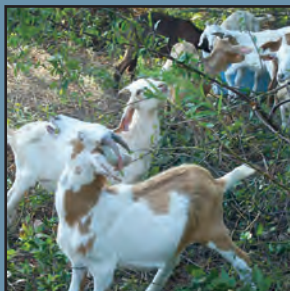


Profitable Farms and Woodlands

A Practical Guide in Agroforestry for
Landowners, Farmers and Ranchers



ALLEY CROPPING

*W.D. 'Dusty' Walter, Larry D. Godsey, Gwendolyn D.L. Boyd,
and Joshua Idassi*

Introduction

This chapter is intended to help you design and manage an agroforestry practice called alley cropping (Figure 1). Properly applied on a landscape, an alley cropping practice can enhance and diversify farm income opportunities, improve the environment and create wildlife habitat. Developing an understanding of the interactions between trees and other plants will help you achieve the goals of the alley cropping practice.



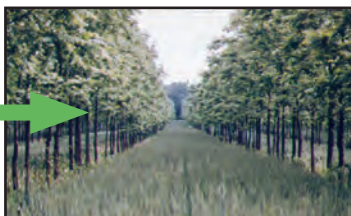
Figure 1. Alley Cropping with black walnut and corn

When trees are established in rows separated by wide spacing that allow the growing of other crops in that between-row space, you have created an alley cropping practice. Depending on the space between rows of trees, alley cropping can be designed to use plants that do well in either full sun or partial shade. It is also possible to design alley cropping to begin growing sun-loving crops and then change over to shade tolerant crops as the tree rows begin shading the alleys (Figure 2). Understanding plant interactions and competition will help you design an alley cropping practice that meets your needs. Proper planning helps you achieve success.

When properly designed and used on a farm, an alley cropping practice can benefit overall farm productivity and the number of farm products that are produced, while at the same time helping to improve the environment by reducing soil loss and improving the use of soil nutrients, such as nitrogen and phosphorus. However, for proper design it is essential to have a good understanding of the goals for your land, both short and long term, and to design the alley cropping practice based on a good understanding of the interaction between the trees, shrubs and crops that have been selected.



Figure 2. Changing from a sun-loving crop of corn, established with a six-row corn planter between tree rows on 22.5 foot centers, to a wheat crop. By age 9 this planting needs to be thinned if the owner wants to maintain row crops. The alternative is to change to a more shade tolerant crop, or to a tree product such as a nut crop.



Crops that can be produced in full sun include (Figure 3):

- Horticultural plants, such as tomatoes, corn and blackberries
- Forages, grains and oilseeds
- Tree crops, such as plums and nuts
- Seeds, such as wildflowers or select grasses
- Christmas trees
- Shrubs and other landscaping plants
- Trees for lumber and wood fiber products

Crops that can be produced at some level of shade may include:

- Herbal medicinal plants, such as ginseng, goldenseal and black cohosh

- Landscape plants like ferns, mayapples, and Jack in the pulpit
- Mushrooms such as shiitake



Figure 3. Lettuce intercropped with peaches until mid-June followed immediately by a pumpkin intercrop until October. (Ontario, Canada. Source: <http://www.omafra.gov.on.ca/english/crops/hort/news/hortmatt/2005/16hrt05.pdf>)

Advantages and Challenges of Alley Cropping
Advantages of Alley Cropping
Short-term cash flow from annual crops
‘Sun’ crops compete with weeds
Soil amendments for crops also benefit the trees
Trees reduce losses from runoff
Trees act as windbreaks for companion crops
Long-term income from tree products (wood, fruit, nuts)
Diversity of farm products
Challenges of Alley Cropping
Trees can be an obstacle during cultivating
Trees may compete with companion crops for light, moisture and/or nutrients
Companion crops may compete with trees for moisture and/or nutrients
Integrated management is often hard to do and challenging

The Basics

Design

Alley cropping is a multicropping practice – two or more types of plants growing on the same area of land at the same time – in which the trees, shrubs and/or other plants compete for light,

