as well as, maintaining the appearance of the farmstead and animal facilities will help to reduce odors and minimize the perception of odors.

## Environmental Concerns

There are a number of gases produced on the farmstead which can contribute to odor problems and potentially impacting air quality throughout the airshed. Hydrogen Sulfide and Ammonia are two common gasses that can cause odors; however, there are over 160 gases that have been identified which may be produced by manure. Odors produced by these gasses can affect a large area, reduce air quality, and be a nuisance to neighboring landowners. If these gasses are present in high concentrations in poorly ventilated farm buildings they can be harmful to human or animal health causing respiratory paralysis and loss of consciousness (Hydrogen Sulfide), or causing irritation to the eyes, nose, and throat (Ammonia).

## Potential Economic Benefits

The cost associated with the various odor reduction practices vary and should be carefully considered to determine if they are feasible for each individual operation. Some methods of odor control (i.e. Anaerobic Digesters) can have a high installation cost, but can provide an economic benefit to the farm by reducing energy costs, generating income from electricity production, or changing to digest off farm wastes. Practices such as vegetated buffers and windbreaks are relatively inexpensive to implement, generally improve farm aesthetics, and address some odor concerns. There may not be an immediate economic benefit for planting buffers and windbreaks however they may positively impact neighboring property values and relationships. Implementing feed management and adjusting the nutrients being fed to animals to match their dietary needs could result in lesser manure odor by allowing the animals to better process nutrients and excrete fewer odor causing nutrients. This method allows the farm to use homegrown grains and forages more efficiently, reducing the need for purchased feed. The farm can save money by not buying feed and can reduce air emissions. Regardless of any economic benefit, odor control should be implemented on the farm to maintain neighbor and public relations.

## For More Information

Cornell Cooperative Extension – [Animal Diet and Feed Management for Reducing Air Emissions](#)

Cornell Cooperative Extension – [Feeding Strategies to Reduce Animal Air Emissions](#)



## Summary of Pollution Prevention Practices

- Maintain neighbor relations and public perception
  - Notify neighbors of seasonal activities that may produce odors
  - Utilize visual screens, vegetated screens, and windbreaks
  - Implement sound on-farm management practices
    - Maintain cleanliness of animals
    - Limit the accumulation of manure, waste feed piles, and ponded silage leachate
    - Properly dispose of or compost mortalities
  - Maintain animal housing and livestock heavy use areas
    - Ensure that there is adequate drainage around animal facilities and that the barns are well ventilated
    - Livestock heavy use areas should be sloped to limit ponding and should have a concrete surface
    - Remove waste from barns and heavy use areas frequently and collect, store, and handle waste appropriately
  - Implement appropriate manure application and storage practices
    - Notify neighbors of agitation/spreading dates and avoid weekends and holidays
    - Waste should be spread close to the ground and/or incorporated
    - Liquid waste storages should be located out of sight and be allowed to develop a crust
- Odors from agricultural air emissions have few regulatory oversights. However, there are some Local,

## Summary of Regulations

State, and Federal Programs which can apply to animal agriculture.

### Local Ordinances

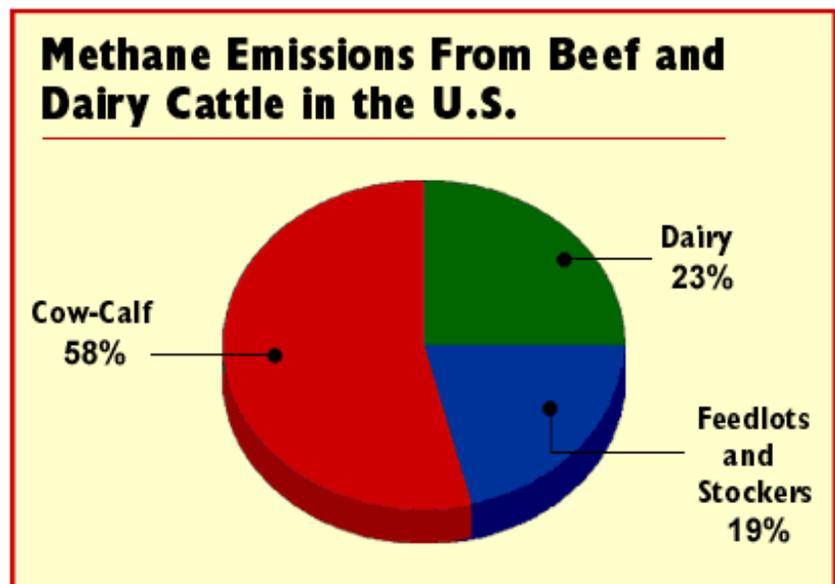
- Right to Farm Law
- Local Zoning Ordinances

