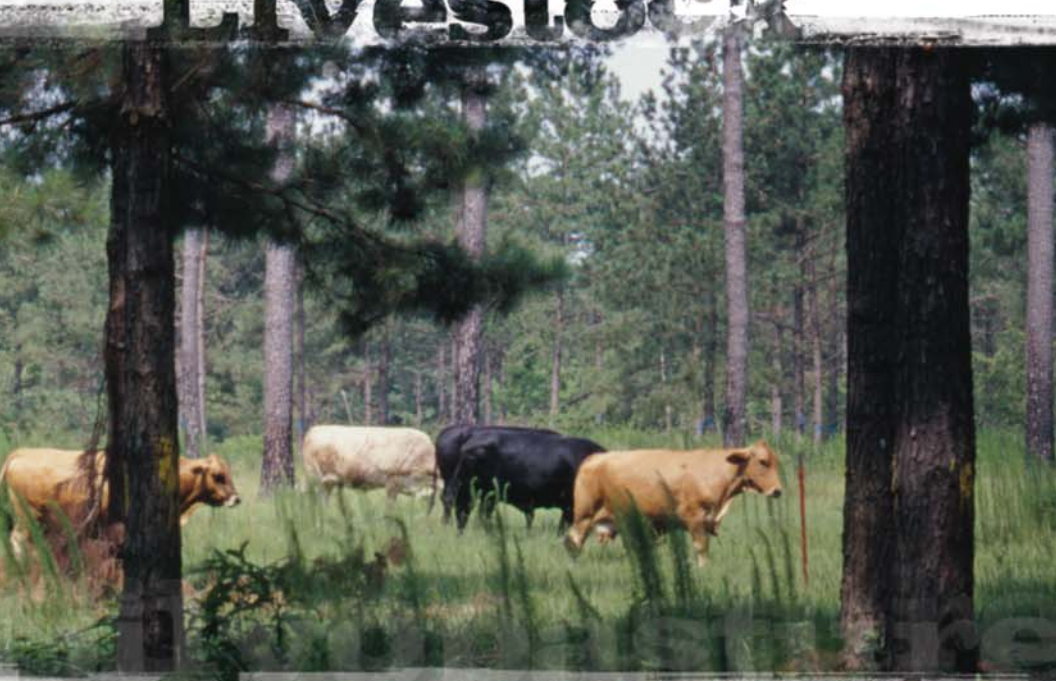
The Livestock Component



Overview

Livestock provide income, consume weeds, and are one major tool by which grass/legume, and tree/forage competition is managed. Grazing may also reduce fertilizer needs by increasing the effectiveness of soil nutrients through recycling (in dung and urine) of elements such as nitrogen, phosphorous, potassium, and sulfur which are stored in pasture forage. Livestock may also be used for site prep by allowing them to "overgraze" areas with weed problems.

Trees in pastures provide shelter for livestock during periods of inclement weather. This can significantly improve animal performance during particularly hot or cold times of the year. In most cases, forage growing under the shady, low wind environment near trees tends to mature more slowly and, therefore, be lower in fiber and more digestible than that growing out in the

Goats can be incorporated into silvopasture systems.

open. Recently established systems may be grazed with little browsing damage to trees provided that other, attractive forage is present.

Conifers, although not really palatable to livestock, are most likely to be browsed after spring bud break when foliage is still light green in color. Livestock like variety in their diet. They will often consume a small amount

of tree foliage each day. This small amount of browsing may accumulate to unacceptable levels when animals are in the silvopasture for prolonged periods—which should be avoided by proper management. Age and experience of animals is probably more important than breed in predicting the willingness of livestock to browse or debark trees. Young animals and those with a past or learned experience of eating tree foliage are much more likely to browse trees. Browsing damage can sometimes be eliminated by removing or managing these animals. Browsing by livestock is unlikely to kill young trees unless it is both severe and repeated several times. Removing the top bud of conifer trees, or over half of the current year's foliage, however, will reduce tree growth that year.