Equipment Needs. The alley between the tree rows should be wide enough to allow clear passage of the widest piece of equipment. This includes planning to allow space for the growth of the tree crowns. This is particularly important in nut production when early crown development is desirable. Plan alleys such that full, or multiple, passes of the equipment can be utilized. For example, if using a 13-foot wide disk, it may be desirable to have an alleyway 60 feet wide. This allows for four passes with the disk (52 feet) and a buffer of eight feet to ensure damage is not done to the tree trunk (Figure 6). The equipment you own will dictate much of the design and spacing chosen for the alley cropping practice.

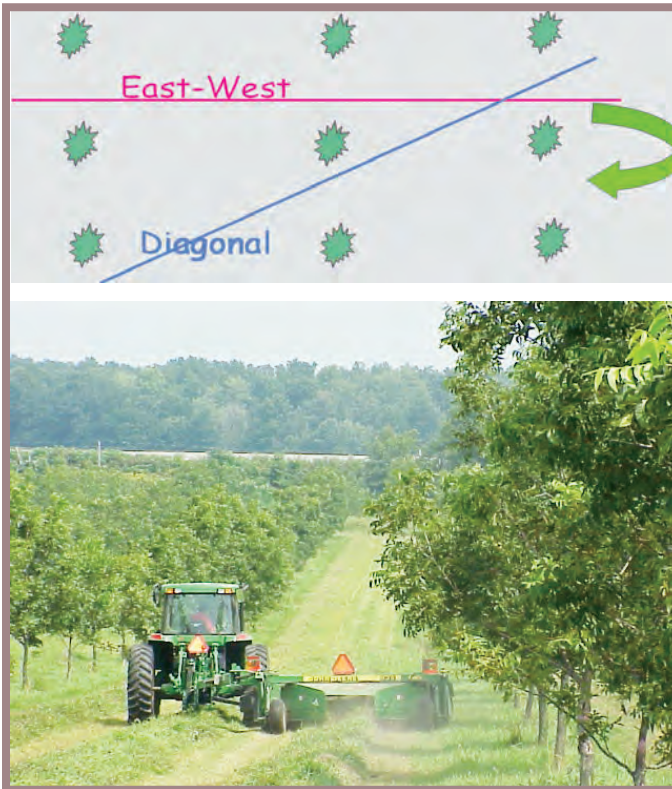


Figure 6. Plan for the type of equipment used in harvest and management. Row orientation, direction of travel, and turn radius of equipment should all factor into the layout of an alley cropping practice

Success Stories

Dan Shepherd

Shepherd Farms

Clifton Hill, Missouri

Bluegrass hay and pecan alley cropping practice; buffalo ranch and agritourism business



Dan Shepherd raises buffalo for processing into lean, high quality meats and jerky, in addition to his pecan and bluegrass hay alley cropping practice. Shepherd Farms is also a nationwide leader in production, wholesale and retail distribution of eastern gamagrass seed. "Alley cropping is ideal for achieving both our production and conservation benefits," said Shepherd. "We earn an annual income off the ground, while the trees are being established. We also enjoy an abundance of wildlife in the habitat created by alley cropping. While the crops are growing we see deer, turkey and quail utilizing this ground and the trees."

Alvin and Shirley Harris

Harris Farms

Millington, Tennessee

Growing hybrid eastern black walnuts using organic farming principles: An Interview by Dr. Frank Mrema of Tennessee State University Cooperative Extension



Introduction: Just beyond the northern suburbs of Memphis, amid fields of cotton and soybeans, forested creeks and new housing developments, lies the small family farm owned by Alvin and Shirley Harris.

Frank: Mr. Harris, when did you learn about alley cropping?

