

# Creating a Hub with Dry Lots for Small Ruminants

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A typical small ruminant operation needs to graze, feed and water animals daily. Ideally, this is accomplished with an efficient rotational grazing system, where animals are moved from field to field while providing them with a convenient source of water to drink. However, there are other activities that need to be accomplished related to animal handling and care. These include routine and seasonal activities such as milking, winter feeding, kidding or lambing, managing sick stock and handling for herd health.

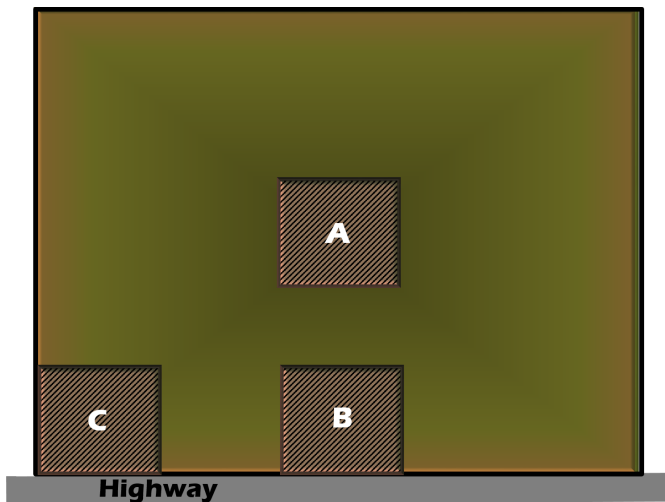
An excellent way to promote efficiency is to create a centralized area or hub for all livestock-related activities. For the hub to be functional and not a wet, muddy mess, an engineered surface is needed to support the activities that will be conducted during any season of the year. A typical engineered surface for a small ruminant operation would be a geotextile fabric and rock surface to create what is called a “dry lot.” The location of the hub is just as critical as the inclusion of improved surfaces. To be successful, a systems approach should be used to site the hub while enhancing water, soil, and air qualities, thereby improving animal performance. This is accomplished by evaluating the ease of access, location, shape and dimensions of watering stations, building layout, barn function, structures, pastures, feeding structures, and gates as well as lanes/alleyways/roadways, which all add up to greater producer and animal efficiency.

A practical and ideal location for a hub with dry lots is near the center of the operation or in the center along the front of the property. However, topography and environmentally sensitive areas should be taken into consideration when planning the location. The hub and its dry lots should be sited in a well-drained area that is relatively flat and does not have upland runoff or drainage swales flowing through the area. It should be located to create a hub where multiple activities occur. It should be near feed (hay) and grain storage to limit handling and transport distance issues. A barn or structure adjacent to an existing farm road should be incorporated into a hub and used for maternity, milking, shade, and sick pens/quarantine area, as well as being incorporated with a handling area. A hub combines many livestock-related activities and allows a dry lot system to act as a collection area for these activities.

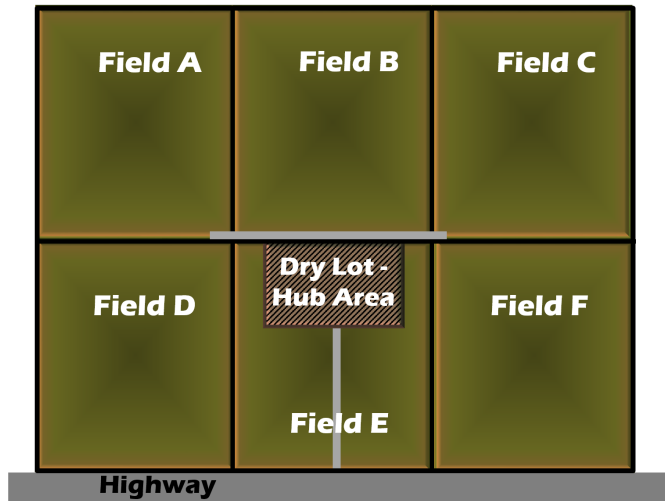


Dry lots are a key component for managing small ruminant operations. They are intended to be used as part of a grazing system and as an area for animals to gather and for herders to capture and hold livestock for short or long periods of time. The practice of using a dry lot is a good management practice for increasing efficiency, improving production and managing animals and muddy conditions. Although the name “dry lot” suggests the area is dry, in Kentucky in winter, they often are not. In Kentucky, these areas are often just as wet as everything else in winter, as well as other times of the year. However, the concept of using a dry lot is to design it with drainage using a structurally designed permanent surface known as a heavy traffic (or heavy use) area.