Trampling of very young seedlings and livestock rubbing on tree saplings may be a problem, particularly with cattle. Where livestock damage must be avoided, young silvopastures may be hayed, or trees protected from livestock by electric fences, individual tree shelters, or rigid mesh tubes. Once the top branches of trees grow above the reach of livestock and a thick layer of bark has developed, potential for tree damage by livestock browsing is minimal and agroforests may be managed similar to pastures.

Grazing systems

Continuous stocking vs. rotational grazing

With a continuous stocking system, the animals are maintained on a single pasture or "all" pastures during the entire grazing season. However this does not mean the stocking rate (number of animals per acre) has to remain constant or that grazing on a particular piece of land will be season-long. This practice is not generally recommended for silvopasture systems. However, available forage can be effectively utilized by adjusting the livestock numbers up and down based on forage production.

While continuous stocking requires less fencing, watering facilities, and labor, the continuous selection by grazing decreases desirable forage species creating weedy pastures and areas of overgrazing and undergrazing. However, it allows livestock to selectively graze the most desirable or high quality plants, thus average daily gains can be quite good. It is the potential problems associated with continuous stocking that makes it the least desirable system with silvopasture. High impact areas can have detrimental impacts on tree growth and survival and lead to soil erosion. More intensive management and monitoring is required for this system.

Rotational grazing systems utilize recurring periods of grazing and recovery with animals being rotated among cells, paddocks, or pastures of a grazing management unit. The number of cells or paddocks may vary from only a few to 12 or more. A high stocking rate is imposed on a paddock for a short grazing period followed by a longer recovery or rest period.

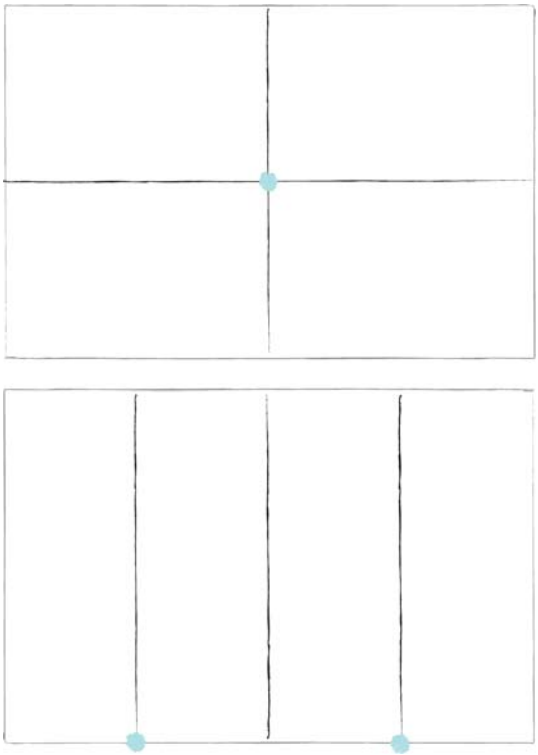
Grazing periods generally range from 1 day to 1 week. It is important that the grazing period is not so long

that forage regrowth begins before the animals are rotated. If this occurs, animals will regraze new growth, thus increasing the recovery period. The recovery periods, when the forage is regrowing, are longer and typically range from 2 to 5 weeks. Forage species as well as climate and soil resources influence this recovery period.

Paddocks

The optimum number of paddocks will vary from farm to farm, depending on the individual circumstances, resources, goals, environmental conditions, and desired level of animal production. Paddock numbers vary considerably, depending on need, desire, and resources. For most beef cattle grazing operations, 5 to 10 paddocks may be sufficient. This permits paddocks to be grazed in 3 to 7 days and rested 25 to 35 days. In most cases, five paddocks should be considered a minimum, and there is little economic advantage for most operators to have more than 12.