Alvin: When Dr. David Brauer, the USDA-Agricultural Research Service representative in this project, talked to me about growing eastern black walnut trees in my farm. I wanted them far enough so I could grow something in between while the trees were growing. I knew nothing about growing trees. While the trees were growing I wanted some space where I could grow watermelons, black eye peas and other short rotational

crops. I was instructed to grow the trees using 25' by 25' spacing. My interest was to space them in this format, 25' by 30' so that I have more room in between the rows to grow some other crops, while these trees are growing.

Frank: Was the space in between the rows based on the machinery you were using or the crops?

Alvin: It was based on an arbitrary figure that I picked. I wanted enough space to grow three to four rows, and thirty feet was going to give me pretty good spacing.

Frank: So how many types of crops do you normally plant in your alley cropping?

Alvin: I've grown peas, watermelon, corn, and etc. by rotating them every now and then. That's the only things I have grown in between the trees.

Frank: Are there any other species of crops apart from the ones you mentioned which you grow in the alley cropping in other areas?

Alvin: Oh yeah. I rotate the crops on the whole farm on a three to five year rotation. Everything is rotated, but I haven't grown tomatoes or anything like that in here. I have too much other space, and I don't want to take a chance on losing a crop of tomatoes in here. I know what I can do with them out there. The peas and the corn have done really well in here. The watermelons did really well.

Frank: Which species did you say have done well in the alley cropping system?

Alvin: Field peas... all types of field peas, cream peas, purple hull... all types of field peas did well in here. The corn did well the year we planted corn in the site. Also, the watermelons did really well. So I have no complaints about their performance in the field. Very good results.

Frank: Did somebody come and tell you to practice this or was it your own initiative?

Alvin: It was mine. Nobody told me anything. But I've been rotating crops for years. A lot of what I do I learned overseas traveling around the world seeing how they did things.

Frank: So you traveled overseas. That's where you learned about this practice?

Alvin : Well I saw more of it over in Europe and Asia than I did any place in the U.S.

Frank: Organic farming is a costly practice, and may be very expensive to other farmers. How do you manage and account for the cost you inject on the alley cropping?

Alvin: I don't get the production off the whole field because the space where the trees are, I'm losing that space. But I don't do intensive farming anyway. Everything I do is organic. These trees are grown organically. There are no chemicals out here on the farm anywhere. I have been doing this for 30 something years and it's going to stay that way.

The forage and the blueberries we have up there, are all organic. In the last 30 years I haven't used any chemical fertilizers or petroleum based fertilizers on the farm. So I did organic farming when they told me it couldn't be done, and I'm going to continue doing it. I've made money so I'm not complaining. So everything out here on this farm is organic, everything!

Frank: Is there any other reason you decided to grow organic crops instead of others?

Alvin: Yes. I was in the military. I was trained in chemical warfare, and I know chemicals and their affect on plants and the environment in general. That was the basic reason. And I know if you put it in the soil the plants will absorb it and then we will eat it in the form of foods. I also refused to feed it to my children and to the general public.

Frank: Will you advise other farmers to practice alley cropping system?

Alvin: Alley cropping. .. Yes... As far as the trees, if they are not going to do it for nuts even if they put in trees for timber, while the trees are small they need to grow something between them—make some money somewhere because if I was growing these for timber, what are we talking about? Forty years. Forty years with no income would be real trouble for a person that needs money. But if they space them so they can grow something between them, even for 10 years, you've got 10 years of income from the land. Whereas right now even with the nuts I haven't lost that much on the farm yet. I am making money in this field every year. Not from the trees yet, but from growing produce in between them. I still make money. Really I haven't lost anything, I don't think, in this field, and I think this is the fifth or sixth year.

