Cornell University
Cooperative Extension

Forest Connect

College of Agriculture
and Life Sciences
Department of Natural Resources
B20 Bruckner
Ithaca, NY 14853
t. 607-255-2115
www.ForestConnect.info

A Framework for Successful Planning and Implementation of Silvopasture Projects

The Silvopastoralist's Quiz…

I am willing and able to:

- Intensively manage both *livestock* and *timber* on my property in a way that is not detrimental to either resource over the long-term?
- Accept significant and continual visual changes in my woods and pastures?
- Invest in sufficient grazing infrastructure to allow full rest and recovery of each silvopasture paddock?
- Adapt management to changing conditions in plant composition (overstory and understory), site carrying capacity for different numbers and types of livestock, weather, and other dynamic factors?

These are just a few of the questions that require an unequivocal "YES" response to move forward with silvopasturing as a management system on your land, or the land that you manage for others.

Mistakes in agriculture can often be corrected quickly: a reseeded field; a herd liquidation; or the sale of a piece of equipment that didn't meet expectations. Mistakes in forest ecosystems, by comparison, can take many decades to correct. Therefore, it is important to carefully consider all aspects of a silvopasture project *before* initiation to avoid mistakes that are both costly and enduring.

The following list of questions can be used to help initially gather data to be used in the planning process. This is not meant to be an exhaustive list of all considerations that one should take into account, and responding to the questions may require detailed thought and diligence.

1. **Why?** State the purpose or goals of the proposed silvopasture project

2. **Where?** Describe the location, physical boundaries and why this site was chosen. Include a detailed drawing that shows access, water sources, gates, hazards, etc.

3. **What?** Describe the proposed actions and desired end conditions

4. **When?** State when work will commence and be completed for major project phases.

5. **Who?** List activities to be done in-house and those that will be contracted. Do you have the time and ability to perform the tasks listed as in-house and what is the opportunity cost?

6. **Will it pay?** Prepare a budget for the project and compare to the estimated benefits. Know what it will cost going into the project to do things right, and make sure that it is a sound investment.

7. **What did I forget?** List potential pitfalls and contingency plans. Are the assumptions realistic?

Creating Quality Silvopastures in Forested Areas

Silvopastures are only as good as the ***quality*** and ***quantity*** of food that is available for livestock. Consequently, unthinned and overstocked forest stands with barren understories do not make quality silvopastures!

There are three keys to establishing quality food (primarily forages and browse) in silvopastures:

1. *Reduce stand density to allow adequate sunlight (i.e. solar energy) to reach the ground level (practice = Timber Stand Improvement; science = Silviculture)*

2. *Meet the germination requirements of the target species (practice = Forage Establishment; science = Agronomy)*

3. *Manage the system to encourage the growth of desirable vegetation once established (practice = Management Intensive Grazing; science = Grazing and Animal Sciences)*

Key Number 1 – Reducing Stand Density

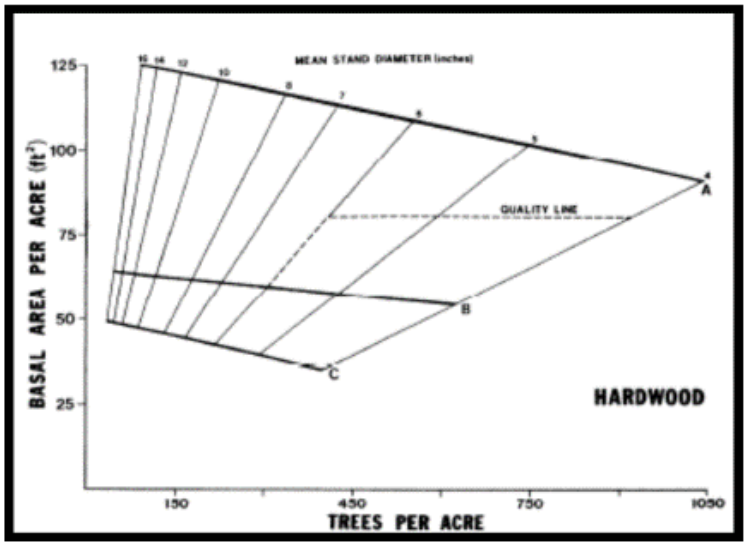
"Crop Tree Management" (CTM) was a thinning strategy refined in the 1980's by the US Forest Service to make thinning operations more efficiently and effectively meet ownership objectives. CTM recommends that trees are culled only when they directly compete with the live crowns of Crop Trees, until the desired residual stocking level is reached. Poor quality and lower canopy trees that do not directly compete with the crowns of Crop Trees can be left to save time and thinning expenses since their removal does not (significantly) benefit Crop Trees.

Conversely, all non-Crop Trees in silvopastures are potentially intercepting valuable sunlight and moisture from reaching the ground. Therefore, thinning in silvopastures should consider trees and shrubs in every strata and location - even if they do not apparently compete with the growth of Crop Trees in the upper canopy.

