Introduction

The expense and potential liability associated with building or expanding a swine operation demands that facilities be placed in an acceptable location. Some areas of the country or locations on an individual farm are simply not suitable for swine production because of the potential for odor complaints or environmental damage. This paper provides prospective – and current - swine producers with many factors to consider when selecting potential locations to build or expand. More importantly, it offers tactics to improve marginal locations and directs developers toward tools that can help to quantify the siting process. Nonetheless, identifying and isolating acceptable locations for swine facilities requires at least a modicum of several disciplines ranging from engineering to sociology to art to common sense and neighborliness.

Objectives

After reviewing this fact sheet, readers should be able to:

• List and discuss large regional factors to consider when selecting general areas for swine operations.
• List and discuss specific local factors to consider when isolating sites for swine production buildings.
• Identify management practices and community relation strategies to improve marginal sites.
• Compare various siting tools.

Siting Considerations

Regional factors when selecting general areas for swine operations. Swine operation location is often constrained by factors such as existing production facilities, land ownership, family ties, etc. However in instances where there are no such limitations, the following regional factors should play a role in selecting broad areas for further expansion of the US swine industry.

Industry infrastructure. Markets, feed, and technical expertise must all be available within a reasonable distance of the proposed area. In addition, road quality and maintenance should be considered when selecting a general swine production area [1]. Finally, the local financing sector's familiarity with swine production eases project development.
Water availability. Adequate amounts of potable water must be available for drinking, facility wash-down, and fire protection [2].

Geology. Producers should be aware of the composition of bedrock in any proposed area of expansion. Specifically, special care should be taken when considering areas underlain by limestone geological formations where errors in manure management can swiftly contaminate groundwater.

History of livestock in the area. Areas with a history of livestock production sometimes face less community conflict over a proposed new operation since neighbors may be tolerant of the sights, sounds and smells of animal agriculture. However, depending on historical manure management practices of existing livestock producers, cropland in historical livestock areas may be near (or above) nutrient saturation and thus not suitable for additional manure application. Alternately, residents in areas without a history of livestock production are often misinformed or frightened of an unknown industry and may provide considerable resistance. This is particularly true in regard to swine production.

Biosecurity. Areas already containing hogs also harbor swine diseases. Good biosecurity may be easiest to maintain away from mainstream swine production.

Availability, fertility, and accessibility of manure application land. If the operation plans to apply manure onto local cropland, enough land must be available and secured to accommodate total manure production from the enterprise [1]. Ideally nutrients should be applied on a phosphorus balance basis, requiring more land than when nutrients are applied on a nitrogen basis [3]. Soil fertility must be adequate for at least reasonable crop yields and nutrient uptake. Finally, the land must be accessible to application equipment. If manure is handled as a liquid, the land must be nearby and not excessively steep. In addition, the soil type must be able to absorb the manure over the expected range of application rates.

Topography. As mentioned previously, steep areas are difficult to traverse with manure application equipment. However areas with some topographical variation serve to hide facilities from public view. As discussed later, topographical variation also helps to disrupt odor plumes.

Airsheds. It’s generally accepted that air emissions from swine facilities will eventually be subject to government regulation. Airsheds that have already been identified as “non-attainment” by environmental regulatory authorities require careful monitoring of activities within the boundary to bring the airshed into compliance. Selecting land outside of designated “non-attainment” areas should make compliance easier for swine producers.

Demographics. Traditionally rural, sparsely populated areas are often the first choice for expansion. Regardless of the demographics of the area, neighbors deserve amiable treatment, keeping in mind that long-time residents unfamiliar with large-scale animal agriculture may object to a new swine operation.

Check federal, state, and local laws. After one or more general areas are selected, evaluate applicable laws. This would be the first step for producers who are geographically bound in building or expansion plans. Even with a consistent federal Confined Animal Feeding Operations [CAFO] law, interpretation and ease of compliance differs among states. Be sure to check local laws and ordinances before moving forward and obtain a clear understanding of permissible land uses, applicable setbacks, and nutrient management regulations.

Specific local factors for isolating building sites. After an individual farm or land tract is identified for the building project, the precise location for the proposed building must be established. Criteria listed below can help isolate the most appropriate building location (micro-site) to reduce community impact from odors and minimize construction expense.

Distance / direction to neighbors. Maximize downwind distance to neighboring homes, businesses, and public use areas [1]. Odor plumes become more dilute with increased distance, so odor complaints should be fewer when distance is maximized.

Vegetation. Thick, dense vegetation, especially downwind of the production facility acts as a vegetative filter to reduce dust, and also disrupts the odor plume leaving the building [4]. Seasonal vegetation such as corn may provide a similar benefit from mid-summer until fall.
Visibility. Vegetation and topography can shield an operation from public view. Less visible operations generally receive fewer complaints [5].

Micro-topography. Topographical variation (particularly downwind of the site) would predictably disrupt the odor plume, and enhance dilution with fresh air. Farm structures, depending on their location also may contribute to odor plume dilution.