Existing facilities and infrastructure should be utilized if possible, but they may need to be redesigned to economize time and labor while conducting needed tasks more efficiently. Conservation practices and concepts are often overlooked in farm design. They address subjects related to efficient livestock care, feeding, watering, and manure management. Conservation practices typically simplify tasks, which in turn conserves resources of time, money, labor, energy, fuel, soil, water, and forages.



**Figure 1.** Possible locations of farm infrastructure.



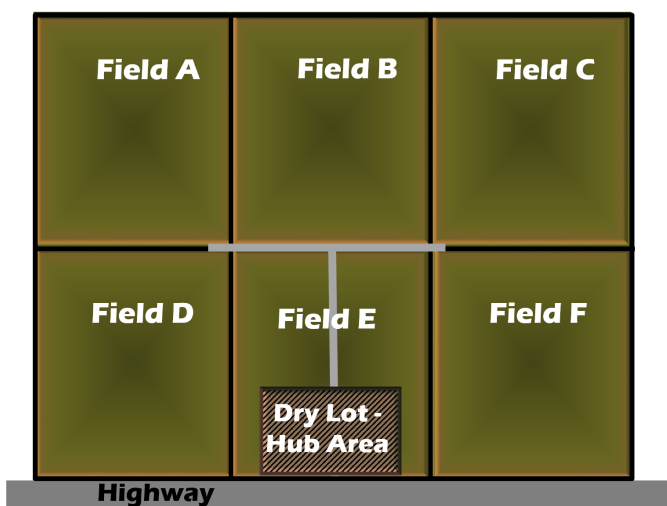
**Figure 2.** Centrally located infrastructure with a farm road that dissects "Field E." Field E can either be a single field or could have the farm road fenced to create two separate pastures.

### Location

Selecting an ideal site for farm infrastructure is the first step. Figure 1 shows the possible locations of a hub for managing the operation and implementing farm infrastructure, such as a dry lot. The best possible location is site "A," which is centrally positioned within the operation. From this site, all the distances to the four corners are equal (Figure 2). Its position also allows the operation to expand in four different directions – along the four sides of the hub. The next best option is "B," which is centrally positioned along the property boundary (Figure 3). This site allows the operation to expand in three different directions. Figure 4 shows an example of how a centrally located operation, along the road, can be expanded to include small holding areas for sick, quarantine, and isolation areas. The least efficient location is "C" because the fields get progressively farther away, and therefore it becomes less efficient from a travel standpoint (Figure 5). Notice that all the operations utilize a lane to move the stock from field to field and to the dry lot/hub. Information

about lanes will be discussed later in the publication.

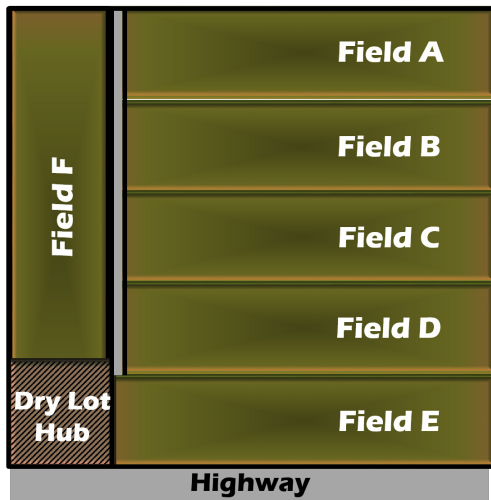
Implementing conservation practices is fundamental for meeting producer and livestock safety concerns. Cataloging existing and planned conservation and renovation projects on maps is a critical first step in the farm-planning process. (See [Maps for Farm Planning](#) (AEN-141) for more information.) Use the farm map development process as a guide to the concepts and considerations necessary in planning renovations and developing new infrastructure on the farm. A technical method for verifying the location is by looking up the hydrologic soil group rating (A, B, C, D) to quickly and easily determine the suitability for a winter-feeding site (<https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>). Hydrologic soil groups A and B are ideal for dry lot areas because these are well-drained soils. However, a site-specific assessment should be made of the site to confirm feasibility, because soil properties will change with time due to animal treading, tractor traffic, compaction, erosion,



**Figure 3.** A centrally located hub area along the property line with two lanes/roads for moving equipment and livestock. Field E can either be a single field or could have the farm road fenced to create two separate pastures.