### State Regulations

- NYS Department of Environmental Conservation: [Chapter III – Air Resources Parts 200-317](#)

### Federal Regulations

- [Clean Air Act](#)
- [Emergency Planning and Community Right to Know Act \(EPCRA\)](#)
- [Comprehensive Environmental Response Compensation and Liability Act \(CERCLA\)](#)
- [Mandatory Greenhouse Gas Reporting](#)



## Background Information for Worksheets

### ***What are the procedures for neighbor relations and considerations?***

When dealing with odors from a livestock operation, a landowner should be proactive in managing odor levels and maintaining neighbor relations. A landowner should be aware of any and all odor sources on the farm and should monitor these areas to ensure odor levels are being kept to a minimum or non-offensive level. If a complaint is received by the landowner, it should be dealt with in a positive and timely manner. A low cost method of improving neighbor relations is to establish a protocol for notifying neighboring landowners when certain odor causing activities such as seasonal manure storage agitation or spreading may be taking place. Notifying neighbors of these activities can be as simple as sending out a postcard, letter, or e-mail and will allow for any concerns to be addressed and will show that the farm is committed to maintaining good public relations.

### For More Information

Video – Cornell University Cooperative Extension – [Neighbor Relations and Odor Management](#)

### ***What is the appearance and public/neighbor perception of the farm and its operation?***

Maintaining the appearance of the farmstead can also help to improve the public/neighbor perception of the farm. A farm operation that is untidy, unorganized, and has manure and waste feed stacks piled in plain sight will be perceived as having worse odor problems than one that is well maintained, neatly landscaped, and strategically laid out (i.e. hiding waste piles from public view). Using visual screens and natural topography to hide unsightly waste and compost piles, as well as, keeping up with property maintenance may improve public and neighbor perception.

### ***Are windbreaks used to reduce odors and screen views?***

Windbreaks and visual screens are a great way to disperse and filter odors, as well as, screen views of the farm operation. Vegetated windbreaks and screens can add an aesthetically pleasing aspect to the farmstead while acting as barriers for unpleasant odors and unattractive farm views.

### For More Information

Cornell Cooperative Extension – [Mitigating Air Emissions with Vegetative Environmental Buffers](#)

Cornell Cooperative Extension – [The Use of Vegetative Environmental Buffers for Livestock and Poultry Odor Mitigation](#)

USDA NRCS – Agricultural Air Quality Conservation Measures, Section 5: [Wind Barriers](#)



## Background Information for Worksheets

### ***Has a Comprehensive Nutrient Management Plan (CNMP) been developed, implemented and kept up to date?***

A Comprehensive Nutrient Management Plan is used to document current best management practices and develop strategies for livestock operations which address natural resource concerns related to soil erosion and agricultural waste management. The CNMP serves as an operating plan for livestock operations and is designed to address applicable federal and state regulations. The plan will include components such as: manure handling plan, land application plan, soil management plan, record keeping, etc. By developing and implementing a CNMP, a farm operation can address manure management issues which will result in reduced odor problems. Keeping the plan up to date will incorporate any changes in the farm operation (i.e. changes in herd size, management style, etc.) and will adequately address new concerns including associated odors.

For More Information:

USDA NRCS – [Comprehensive Nutrient Management Plan](#)

Cornell Cooperative Extension – [Comprehensive Nutrient Management Planning](#)

### ***How clean are the animals?***

The cleanliness of livestock can be a great indicator of the farm management style. Cleaner animals suggest that manure is being managed properly and removed from animal housing facilities on a regular basis. This will reduce the amount of accumulated manure and thus reduce the associated odor.



