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Planning Fencing Systems For Controlled Grazing

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Controlled grazing can be an economical way to provide forage to grazing animals. Utilizing pasture as a major portion of the forage plan can significantly reduce feed costs during the grazing season. Virginia's soils and climate are especially favorable for the growth of a wide range of productive, high-quality grasses and legumes suitable for grazing. However, optimizing a controlled grazing system requires careful planning and good management of a fencing system.

Controlled grazing works by allowing livestock to intensively graze a portion of pasture followed by rotation to a "rested" paddock. This permits plant regrowth on the grazed pasture while letting animals forage on the highly nutritious plants in the rested paddock. Depending on the quality and density of the pasture, livestock typically remain on a given paddock for as little as 12 hours and up to two weeks. Rotation of animals in the paddocks is based on forage growth rather than a rigid time schedule.

An effective controlled grazing system requires an adequate fencing system that provides the manager control of the grazing animals. Permanent boundary fences are used to hold grazing animals in the pasture area. Temporary or minimal interior fencing is required to subdivide the pasture into paddocks among which livestock are rotated. Proper fencing is usually a major capital investment. Therefore, the fencing layout should be carefully planned to save time and money.

Evaluating Resources

Evaluating on-farm resources is a good way to start your fencing layout plan. Remember, the goal of a fencing system is to efficiently utilize available forage resources while providing the desired rest period for each paddock. The fence should create paddocks as homogenous as possible. For example, a paddock should have similar soil type, slope, and orientation with respect to the north (aspect) within the fence. Such paddocks are more likely to be grazed uniformly, which optimizes the controlled grazing system.

Farm resources can be divided into three mai categories:

1. fixed resources
   - acreage
   - soil type
   - slope
   - aspect
2. semi-fixed resources
   - water supply
   - trees
   - existing permanent fence
3. changeable resources
   - forage type
   - temporary fence
   - travel lanes

Careful consideration of these resources will help develop the best fencing plan for your controlled grazing system.

Fixed Resources

Fixed resources cannot be altered and will have the biggest impact on fencing layout plans.

Soil Type and Land Class

Soil types and land classes will determine how land can be used for controlled grazing (Figure 1). A land capability map of your farm, available from your local office of the Natural Resources Conservation Service (NRCS), will provide this information. There are eight land classes determined by slope, drainage, erodibility, and soil depth.

Classes I through IV are suitable for cultivation, although many producers make good profits by grazing

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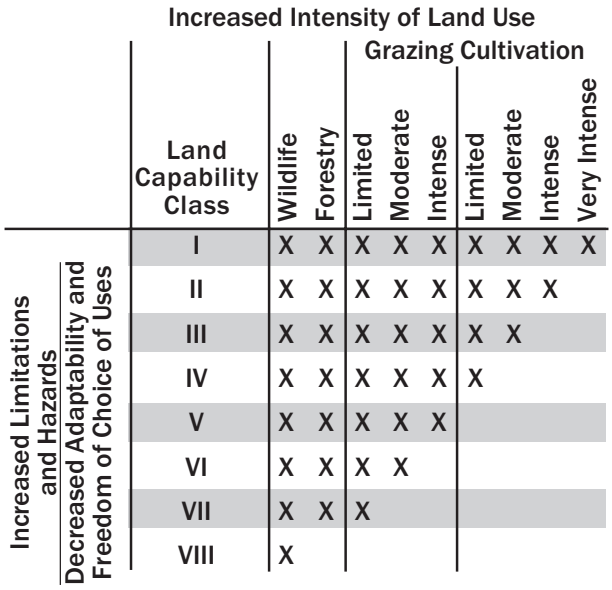


Figure 1. Intensity with which each land capability class can be used with safety. Note the increasing limitations on the uses to which the land can safely be put as one moves from Class I to Class VIII. (Modified from R. D. Hockensmith and J. G. Steele, 1949).

livestock on these lands. Classes V through VII are suitable for only pasture or forest. However, the controlled grazing system must be carefully managed to minimize erosion if Class VII is used for pasture. Class VIII is highly erodible and should not be used for grazing.