**Figure 4.** Expanded operation with "Field F" divided into three smaller lots, which could be used for monitoring multiple small groups of stock.



**Figure 5.** The least efficient location of a hub on a farm.

organic matter content, soil phosphorus levels, etc. Site-specific variations may also exclude it as a suitable site.

Once the producer has identified the best possible locations for a hub, the next step is to rule out any low-lying areas, particularly those along floodplains. Even though sites may provide well-drained conditions, these areas should be avoided if flooding periodically occurs or if they are near a water body. Also exclude areas where streams of stormwater flow through the winter-feeding area or where ephemeral ponding occurs. These areas will often collect additional water originating from upland watershed areas. Roofs without gutters can also create a large amount of runoff and should be avoided. Moisture levels from a rising water table and drainage can easily shift a soil from a friable (workable) to plastic (moldable) to a liquid state (flowing). Collecting the water from a guttered roof could add to the operation by providing harvested water, which could be used to water the stock. More information on water harvesting can be found in [Rainwater Harvesting for Livestock Production Systems](#) (AEN-135).

An ideal location for a hub is on a summit or flat area on top of a hill if there is some protection from the wind (structure, trees, etc.). A summit location usually prevents upland runoff. Typically, runoff from summits has a long distance to travel before it reaches a stream or waterway. Farm operators should not place a dry lot near a stream or where the drainage to a stream or sinkhole is less than 150 feet away. If a stream is located nearby, producers should consider installing a riparian buffer (dense vegetation along a body of water) to protect water quality.

In the northern hemisphere, locating the site on a southern slope will allow solar radiation to dry and stiffen soil. This would be particularly useful in the winter months during winter feeding. The next best options are a west-facing slope, followed by an east-facing slope. A north-facing slope should be avoided, as it will have the least solar exposure and the coldest, wettest soil. Other situations to avoid include shade from buildings, structures, and trees, which can interfere with solar energy and lower wind speeds across the area, and low-lying areas where high humidity tends to concentrate, commonly overnight and

in the morning as the sun rises. During a typical day, humidity will be lowest when high temperatures are reached in midafternoon. To leverage these trends, producers should orient the dry lot used for a winter-feeding area to slopes with a southern exposure. If southern exposures are not easily accessible, western aspects, or eastern as a third preference, should be chosen over northern aspects.

The slope for a hub with dry lots should be less than 4 percent. A vegetative buffer or area that maintains good vegetative cover should be provided downhill from the winter-feeding area prior to runoff entering a water body. The vegetation will filter solids/organic matter and trap potential pathogens in the manure, while allowing nutrients to infiltrate into the soil profile and boost yields for vegetation. A standard minimum setback distance from a water body located downhill from a dry lot where winter feeding will occur is approximately 150 feet. A steeper slope with no vegetation requires a significantly greater setback. The number of small ruminants being fed as a group is a criterion that also affects the setback distance.

## Size

Size should be considered in the design, so the dry lot provides adequate space for the planned number of animals to move around freely to eat, drink and socialize. An area of approximately 50 square feet per mother and offspring is suggested. The size is dependent upon the age, type, size, number, and temperament of the small ruminants, as well as the area available for enclosure. Keep in mind that most small ruminant operations that have constructed traffic pads later regret not making the area larger, especially if the dry lot is used for other livestock enterprises, such as cattle. If other uses are planned for the traffic pad, the size of the area should be adjusted accordingly.

## Location of Water Sources

The placement of watering facilities should follow practical guidelines. (See [Providing Water for Beef Cattle in Rotational Grazing Systems](#) (ID-236) for more information.) A watering source should be accessible for multiple groups. This is normally accomplished by placing a dissecting fence across the waterer. A circular watering trough allows more animals to drink than any other shape. The surface that the animal stands on should be an all-weather surface. All-weather surfaces made from geotextile fabric and rock will typically not last more than a few years and therefore are not cost effective in the long run. Conversely, concrete, if placed properly, will last for at least 30 years. To date, there is not a cheaper, more durable, cleanable product for outdoor use. It should be textured to provide traction during any weather and placed on a 2 percent slope to provide drainage. A concrete pad should extend approximately 5 feet surrounding the waterer to allow the entire animal to stand on concrete.