### ***What is the relative odor risk associated with the type of waste handling/ storage/ treatment system used?***

Different types of waste handling/ storage/ treatment systems have various levels of risk associated to odor levels. Waste storages with a treatment system (i.e. anaerobic digester), covered waste storages, compost waste storages, or storing waste for less than one week before land application are all methods which minimize manure odor. Longer term structural waste storages or earthen manure storages without a treatment system or cover have the most risk of odor issues.

### ***Is waste or spilled feed allowed to accumulate?***

Waste or spilled feed should not be allowed to accumulate and should be properly disposed in a timely fashion. If not properly disposed, waste/spilled feed can spoil and form leachate creating odor and potential water quality issues. Disposal can include: placement into a waste storage, land application, composting, etc.

### ***Is trash properly disposed of without burning?***

Trash generated on the farm needs to be disposed of properly without the use of burn piles or barrels. Burning certain types of trash (i.e. plastics, chemical or paint containers, etc.) can result in the formation of noxious fumes that can be hazardous to human or animal health. Burning trash can also generate unpleasant odors which could put strain on neighbor relations.

For More Information

AEM Tier 2 Worksheet – Waste Disposal

New York State DEC [Open Burning Regulations](#)

## Background Information for Worksheets

### ***Is dust controlled on roadways during farm operations?***

Open feedlots, unpaved roads, and some pastures or fields can be major sources of dust on farm operations. Dust alone can be a nuisance; however, odor molecules can adhere to dust particles creating a bigger nuisance to surrounding neighbors if not controlled. Controlling dust can improve or strengthen neighbor relations and public perception decreasing the likeliness that the farm operation will receive complaints.

#### For More Information

Cornell University Cooperative Extension – [Mitigating Dust \(Particulate Matter\) Emissions from Animal Agriculture](#)

### ***Will expansion, or potential changes create additional odor production, for example, changes from daily spread to storage?***

If a farm is planning an expansion or has recently expanded, more waste is often generated which results in the need to adapt a new waste management program. A new waste management program may mean changing from daily spread to storing waste and dealing with more liquid manure. Any of these changes can also result in more odor production. When a farm is considering making a change to the operation, thought should be given to how the change will impact odor production and neighbor relations and these issues should be addressed in a farm nutrient management plan.

#### For More Information

[Agricultural Waste Storage Facility Screening Tool](#)

### ***Is silage spoilage minimized? Does spoiled silage accumulate?***

Silage spoilage can be minimized by excluding outside precipitation and utilizing proper feed out techniques. Sealing silage bunks and piles will keep precipitation out and maintain proper moisture content of the silage. Utilize techniques such as: maintaining a smooth feed out face, shaving silage down the face and never digging into the bottom of the feed out face, etc.



#### For More Information

Cornell University Cooperative Extension – [Silage Management Considerations](#)

### ***Does silage leachate pond or is it stored?***

Silage leachate can be an additional source of odor on the farmstead. By utilizing proper management techniques including harvesting at optimal moisture levels, packing silage to favor anaerobic conditions, immediately sealing silage to exclude outside precipitation and with proper feed out, silage leachate can be reduced. If leachate is produced, it should not be allowed to pond. Leachate should be directed to a waste storage facility or a high flow/low flow collection system and land applied or treated (with a vegetated treatment area). Storing or treating leachate will help reduce associated odors, as well as, protect water quality.

#### For More Information

AEM Tier 2 Worksheet – Silage Storage

## Background Information for Worksheets—Animal Housing

### ***What are the characteristics of the drainage around animal housing facilities?***

Proper drainage around animal housing facilities will reduce any ponded water, as well as, exclude clean water. Without proper drainage, precipitation can pond, become contaminated, and create odor issues. Additionally, farmsteads with poor drainage tend to appear messy and unkempt, which can give the perception that odor issues exist.