Slope and Aspect

The land's slope and orientation with respect to the north, referred to as aspect, greatly influence plant growth. Early in the year, southeast facing slopes warm up sooner and will have more forage growth than other slopes due to sustained warm temperatures throughout the day. North facing slopes generally show increased productivity during mid-summer when the sun is higher in the sky and present for a longer period of time. Similarly, southwest facing slopes usually show declining forage production in mid-summer because of a tendency toward droughtiness. Plant growth differences also vary according to forage and soil types.

Animals tend to change their grazing behavior depending upon forage production and will likely overgraze and undergraze on the same paddock if it contains areas of differing aspect, slope, and forage type. Therefore, fence placement with respect to slope and aspect is very important.

Erosion

Some land classes on the farm will be more susceptible to erosion than others and should be evaluated to determine if they are suitable for controlled grazing. Highly erodible areas may be fenced off from livestock completely to limit erosion and to possibly reclaim marginally eroded areas.

Semi-Fixed Resources

Semi-fixed resources may be altered to fit into your fencing layout plan.

Water

Water supply is critical for livestock on a controlled grazing system. Table 1 shows the estimated water needs for livestock during average and hot temperatures. Water should be available in every paddock and within a walking distance of 400 to 500 feet for lactating dairy cows (Swisher, 1997). This arrangement is also preferable for other livestock. When this is not possible, a central water source is a viable option, but should be located within a walking distance of 700 to 900 feet for sheep, goats, and horses, and 1,200 feet for beef cattle. A watering lane should be incorporated into the fencing plan if a central water source is used. One disadvantage of using a central water source is that the area surrounding the source often becomes a mud hole from the congregation of livestock in one small area.

Table 1. Estimated water needs for grazing livestock during average and hot weather.

Livestock	Average Consumption (gal/day)	Hot Weather Consumption (gal/day)
Lactating dairy cow	20 – 25	25 – 40
Dry dairy cow	10 – 15	20 – 25
Dairy calf	4 – 5	9 – 10
Lactating beef cow	12 – 18	20 – 25
Dry beef cow	8 – 12	15 – 20
Feeder calf	10 – 15	20 – 25
Sheep	2 – 3	3 – 4
Horse	8 – 12	20 – 25

Livestock that drink from surface water sources such as ponds and creeks are at a potential risk to ingest bacteria and pesticides from cropland runoff. Fencing off ponds, springs and streams and using a watering tank fed by these resources may be a better option.

Water quality problems can also occur with wells and springs. These sources may become contaminated with

nitrates and bacteria, especially if they are located near septic tanks or milkhouse wastes.

Remote water pumping can provide fresh, high quality water to the controlled grazing system. Do not allow the lack of existing water to be a barrier to the development of a controlled grazing system. Information on water development for livestock is available from Virginia Cooperative Extension (VCE Publication 442-755).

Shade

Lactating dairy cows should not graze during midday in summer. However, cows may graze on shaded paddocks in the morning and on paddocks without shade late in the evening. Beef cattle may graze longer than dairy cows in paddocks with no shade. Newly shorn sheep may require shade to prevent sunburn. Shade is usually considered more important in the Southern Piedmont and Coastal Plains regions of Virginia.

Paddocks with trees for shade should be rotated intensively so that animals do not congregate in the same area for more than 12 to 24 hours. Livestock congregation that exceeds this time span will result in sod kill and nutrient concentration. Also, dairy cows tend to contract mastitis when congregating in one area for a long time.

Existing Permanent Fences

Existing permanent fences may fit well into the controlled grazing system. However, the presence of an existing fence should not limit thinking when planning a controlled grazing system; the best use of land resources should be considered first. The condition of the existing fence should also be evaluated. Old fences can be enhanced with a single wire electric fence on a strut that protrudes into the pasture. However, if the existing fence is in poor condition, it should be replaced.

Changeable Resources

Changeable resources can easily be altered to fit into your fencing layout plan.

Forage Type

A combination of cool and warm season forage plants should be selected to provide a good forage supply throughout the grazing season. Your county Extension Agent can help determine what types of forage to use for a controlled grazing system. The Virginia Cooperative Extension *Agronomy Handbook* (VCE 424-100) provides an excellent comparison of the various forages adapted for Virginia.