One measurement that can be used to assess forest stocking, or density, is "basal area". Basal area is the surface area of all tree stems per acre at "diameter breast height" (4.5' above ground). Basal area can be correlated to the "porosity" – or "relative density" - of the upper canopy and the amount of sunlight reaching the ground. The lower the basal area, the higher the sunlight levels at the ground level. Simple instruments used to measure basal area are the angle gauge and prism.

The Angle Gauge: Keeping your feet over a fixed point, turn 360 degrees and tally all trees that completely fill the window of the angle gauge. Multiply by the factor of the window. For example, ten trees tallied using the 10-factor window would mean that the site contains approximately 100 square feet of basal area per acre. Take sufficient random samples to accurately assess stocking.

Although relatively little research has been done to date to evaluate forage growth under different forest stocking levels in northeastern silvopastures, studies at the Center for Agroforesty at the University of Missouri, and the Ag Research Service Station in Beaver, WV suggest that acceptable growth of a number of cool season grasses and forbs will occur at around 60 sq. ft./acre of basal area. This stocking level coincides approximately with the "B-line" of a stocking chart for northern hardwoods.



Stocking chart for northern hardwoods is based on trees in the main crown canopy. The A line is average maximum stocking. The B line is recommended minimum stocking for adequate growth response per acre. The C line defines the point at which the stand become understocked (until new trees become part of the stand). The quality line defines the stocking measure in young stands for maintaining quality stem development

Since both forage and timber production are primary objectives in silvopastures, *frequent thinning* will be necessary to maintain stocking at around the B-line. Allowing stocking to significantly surpass the B-line may still be acceptable for good tree growth, but be detrimental for forages as the tree crowns quickly close after thinning and reduce sunlight at the ground level. Thinning below the B-line may increase forage production (depending on sward composition and management), but decrease timber production on a per acre basis. It is currently believed that maintaining stocking levels in silvopastures at around the B-line will optimize overall timber and forage production.

It is recommended that no more than one-third of the basal area be removed in a single thinning operation or unintended consequences may occur such as wind throw, epicormic branching, and "thinning shock". Gradual thinning is best if operationally feasible.

Using the following criteria, identify "Crop Trees" that:

- Are desirable species (e.g. valuable timber, mast production, light foliage, pest resistant, etc.) based on predefined objectives
- Have good form and are free of visible defects
- Appear vigorous and fast growing
- Will appreciate in value
- Should persist in the stand (be long-lived)
- Are well-spaced

After marking crop trees that are to be left, use the angle gauge to measure the residual stocking. Adjust as needed to approach the B-line, without exceeding one-third of the total basal area.

Trees that are to be culled can be harvested for timber products, dropped and left, girdled or poisoned. Whole tree harvesting will minimize residual slash and obstructions on the ground to grazing livestock.

Heavy duty mowing machines like the FECON, Timber-Ax, or Brontosaurus may be cost-effective to clear dense small diameter brush and trees. Mist-blown herbicide treatments are another alternative.

Key Number 2 – Meet Germination Requirements

Woods that are adjacent to fields and pastures will normally have sufficient seed banks of forbs and grasses to provide adequate volunteer forage establishment once sufficient sunlight reaches the ground level. However, in areas where there may be an insufficient seed bank, or where it may be desirable to augment with commercial forage mixes, care should be taken to use species and varieties that have reputed tolerance to modest shade. Seed germination and establishment will also depend on numerous factors such as: soil contact, soil moisture, seed quality, soil pH and fertility, pests, sunlight levels, temperature, and disturbances such as grazing during vulnerable stages of early growth. Scarification of the duff layer may be necessary to achieve germination.

Key Number 3 – Manage the System to Encourage the Growth of Desirable Vegetation

Silvopastures should be managed with "Management Intensive Grazing" (MIG) principles. Longer than normal rest periods may be needed to allow plants in the understory to fully recover since they are generally growing in lower sunlight levels. Woody plants are generally more sensitive to the timing, frequency and intensity (level of defoliation) of grazing than grasses and forbs, so care should be used if preserving woody plants in the understory is a goal.

Silvopastures should be developed at a rate that is synchronized with herd growth to avoid thinning a site and then having it become overgrown with undesirable vegetation due to understocking and low grazing pressure.

Living Fence Posts

Treated posts cost about $10/post and upwards of twice that amount after handling and installation costs are included. Furthermore, installation on rugged terrain and in shallow soils can prove challenging.

Low quality trees growing around the perimeter of pasture areas offer an effective, economical and environmentally-friendly alternative to pressure treated posts. The following characteristics can be used to help identify suitable living post trees:

- At least 2" in diameter (greater, if under side strain)
- Low economic value (present and future)
- Likely to live at least 10, and preferably 20+ years
- Properly positioned and spaced along desired fencing route

Wire that requires tensioning should never be fastened directly to live trees since tree growth will eventually crimp the wire at the point of attachment. To prevent this, a durable batten should first be attached to the tree with two heavy galvanized (or aluminum) nails. Use fender washers between the nail head and batten to allow batten to be pushed outward as the tree grows. Wires can then be attached to the batten, using insulators if needed for electrified fences.