### ***Are waterers inspected and repaired to control leaks?***

Animal waterers often have devices that allow them to automatically fill when the water level is low. These devices or mechanisms can malfunction, often times, going unnoticed for lengths of time. If a waterer is leaking or malfunctioning, excess water will likely pool in the barn or barnyard area which can potentially create additional odor issues. Animal waterers should be inspected regularly and repaired when necessary to control leaking water and prevent odor and public perception issues.

### ***What is the quality of ventilation inside the barn?***

Maintaining good ventilation inside the barn is not only beneficial for keeping odors to a minimum, but it is also beneficial to animal health. Ventilation is generally more of a concern in smaller barns, as odors do not become concentrated in large barns. Providing constant fresh air will help remove harmful airborne organisms, eliminate odors (i.e. ammonia), and remove excess moisture and heat. The air inside the housing should be similar to that of the outside air.

### **For More Information**

Cornell University Cooperative Extension – [Ventilation and Cooling Systems for Animal Housing](#)  
Purdue University Cooperative Extension Service – [Environmental Control for Confinement Livestock Housing](#)

### ***How is manure controlled, collected and handled?***

Manure, both solid and liquid, should be contained within animal housing facilities and not allowed to collect or pool in or around animal housing. If manure is allowed to accumulate or pool around animal housing, not only can this be a concern for surface water contamination, but also a potential odor source.



### ***What is the frequency of manure and waste feed removal?***

Manure and waste feed should be removed daily from facilities to prevent odor issues from forming. Bedded pack barns should be bedded heavily to maintain dry conditions and reduce odors. If animal housing facilities are cleaned out less than once per week, the potential for odors issues to develop is very high. The cleanliness and livestock appearance will also be impacted if manure removal is infrequent.

### **For More Information**

Cornell University Cooperative Extension – [Effects of Waste Management Techniques to Reduce Dairy Emissions from Freestall Housing](#)

### ***Is silage leachate low flow added to an under barn storage?***

Low flow silage leachate is very concentrated and has pronounced odors. If low flow is added to an under barn storage, odors issues are more likely to develop. It is recommended that silage leachate low flow be directed to a separate storage tank or added to an outside waste storage and land applied in accordance with an appropriate nutrient management plan.

## Background Information for Worksheets—Heavy Use Area

### *Is the HUA well drained?*

The heavy use area should have a smooth surface with no depressions and be properly sloped to limit ponding of surface runoff. Ponding of precipitation or surface runoff on an HUA can be the source of odors and will create unsightly conditions which can perpetuate the perception of odor.

### *Is the barnyard area sized as small as possible? (See Livestock Heavy Use Area Worksheet)*

A small barnyard area is easier to clean than one that is larger in size. Reducing barnyard sizes to as small as possible will allow them to be cleaned more efficiently and thus will reduce odor issues from accumulated manure.

### *What is the HUA surface?*

Concrete is the ideal surface for a heavy use area. It provides a hard, firm surface which will facilitate easy cleaning reducing the potential for odor issues. When the surface is not hardened, it can be difficult to clean and manure will accumulate. Heavy use areas that have soil surfaces can also trap precipitation and runoff creating very messy conditions which can lead to increased odors, as well as, the increased perception of odor.

### *Is the HUA cleaned completely?*

In order to prevent odor and public perception issues, livestock heavy use areas should be cleaned regularly with complete manure removal. To help facilitate proper clean up, the HUA should be regular shaped (square or rectangle; avoid sharp angles and tight corners), constructed of proper surface material, and have curbs and a buck wall installed.