Locating a waterer in a building also requires special considerations. The site chosen should be selected knowing that the use of a waterer, and its maintenance and repairs, will create spills and leaks, which will foul bedding and create unnecessary management issues. Placing a waterer in a building is not a success when it creates more work. For example, a waterer should



never be placed on or near bedding. Also, consider that water dripping from an animal's mouth will fall approximately 8 to 10 feet from the source.

### An Example of a Hub with a Dry Lot System

A hub can be created by repurposing an old barn and adding a fenced boundary for the dry lot. However, existing barns may not be the best choice, if they were not located properly when they were built. Some producers built barns in locations for social reasons rather than scientific ones. Ideally, the created hub/dry lot should be accessible to a series of pastures by way of a lane, as shown by the examples (Figures 2 through 5). The hub/dry lot can be used year-round to provide access to water and supplements, but it can also be used during the winter and early spring months as a confined feeding area.

An ideal location for a hub with dry lots is close to roads or existing structures to reduce labor. Figure 6 shows a layout for a small ruminant operation. The implementation of a lane that interfaces the pastures creates the opportunity for a centralized hub, with dry lots (Figure 7). Additional (electric) fencing can be used to subdivide larger pastures into several equally sized pastures. This provides the producer with a functional, multiple-pasture rotational grazing system.

The dry lot in Figure 7 is intended to provide water, feed (via troughs), salt/mineral blocks, shade, and hay feeding. The addition of smaller dry lots, as shown in Figure 8, provides the opportunity to use the dry-lot concept for holding different groups of livestock. An example of different groups could be separation based on the number of offspring that the mother is raising (singles, twins, or triplets). This would permit more efficient feeding practices through which those mothers raising singles are not overfed and those mothers raising multiples are not underfed. Each group has access to a covered portion of the barn, which can be used to provide shelter.

The size and layout of the dry lot allows gates, feed, and water to be adequately spaced to reduce overcrowding that may expose the small ruminants and handlers to unnecessary risk. Ideally, a waterer placed in a dry lot should be able to serve multiple pastures or animal groups. Farm gates should be installed to provide access from the dry lot to pastures or as a means of limiting access to the much larger pasture area.



**Figure 6.** A small ruminant operation.



**Figure 7.** A revised layout creating a functional rotational grazing system with a hub and a dry-lot system.



**Figure 8.** An example of dry lots used for different maternity groups with a connecting lane.

**Table 1.** Minimum Requirements for Non-Woven Geotextile.

Property	Test Method	Value
Tensile Strength (pounds) <sup>1</sup>	ASTM D 4632 Grab Test	150 min
Bursting Strength (psi) <sup>1</sup>	ASTM D 3786 Diaphragm Tester	320 min
Elongation @ Failure (percent) <sup>1</sup>	ASTM D 4632 Grab Test	> 50
Puncture (pounds) <sup>1</sup>	ASTM D 4833	80 min
Ultraviolet Light (percent residual tensile strength)	ASTM D 4755 150 hours exp.	70 min
Apparent Opening Size - AOS	ASTM D 4751	# 40 max <sup>2</sup>
Permittivity (1/sec)	ASTM D 4491	0.70 min

<sup>1</sup> Minimum average roll value (weakest principal direction)

<sup>2</sup> U.S. standard sieve size

Source: NRCS Conservation Practice Standard, Heavy Use Area Protection Code 561.