Temporary Fences

All fencing used to develop a controlled grazing system need not be permanent. Temporary fences may be used to sub-divide pasture that will be used for haying or cropping at some other time. Temporary fencing is also more economical when small paddocks are needed.

Planning the Fencing Layout

The Layout Map

Three types of maps will help plan the fencing system: 1) the land capability map; 2) an aerial photograph; and 3) a topographical map.

As previously discussed, the land capability map will help determine production boundaries for cultivated fields, hay and pasture land, and pasture only areas.

The aerial photograph is probably the most valuable tool for fence planning and will help sketch your fencing layout plan. Aerial maps are generally available from the NRCS or the Farm Service Agency (FSA) in your area.

Topographical maps may also be available from your local NRCS office. These maps provide information on the contour and slope of your land and will help you plan your fencing layout.

Step 1 – Investigate Fencing Laws

It is important to consider the views of adjacent landowners when establishing boundary fences to address any concerns they may have about the proposed project. Each landowner should have a good understanding of the laws that describe legal rights and responsibilities in fencing to avoid potential disputes between neighbors.

Step 2 – Investigate Cost-Share Opportunities

Fencing is a major capital investment and will typically have cost-share opportunities. A visit to your local Soil and Water Conservation District (SWCD), NRCS, and local county extension offices will provide information on the availability of cost-share funds and tax credits for fencing and water delivery systems for livestock.

Step 3 – Establish Boundaries

Field boundaries may be established using the aerial photograph of your farm. You will also need the fol-

lowing materials: 1) a ruler or scale; 2) transparent overlays; and 3) marking pens. Place the transparent overlay on the aerial map and draw a fencing layout plan accordingly. To make changes to your plan, simply change the transparent overlay and redraw. Some useful symbols for a fencing layout plan are in figure 2.

Figure 3 shows an 80-acre farm on a typical aerial photograph scale of 1 inch = 660 feet. The fenced land on the ridge is Class III loam soil suitable for row crops. All other land on the farm varies from Class IV to Class VI clay soil appropriate for hay and pasture. The existing boundary fence and ridgetop field fence are both woven wire and in good shape. If these fences were in poor condition, replacing them would be the first priority in the fencing layout plan.

A well-built permanent boundary fence is important for three main reasons:

1. To establish a fixed property line between you and your neighbor or between you and the highway.
2. To confine livestock. Losses due to livestock killed on a highway and payment for damages to neighbors' crops may be more than the cost of a permanent fence. Meanwhile, neighbors' livestock are confined to their property. This saves your crops from being damaged and prevents the mixing of scrub and unwanted weeds or diseased animals with your livestock.
3. A permanent boundary fence will probably never be moved unless the adjoining property becomes part of your farm.

Step 4 – Adding a Division Fence

Adding a single permanent division fence creates a two-paddock rotation. Figure 4 shows the most logical location for a division fence on the example farm. The fencing system has also been extended around the pond and the central lot. This allows for better animal handling and provides access to the water tank. Notice that the fence follows the contour of the land rather than a straight line. A straight fence would be shorter and less expensive. However, following the land contour will help you create more homogenous paddocks to optimize the controlled grazing system.

Three-wire high tensile electric (HTE) fence is used for the division fence and 5-wire HTE fence is used for the central lot and around the pond. For our example farm, the cost would be approximately $344 for 800 feet of division fence, $832 for 1600 feet of central lot and pond fence, and $250 for a controller for a total cost of $1,426. You can estimate the break-even cost for a fencing system by simply dividing initial capital investment by current commodity price.

Controlled grazing requires two or more paddocks. However, the two-paddock rotation is probably the most difficult controlled grazing system to manage. The forage growth tends to be more uneven and one paddock tends to "get ahead" of the other. Further subdivisions allow for more effective management of the system.

The number of paddocks required for a controlled grazing system must be sufficient to provide adequate amounts of forage to the animals. This will depend on the number of days the animals graze in a paddock and the maximum rest period needed for forage plant regrowth. Rest periods should be based on the growth rate of the pasture, which will vary with the season and weather conditions (Table 2).