### *How often is the HUA cleaned?*

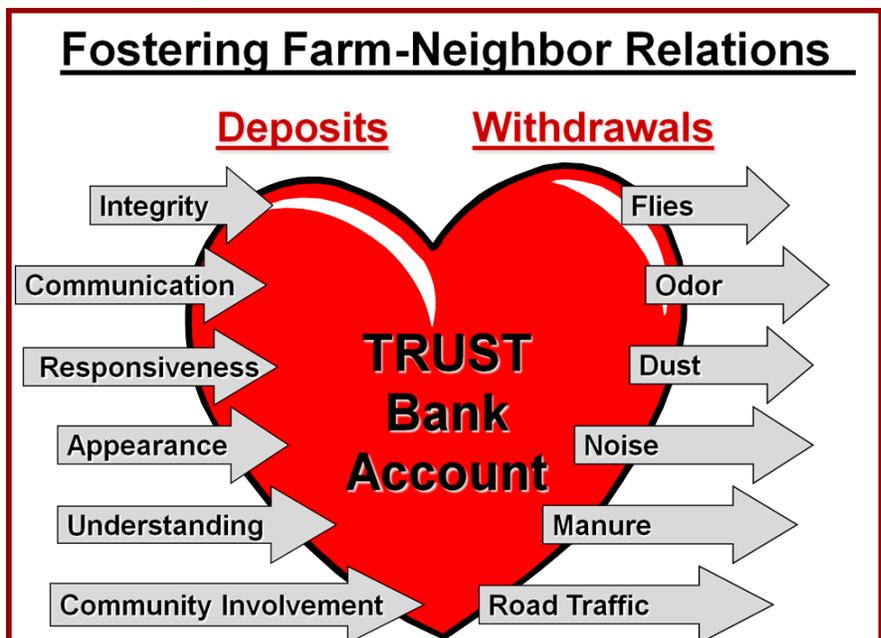
A heavy use area should be cleaned daily or several times a week. This prevents manure from accumulating, reduces and prevents odor issues, and maintains a clean environment for livestock.

### *Are there manure ridges at fence lines or manure piles?*

Manure ridges and piles should not form and if they do, they should be removed. Manure that is left in the heavy use area will create odor issues for the farm and can be unsightly. Curbing can be installed to assist in the cleaning of the HUA and prevent ridges/piles from becoming a problem.

### For More Information

USDA NRCS Conservation Practice Standard – [Heavy Use Area Protection](#) (561)



## Background Information for Worksheets—Land Application

### ***Does your waste spreading plan take into account field specific neighbor impacts from odors?***

Before spreading, ALL neighbors should be notified. This includes landowners adjacent to farm fields and not only those near the farmstead. Notifying neighboring landowners of waste spreading is a common courtesy practice that helps preserve neighbor relations and likely reduce complaints against the farm.

### ***What is the timing of waste application?***

The best time for waste application is in the early morning on weekdays. Most neighboring landowners are likely to be away at work and by the time they return odors associated with waste application will have dissipated. Holidays and local special events should be avoided to prevent potential conflict.



### ***Is spreading equipment kept clean?***

Keeping spreading equipment clean can be difficult and daunting; however, it will maintain good public relations and reduce the perception of odor issues.

### ***Have you considered application equipment that applies waste closer to the ground?***

Manure application equipment that applies waste closer to the ground reduces odors considerably. Waste is spread more evenly which promotes quicker drying and in turn less odors. Incorporating manure within one day after application will also reduce odors associated with manure spreading.

### ***Is waste incorporated?***

As stated in the previous question, incorporating manure can dramatically reduce odors. Waste should be incorporated immediately and completely to have the best success at odor reduction. Incorporation can include injecting manure or tilling the field after application.

### **For More Information**

Cornell University Cooperative Extension – [A Review of Manure Injection to Control Odor and Ammonia Emissions During the Land Application of Manure Slurries](#)

### ***Are records of waste spreading kept?***



Maintaining records of waste spreading will help to track where, when, and how much manure was land applied. Tracking this information can prevent overspreading, nutrient overloading, and can control potential odor issues. Waste spreading records are also a requirement if the farm is a CAFO and has a Comprehensive Nutrient Management Plan.

### **For More Information**

USDA NRCS – [Comprehensive Nutrient Management Plan Process Guideline](#)

## Background Information for Worksheets—Land Application

***Do you use a big gun to irrigate waste and if so, do you limit application to when the wind is less than 5 mph?***

Waste that is applied to fields through irrigation is sprayed onto the field using a big gun or other type of irrigation equipment. While this is an efficient way to cover a large area of ground, it can be the cause of serious odor issues. By spraying the waste, odor compounds can easily enter the air stream and be carried large distances. To avoid odor issues, it is best to apply waste when the wind is less than 5 miles per hour or utilize another method which applies waste much closer to the ground.