Inversion Path. During times of temperature inversion (when the atmosphere is stable and cool air moves in the same direction as surface water drainage), odorous gasses from exhaust fans or manure storages may remain close to the ground and be carried from the facility for fairly long distances with minimal dilution, or remain undisturbed in a nearby low-lying area [5, 6]. Temperature inversion conditions (e.g. fog or frost) often occur in the late night or early morning hours and can lead to complaints from neighbors in the inversion path.

Access. The micro-site must be accessible from public roads. Short access roads save considerable expense, but other micro-siting factors may require a longer, more costly access road. Be sure the intersection of the access and public roads has a clear view in both directions, and ensure that roads and bridges can tolerate loaded trucks within assigned weight limits. Some local jurisdictions disallow any gravel, mud, or manure from being tracked onto the roadway from the entrance lane.

Setbacks from groundwater/surface water. For obvious reasons neither the production facility nor manure storage should not be constructed in proximity to surface water or groundwater conduits such as sinkholes. State or local rules will often list required setbacks distances.

Destruction of tillable land. If possible, avoid constructing the building on tillable land. Buildings constructed in or near woodlots have the advantage of using existing vegetation to screen the facility. In areas with strip cropping practices, placing the building diagonally across strips leads to triangular fields that are difficult to farm.

Biosecurity. If other swine operations exist on neighboring farms, make sure your site is neither directly upwind nor downwind of the neighboring facility.

Strategies to improve a marginal site

Perfect sites are difficult if not impossible to find. However, imperfect sites can often be improved using some of the following tactics.

Reducing facility size. Reducing the number of animals also reduces odors and can improve nutrient balance issues. On marginal sites size reduction should not be overlooked, although reducing operation size may impair the business strategy.

Management practices

- Under-building or covered manure storages emit less odor than open outdoor storage structures.
- Manure treatment strategies such as solids separation may reduce the odor of stored and applied manure, creating fewer odor complaints.
- Injecting or incorporating manure into the soil during manure application not only retains nutrients but reduces application odors [6] – the cause of over half of all odor complaints [7].
- Minimizing application time can also reduce odor complaints. If possible, manure should be applied only twice per year and as quickly as possible, avoiding weekends or holidays when neighbors surround application areas.
- Treating exhausted air with biofilters, fan scrubbers, or other methods to reduce odorous gasses or increase dilution rate.
- Screening the facility with planted windbreaks reduces visibility and helps to disrupt odor plumes.
- Facility beautification can be accomplished with vegetation, landscaping, or simply keeping a visible site neat and clean [2, 5]. Neighbors complain less about sites they consider attractive [8].

Community relations. Most neighbors will tolerate more odor or life quality disruptions if they feel the owner and the operation contribute to, and are a part of, the community [8].
- Producers with a personal and/or family history of conscientious livestock production should make
neighbors feel more at ease with a proposed new operation. Out-of-town developers starting new swine operations often create significant community conflict.

- Personal visits to surrounding neighbors during the planning phases of the operation can be used to explain the proposed operation’s scope. These visits should be used to explain proactive steps to reduce odors and protect the environment.
- Community involvement such as membership to local benevolence groups solidifies a producer’s value to the community.
- “Good neighbor” approaches such as holding an open house after completion of the facility, offering snow removal services, donation of pork for local fund-raisers or as gifts, or hosting an annual neighborhood BBQ significantly improve neighborhood perception of swine producers [6]. Some producers have even designed web pages to allow neighbors access to current operation information.

Siting tools

Odor plume models. In certain situations, mathematical models can predict how far away, in what directions, and how often an odor plume may strike certain neighboring homes [9]. Odor plume models may work reasonably well in flat, un-forested areas, but vegetation and topographical changes can reduce accuracy [5].

Independent consultant. Although hiring a consultant will be an added expense to a new operation, a professional consultant can provide valuable perspective when placing a new operation. Perhaps more importantly, consultants help guide operators through the sometimes-difficult permit process and can assist with CAFO permitting, nutrient management planning, land development, and hydrology studies [1]. Additionally, consulting engineers are especially trained to design and precisely locate manure storage facilities and manage surface water around the site.

State-mandated evaluation tool. Several states have adopted mandatory site evaluation tools for new operations [10]. A third party evaluator considers a variety of criteria to calculate a score. Usually the site must score above a certain threshold before construction is permitted. In some cases, producers may make management or other changes to improve a site’s score.

Summary

Perfect locations for a swine operation are rare in today’s agricultural climate. If given the opportunity to choose potential production areas from a large landscape, criteria in this paper will help to ensure that basic services and nutrient issues can be met. After checking applicable laws and choosing a general location [or if a tract of land is already owned], criteria for isolating a building site can help select the best possible location. Selected management and neighbor relation strategies will improve almost any sites. Finally, tools exist to help producers select appropriate locations for a swine enterprise.

Literature Cited


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