Table 2. Paddock rest periods for controlled grazing systems.

Season	Weather Conditions	Growth Rate	Rest Period
Spring	Cool, moist	Fast	10 – 15 days
Spring	Warm, dry	Medium	15 – 20 days
Summer	Hot, moist	Slow	30 – 35 days
Summer	Hot, dry	Very slow	40 – 60 days

The formula given below is a useful tool to determine the number of paddocks needed for a controlled grazing system.

(resting days ÷ grazing days) + number of herds = number of paddocks required

Example 1: A herd will graze each paddock for five days and the maximum resting period between grazings is 15 days.

(15 resting days ÷ 5 grazing days) + 1 = 4 paddocks

More information on determining the proper number of paddocks for your controlled grazing systems is available from Virginia Cooperative Extension (VCE 418-012).

Figure 2. Fencing layout planning symbols.

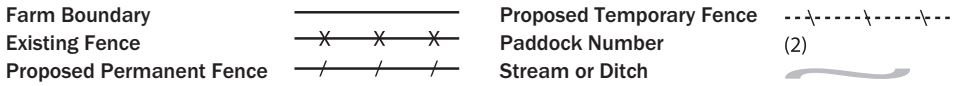


Figure 3. Example 80 acre farm.

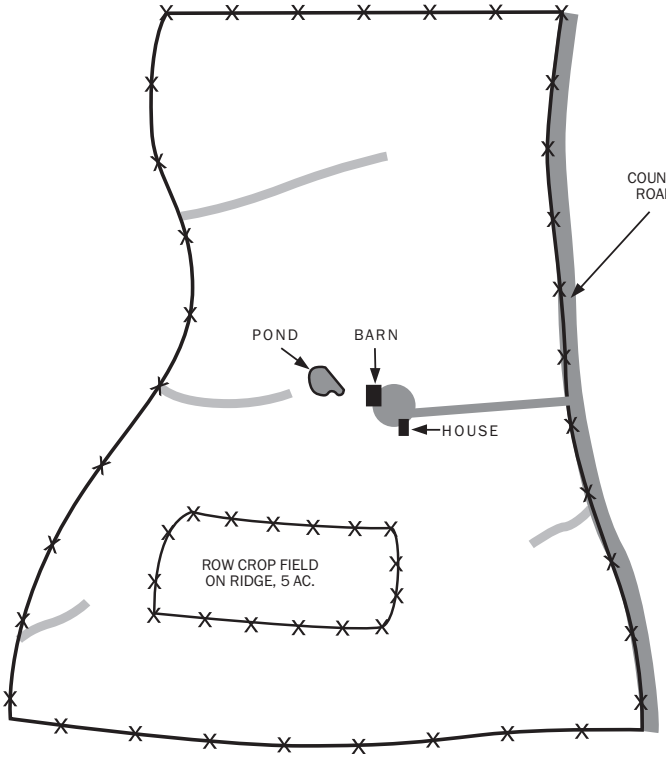


Figure 4. Adding a division fence

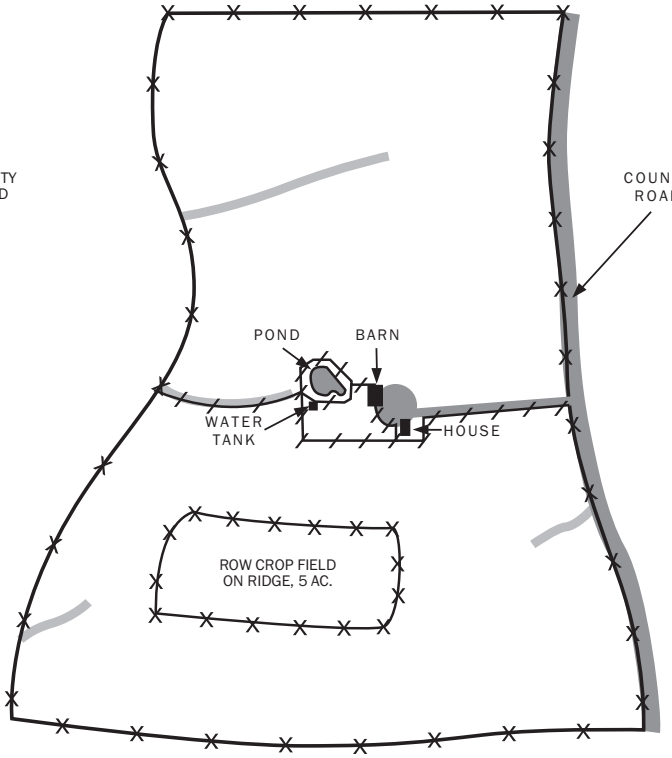


Figure 5. Subdivision to four paddocks using permanent and temporary fence.

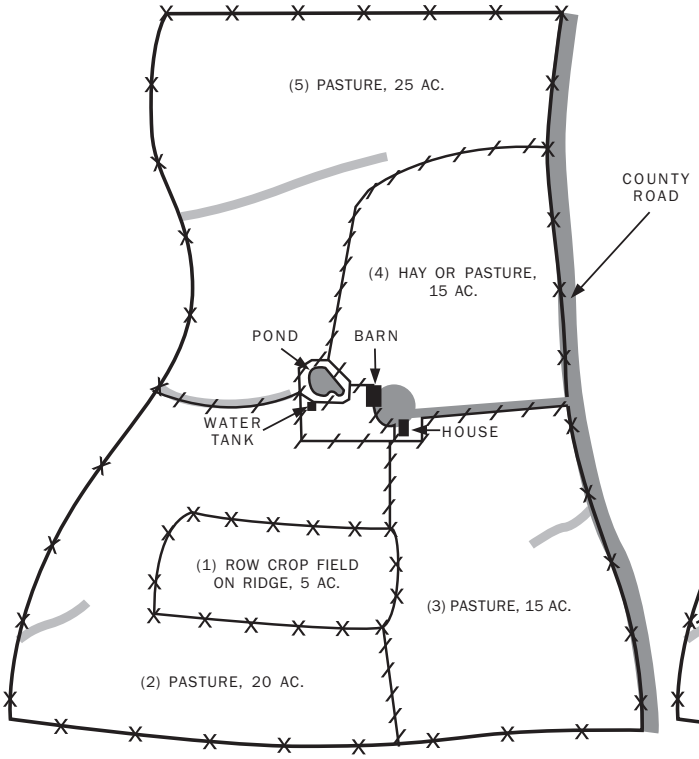
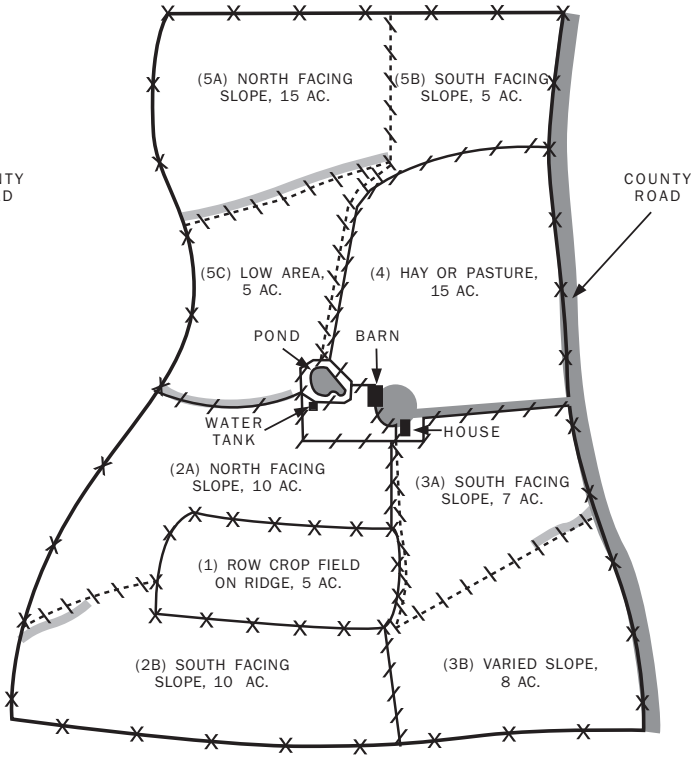


Figure 6. Subdivision to eight paddocks using portable fence.