## Construction

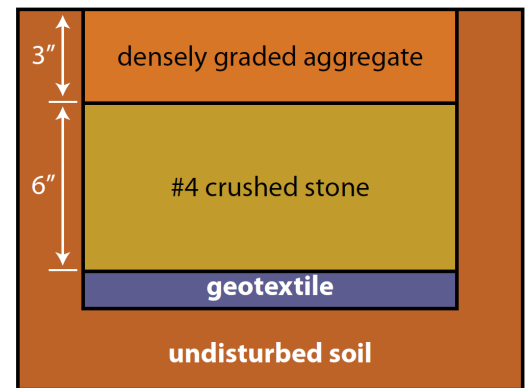
Excavation of the topsoil is required to construct the heavy use traffic pad. The topsoil is removed down to a soil horizon with a high clay content and a more stable surface. After excavation, geotextile fabric should be laid down over the exposed soil to prevent rock from sinking into the ground and soil from moving up through the fabric and rock matrix. A non-woven, non-heat bonded, and needle-punched geotextile fabric should be placed under the entire treatment area unless the foundation is rock or concrete. The fabric should have the minimum material requirements as specified in Table 1. A weight for the geotextile fabric is usually not specified, because the specific material features are different from one manufacturer to another. The fabric should weigh at least 6 ounces per square yard to meet the requirements in the table. Your local agriculture and natural resources extension agent, NRCS district conservationist, agricultural supply store, concrete supply store, and construction supply store are potential sources of information on where geotextile fabric can be purchased.

A base layer of large rock (i.e. #2 or #4) should be laid on top of the fabric, to a depth of at least 6 inches (Figure 9). Caution should be taken when spreading the base layer not to disturb the geotextile fabric. After the base layer, a top layer of 3 inches (minimum) of dense grade aggregate (DGA) should be spread over the area. This will provide a solid, stable surface for feeding during wet weather periods and during the winter. It may also be desirable to extend the geotextile fabric and rock out past the gates into the pasture, as these areas will see heavy traffic, especially if only one entrance to the pad exists.

## Lanes, Fences, and Gates

A required feature of the layouts presented in Figures 2 through 4 is that they all provide livestock traffic lanes. Lanes allow the animals to be moved from their present locations directly to the dry lot or to other paddocks without going through a second field. Further information for the construction of trails and walkways can be found in [Lanes for Beef Cattle Operations \(AEN-151\)](#) and NRCS Conservation Practice Standard Code 575.

A wide range of fencing options exist, depending on the desires of the herder. Hubs with infrastructure for managing



**Figure 9.** Cross section of a heavy traffic pad showing a base layer of #4 crushed stone top-dressed with a layer of dense-grade aggregate. Individuals may also choose to cover the final layer with no more than 2 inches of Class I sand or limestone dust to facilitate cleaning. Any more material than this will erode on a slope greater than 2 percent. (Donnie Stamper)

small ruminants are permanent structures and should be constructed with permanent fence. The addition of a perimeter hot wire adds the ability to exclude predators. In a situation where the animals are crowded, it is very important to think of small ruminant and handler safety. Corners and metal T-posts should be avoided. Normally, the dry lot will have a gated access from a farm road or farmstead. Gates and fences should be designed to accommodate truck and tractor access, where needed, to facilitate feeding and cleaning. The placement of the gates should also be designed to swing in a direction that facilitates herding, efficiency, and management, especially for a lone operator. A narrow lane uses fewer materials and discourages animals from reversing direction. Further information for the construction of fences can be found in NRCS Conservation Practice Standard Code 382.

## Summary

A well-designed and properly positioned centralized hub with an engineered, all-weather surface can be a significant enhancement to small ruminant operations. To be successful, a systems approach should be used to site the hub so that it enhances water, soil, and air quality while improving animal performance. This is accomplished by evaluating the ease of access, location, shape and dimensions of watering stations, building layout, barn function, structures, pastures, feeding structures, gates, and lanes/alleyways/roadways. Done correctly, the addition of hubs will result in greater producer and animal efficiency.

## Further Reading

Farmstead Planning: Old Farm Buildings Repurposed for Better Farming, How to Develop a Farming Complex (AEN-131).  
[Kentucky Nutrient Management Planning Guidelines \(KyNMP\)](#) (ID-211).

[On-Farm Composting of Animal Mortalities](#) (ID-166).

*2020-2021 Lime and Nutrient Recommendations* (AGR-1).

*Nutrient Management* (NRCS Code 590). Available at: [https://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/stelprdb1081578.docx](https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1081578.docx).

*Soil Testing: What It Is and What It Does* (AGR-57).

*Stockpiling for Fall and Winter Pasture* (AGR-162).

Topographic Map, United States Geological Survey. Available at: <https://viewer.nationalmap.gov/basic/?basemap=b1&category=histtopo%2Custopo&title=Map%20View#startUp>.

*Using a Grazing Stick for Pasture Management* (AGR-191).

Web Soil Survey, Natural Resources Conservation Service. Available at: <https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>.

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