For More Information

Cornell Cooperative Extension – [What Kind of Irrigation System Do I Need to Land Apply Wastewater](#)

***Is waste spread evenly and at rates such that it dries quickly?***

Paying close attention to the rate at which waste is applied and taking care to spread it evenly can result in quicker drying time and less odors.

## Background Information for Worksheets—Liquid Waste Storage

***What are the characteristics of the waste surface in the waste storage?***

The waste inlet pipe should be below the liquid surface and a crust should form over the entire surface. The crusted surface will prevent or limit odors from escaping the storage. Waste storages can also be enclosed or covered year round, or utilize surface aeration to keep odors at bay. Allowing the waste storage surface to be exposed with no crust formation, can cause odors associated with stored manure to become a problem.

For More Information

Cornell Cooperative Extension – [Manure Storage Covers Curriculum Materials](#)  
[Biofiltration: Mitigation for Odor & Gas Emissions from Animal Operations](#)

***Is the waste storage surface visible by neighbors of from the road?***

If a waste storage is visible from the road or can be seen by neighbors this can increase the perception of odor. Additionally, any odors that originate from the storage will not be dissipated by visual screens.

***What is the amount and timing of agitation during emptying?***

During storage emptying, it is best to minimize agitation to the extent possible as odors can flare up and become a nuisance. If agitation is necessary, a stream of waste should be directed below the waste surface. Agitating amplifies odors and should not be done when there is a high risk of neighbor complaints such as weekends or holidays.

## Background Information for Worksheets—Solid Manure

### *How are manure pile areas (MPA) managed?*

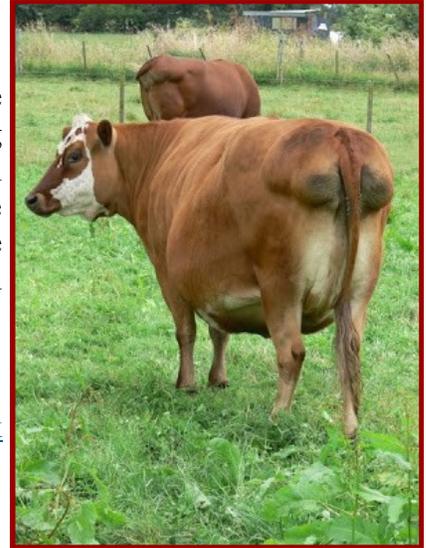
Designated manure pile areas should be used on a temporary, infrequent basis. Ideally, the location of the pile will be properly drained (precipitation and seepage drains away from pile), not in a highly sensitive area, and located away from and out of sight of neighbors. If manure piles areas are utilized, the pile should be removed as soon as practical.

### *How is composting managed?*

If manure is being composted, it is important to monitor the moisture levels of the material being stockpiled. Manure or residues being composted should have less than 70% moisture content. This will provide adequate air pore space which will help to facilitate the composting process. If the manure or residue material has moisture content greater than 70%, the air pore space will become saturated inhibiting the composting process resulting in potential odor issues.

### For More Information

Cornell University Cooperative Extension – [Composting Livestock or Poultry Manure](#)



## SUMMARY

AEM Tier 2 Assessments document environmental stewardship and establish benchmark conditions on the farm. They also identify resource concerns and areas of opportunity. The AEM Tier 2 worksheets also help to further establish baseline data that can be used to prioritize issues for Tier 3 planning.

Tier 2 Assessments should be completed on-site with the farmer. When the initial assessment is completed, appropriate feedback in the form of an AEM Tier 2 Worksheet Summary should be provided to the farmer. The summary should include an overall level of concern for the worksheet, explanation of the overall ranking, a list and description of items of greatest concern, as well as, documentation of what is being done well and what areas need improvement. After the evaluation is complete, the farm should be given a ranking which will determine their priority to advance to the AEM Tier 3 planning phase. Appropriate ranking categories that could be used are: High, Medium, or Low Priority. A ranking procedure that has been approved by your local AEM Team should be used to make the ranking determinations.