Step 5 – Further Subdivision

Further subdivisions may be developed using a combination of permanent and temporary fencing. Figure 5 shows the addition of this fencing combination to create the four paddocks required for the grazing system described in example 1. Paddock 4 is gently rolling land and is planned for hay production. The fence follows the main contour of the land to create a homogenous field with similar soil type and slope.

The cost for constructing an additional 1300 feet of 3-wire HTE fence is $559. Portable electric fence is used for part of Paddock 3 at a cost of $46 for 300 feet. The total additional cost is $605, which brings the total system cost in figure 5 to $2,031.

Step 6 – Additional Temporary Subdivisions

The four paddock fencing system shown in Figure 5 is a feasible starting point for a controlled grazing system. However, slope and aspect differences within the paddocks could still cause uneven grazing. For example, with a 5-day grazing period only 15 days are available to rest each paddock before regrazing. A combination of portable and permanent fencing could be used to create more paddocks with the desired level of homogeneity. The number of resting days between grazings could also be increased.

Example 2: A herd will graze each paddock for five days and the maximum resting period between grazings is 35 days.

(35 resting days ÷ 5 grazing days) + 1 = 8 paddocks

Figure 6 shows the example farm with the addition of portable electric fences to create eight paddocks of similar slope and forage type. Notice that permanent fences have been used to create access lanes for the central water supply.

The additional paddocks were created for relatively little additional cost. Twelve hundred feet of temporary electric fence can be purchased for $185 and used at various locations. The major cost item is the $516 for 1200 feet of additional 3-wire HTE fence for the access lane. Total investment in the fencing system in Figure 6 is now $2,732.

Travel Lanes

A well-designed travel lane facilitates animal movement by improving the manager's control of the animals. Travel lanes should be limited to the minimum width that allows machinery or equipment to be transported between paddocks. A lane width of 10 to 12 feet is recommended for livestock only. Transport of harvesting combines, hay balers, cotton pickers, and other machinery generally requires a 14 to 16 feet wide lane.

Travel lanes also limit animal and machinery traffic damage to a small area. Animals should spend a limited amount of time only in the travel lanes to reduce the amount of manure deposited in these areas. Travel lanes should not be placed on steep slopes to minimize erosion.

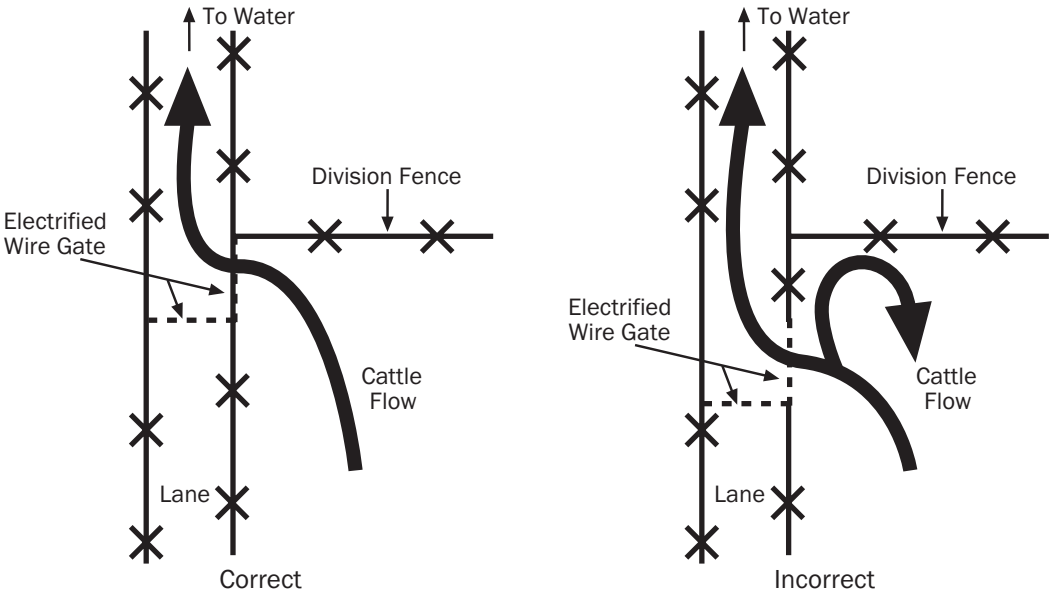


Figure 7. Gate placement is important to good animal movement.