Know the productivity of the soils and forages and when possible adjust paddock size of less productive units so production is similar on each paddock. This will allow similar grazing periods per paddock. An important point for providing optimum nutrition to the overall herd is to have animals in appropriate groups. These groups would be gestation (dry cows), lactation (nursing calves), first-calf heifers, and replacement heifers. Each of these four groups has very specific nutrient requirements. If all of these animals are managed together, then most of the cattle are being over- or under-fed and very few are being fed to meet their requirements. Again, grazing management in a silvopasture system helps eliminate this problem. Because the animals are being grazed in specific pastures and not allowed access to the entire acreage



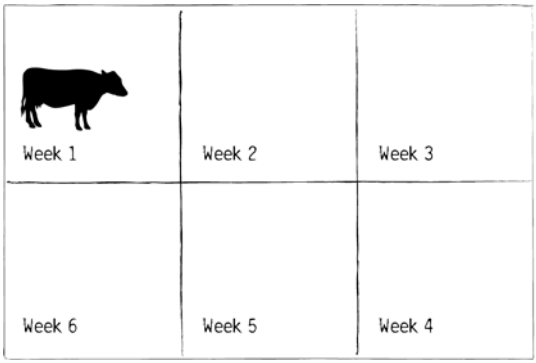
Diagrams show options for dividing up grazing area into paddocks. The blue circle indicate water sources and lines indicate fencing. Water sources should be portable where possible.

then it becomes easier to manage these groups. In fact first-calf heifers or grass-finished stockers should have first access to a fresh pasture to get the highest quality forage, followed by the lactating cows. The lowest quality forage would be cleaned up by the dry cows. Thus, silvopasture, grazing management, and optimal nutrition all become synonymous.

Managing rotational grazing system

Utilize the higher quality parts of the forage plants for grazing (top one-third of leaf). Do not force animals to eat low quality basal leaves and stems.

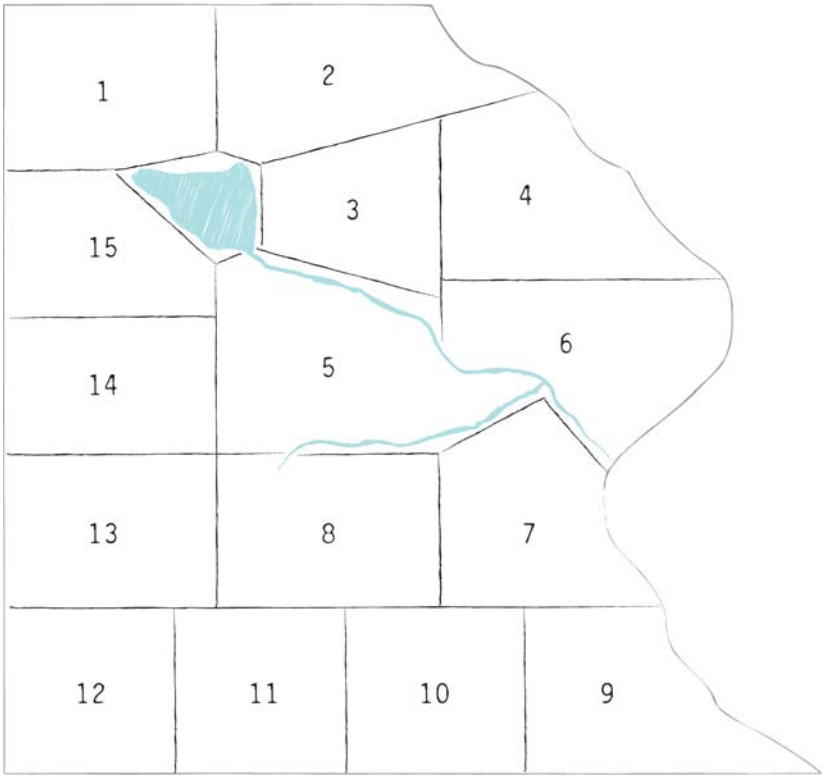
- Match rotation time to forage growth. Do not use a fixed time schedule.
- Maintain sufficient leaf area for photosynthesis.
- Rotate animals to a new paddock before they graze new regrowth.



- Forage quality decreases with increasing forage maturity and thus it is important to plan the entire management scheme around the forage program to take full advantage of forage quality when it peaks.
- Adequate mineral supplements are needed in silvopasture systems.

Where land allows, uniform sized paddocks with parallel sides can be desirable for rotational grazing systems. Uniform sized systems are sometimes implemented to better facilitate grazing distribution, the addition of subdivisions, as well as the mechanical

harvest of forage when appropriate. This is less critical for small paddocks or where the grazing period is generally 3 days or less. Cattle take about 3 days to establish a strong grazing pattern within an individual paddock. When cattle are allowed to remain on a paddock beyond 3 days, spot grazing (caused by low animal numbers and too large of an area) and pronounced cattle trails will begin to develop. When the cattle return to this paddock they will again begin to follow the grazing patterns previously established.



This rotational management plan incorporates 15 paddocks with streams and water impoundments for water sources. Additional water tanks would be necessary in the paddocks without existing water sources. Plant species composition and proper soil testing are also necessary for proper establishment and management.

Fencing

Because overgrazing reduces the nutritional composition for the animal and reduces the regeneration of forage, fencing is an important component of a silvopasture system. Fencing allows control of animal movement within a silvopasture system. Fence plans should be flexible and not limit grazing options. Three types of fencing are commonly used: perimeter fences, permanent subdivisions, and temporary/portable fences.

Energized high tensile wire fence will withstand falling debris. Strategically locate power switches to improve pasture access and diagnosis of power failures.

Proper pasture rotation using a paddock fencing system provides "recovery periods" for the grazed forage, minimizes soil compaction, and protects trees in a silvopasture system. There are several key components in an effective and easily managed fencing system:

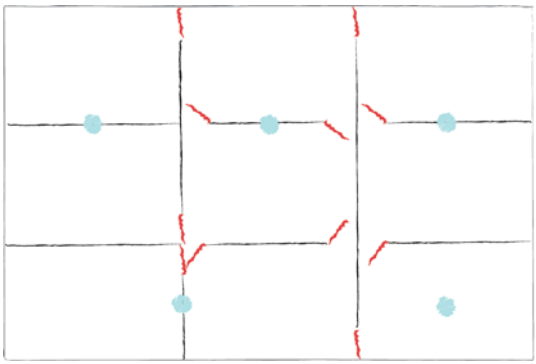
- An energized fence is primarily a psychological barrier and can only be effective if the fence carries enough current to deliver a "deterrent" shock. Soil type (rocky, sandy, or clay) and soil depth will need to be considered when planning and installing an energized fence. AC-powered units are generally the best choice for energizing a fence if 220 or 110 volt power is available. Battery powered systems with solar recharging capacity can be used onsite. A properly sized energizer should generally produce 1 joule per mile of fence needed.

- Fence should be properly grounded with a minimum of 3 feet of ground rod per joule output (typically provided by three, 96-inch ground rods, or other configurations in shallow soils, placed at least 10 feet apart). The fence should also be protected from lightning by installing a surge protector at the power source; a lightening choke may be installed "in" the fence, and an additional ground rod every 3,000 feet of fence.

Thoroughly consult with an energized fence supplier or livestock management specialist for specifications and site requirements for proper installation of an energized fence.

Gates and access

The location of gates in the rotational system is important to facilitate the movement of livestock through the paddock and the alignment of temporary lanes and alley ways.



Wires and wire spacing

High tensile wire is recommended when using electric fences for perimeter areas and in cross-fences. The number of strands depends on type of livestock, topography of the area being fenced, prior training, and management. Generally a minimum of four to six strands is recommended for perimeter fencing and one to three strands for cross-fencing, depending on livestock. For smaller livestock like goats, tighter configurations are sometimes needed.

If a land line is not available to supply electricity, a battery or solar powered system is required. Small units with less than 1 joule output may be powered by self-contained lantern batteries while larger units up to

An in-line switch is a wise investment. By strategically locating switches, a landowner can save miles of walking when tracing electrical current using a voltmeter.