Gate Placement

Gate placement is important in a controlled grazing system since animals are moved frequently. In general, gates should be located in the corners of paddocks and close to buildings. Gate placement should allow you to drive the lead animal down through the paddock and into the lane so that others will follow through the gate rather than along the inside of the paddock fence (Figure 7).

Multiple gates are recommended for paddocks with lactating dairy cows. These animals travel to and from the barn more frequently than other livestock. As a result, sod kill and manure concentration will occur around a single gate.

If your paddocks are on opposite sides of the highway, the gates should be located directly opposite each other. Locate the gates along a highway where there is good visibility from either direction for your own safety and the safety of others.

Gates along highways should be located at a distance from the road that provides ample clearance for parking a tractor and a wagon while you open or close a gate. Some highways have ample clearance of 25 to 30 feet from the side of the road to the fence line. However, many rural roads provide very little clearance and it is important that you provide a drive-in area at the gate so that no part of your equipment extends into the roadway.

The Pie-Shaped Arrangement

Some producers think a pie-shaped fencing system is ideal for animal access to a central water source (Figure 8). However, this arrangement has three main disadvantages: 1) the area around the water source often becomes a mud hole from the congregation of livestock in one small area; 2) it is more difficult to create paddocks that follow land contours; and 3) pie-shaped paddocks are hard to manage for hay cutting and fertilizer and herbicide applications. It is best to avoid this type of arrangement.

Conclusion

Fencing systems for controlled grazing must be tailored to each individual farm. However, there are common principles that should be used for every fencing layout plan. Paddocks should be created from soil that is as uniform in slope, aspect, and forage type as possible. Fences should follow contours to create homogenous paddocks. Walking distance to a water source should not exceed 500 feet for milking dairy cows, 900 feet for sheep, goats and horses, and 1,200 feet for beef cattle. Gates should be placed in paddock corners. Multiple gates are recommended for paddocks with lactating dairy cows. A well-fenced controlled grazing system can be an economical way to provide forage to grazing animals and can increase returns.

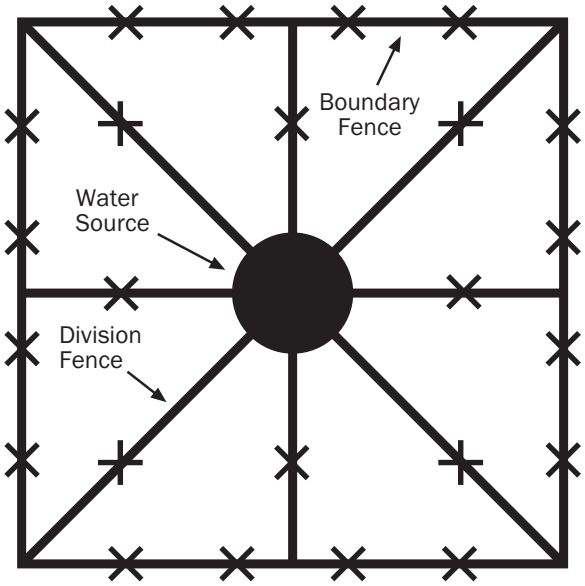


Figure 8. The pie-shaped division arranged around a central water source.

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For Additional Information:

On Fence Construction

NRAES-11 "High Tensile Wire Fencing" ($4.00)

To order NRAES publications, contact:
Natural Resource, Agriculture, and Engineering Service
Cooperative Extension
152 Riley-Robb Hall
Ithaca, New York 14853-5701
Phone: (607) 255-7654
FAX: (607) 254-8770

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Reviewed by Bobby Grisso, Extension specialist, Biological Systems Engineering