9 joule output can be powered by 12-volt automotive batteries. Deep cycle RV batteries provide greater storage capacity and better recharge. The higher the output of the energizer, the more rapidly a storage battery is drained. To avoid repeated battery turnaround, a solar recharge system is a must. A number of solar panel systems exist on the market.

However, it is important to match the size and output of the solar system with the output of your energizer. A good rule of thumb is that allowing 1 mile of fence per joule output will give satisfactory performance in most situations.

Voltage requirements for livestock vary depending on the type of livestock. Generally accepted figures for adequate control are: 6,000 volts for cattle, 2,000 volts for sheep and goats, and 1,200 volts for hogs and horses.

A reliable energy supply is necessary for powered fences. Also, ensure that an adequate supply of water is available in each paddock.

Wire recommendations for livestock

See state guidlines and standards for more specific details

	LIVESTOCK	NUMBER OF WIRES	WIRE HEIGHTS (inches)	POST SPACING (feet)
INTERNAL FENCES	Cows with calf	1 or 2	28-34	40-80
	Stockers	1 or 2	22-32	40-60
	Sheep	3 or 4	5-10, 20, 32, 46	20-40
	Cattle	3 or 4	10, 20, 32, 46	20-40
PERIMETER FENCES	Cattle, horses	4-6	10, 20, 30, 40, 50	20-40
	Sheep, goats	5-8	4, 8, 12, 18, 24, 30, 40, 52	20

Portable fencing

Polywire or polytape are the most commonly used materials for temporary or portable cross fencing for paddocking purposes or for allocating stockpiled pastures for winter grazing. Portable fencing is easily solar energized and grounded and commonly used for break and strip grazing. Both of these materials are combinations of plastic strands and metal filaments. These products are lightweight and require no setup tools. Minimal bracing is needed to hold the fence and very light duty lineposts may be used. Most polywire is sold in 6- or 9-strand. The 6-strand can be effectively energized for up to one-half mile. The 9-strand polywire has more wires and also slightly larger wire filaments that increase the practical length up to several miles.

Polytape has the advantage of greater visibility when compared to polywire. Tape tends to flutter in the breeze and attract more attention and recognition from livestock. Good quality tape lasts from 5 to 7 years, while polywire may last up to 10 years.

The number of wire strands depend on the type of livestock being grazed. Generally, a minimum of four to six strands is recommended for border fencing and one to three strands for cross-fencing cattle.

Plastic step-in posts are the most common linepost used with polywire and polytape products. As long as soil conditions allow, posts can be easily pushed into the ground or hammered in. On level or evenly sloping terrain, line posts may be up to 100 feet apart for a single wire paddock fence. Most conditions however, will require a more realistic 40- to 60-foot spacing. Three or more wire fencing systems will require a closer spacing. Most fence post spacings range from 20 to 60 feet between posts. To use the polywire and polytape systems effectively, a reel system is a must. Features of a good reel system include a positive locking system, a good warranty, the capacity of the reel to hold the amount/length of product used, and high-speed gearing when necessary.

Watering

Grazing animals need to drink on a regular basis and to do this they must stay within a certain traveling distance of the water source. Consumption of water is greater when water is made available in every paddock and the travel distance is kept < 800 feet. When water is located close by (< 800 feet) from where the cattle are grazing, they will water as individuals and not a herd. Pasture utilization tends to become less uniform as cattle travel more than 800 feet to water. If adequate watering facilities are limited, use lanes and alleyways to get to a single water source serving several paddocks; mud and trampling around the water source can occur.

Producers generally desire to have one water source serve more than one paddock. Placing the water tank in the fence line toward the center of the paddock allows a wider area of access and keeps compaction and animal concentration to a minimum. It also provides

Portable tanks are easily removed during timber harvesting.

the opportunity to cross-fence if the producer needs to increase the intensity of the grazing system. While water sources are commonly located in the middle of the grazing unit, it is best to have flexibility and portable water facilities to better manage vegetation, reduce trampling, and allow transport of tanks. Rubber or nylon structures are lighter weight and easier to use than traditional steel tanks.