FOREST FARMING

Deborah B. Hill and Rao Mentreddy

Introduction

Sales of medicinal plants are now worth \$60 billion worldwide, and over \$12 billion in the United States. For example, a grower of goldenseal in Georgia can earn \$6,500 per acre each year. A well-managed hive of bees can gross \$300 per year for all bee products, and remember their value in pollinating crops. In an 800-log shiitake business, a grower can earn about \$6,000 per year (see Success Stories). Returns from timber can take 50 to 80 years. In the past, forests in the South have been managed badly or not at all. Their quality can be improved by “weeding,” which foresters call timber stand improvement (TSI). Economic returns on weeding can take many years. A guaranteed way of making cash flow faster is by farming the forest. Forest farming is managing the forest to produce things called non-timber forest products (NTFP) that can be sold on a yearly or short-term basis. Non-timber forest products are a variety of “crops” that can be produced in a forest. These include, but are not limited to:

bee products	fuelwood	maple syrup	fence posts
medicinal plants	crafts	fruits & nuts	mushrooms

These forest farming options need attention in different seasons. Bee products, fruits and nuts, mushrooms, and medicinal plants are usually managed during warmer months. Maple syrup is collected and processed in mid to late winter. Firewood, fence posts and craft materials can be collected year round. Management of these options may compete with time, money and energy needed by other farm crops. However, developing several of these options will improve the quality of the remaining timber on the forested land and at the same time provide annual or short-term extra income for the farm or forest.

Many of these forest farming options need equipment, skills and knowledge, which can be very different, depending on what

you choose to do. For example, maple syrup production needs expensive equipment to begin, but once you have the equipment, those costs are usually not repeated. However, maple syrup is a high value product with a long shelf life and can be marketed year round. On the other hand, firewood, fence posts and craft materials may only need basic tools, knowledge and time to create a product. They can be collected, created and marketed at any time of year, although firewood would probably sell more rapidly and in greater amounts in the winter months.

The economics of developing non-timber forest products in a forest farming system can be very different. Options like maple syrup will probably need an investment of several hundred dollars to get all the necessary equipment. On the other hand, options like crafts materials and native fruits and nuts may not require any out-of-pocket costs other than containers to sell the products in. Products like maple syrup, some medicinal plants, mushrooms and honey are high-value products and will bring a quick return on investment, while crafts, jams and jellies may make money in volume rather than in per unit value.

A variety of options and references are outlined in this chapter to help you look at forest farming further. Depending on what resources you have in your woodlots, you could choose to do one, several, or all of them. Many have specific times of year when you need to work on them. Maple syrup production is usually a four to six week period in late winter/early spring, and then you are done for the season. Crafts can be worked on all year. Choose things that interest you and that you know you will be able to market locally or on the Internet.

Beekeeping

Introduction

Raising honey bees in hives can produce honey, beeswax, pollen, propolis (beehive glue) and royal jelly. These products can be harvested every year (honey possibly can be harvested more than once a year) and are valuable. From these basic products, several other value-added products can be developed for more income.

Success Stories

Jim Day

Nashville, Tennessee



Jim Day built a hoop house to grow mushrooms year-round.

Jim Day wanted to grow shiitake (*Lentinula edodes*) mushrooms. This gourmet mushroom, originally from Japan, has become a mainstream mushroom in the United States over the past 30 years, and gets a good price in the marketplace. Starting in 2000, Jim inoculated a few logs, grew really nice mushrooms and established a marketing relationship with some restaurants in the Nashville, Tennessee area over the next year and a half. After his early success, in 2003, Jim expanded his operation from a spring-to-fall mushroom production to a year-round production. He also established his home place (about 5 wooded acres with his house in a suburban development north of Nashville) as Timbertop Farm (www.timbertopfarm.com). In order to grow the mushrooms year-round, Jim built a hoop house, 10' by 20' with its long axis oriented east-west. It's insulated on the north side and top, but has a non-insulated opening on the south side so that the winter sun can come in and help warm the inside of the building by passive solar heating.

Jim wanted to work with white oak (*Quercus alba*) logs but was having problems with competing fungi on the bark of his logs.

This is not a good thing in a shiitake production operation, since it is really important to keep the tree bark on the logs while the mushrooms are incubating and producing. In 2006, he submitted (and received) a grant proposal to SARE to test different management techniques to see if he could solve this problem. From that research work, Jim learned the importance of paying close attention to the logs at all stages of development, keeping good records and an activity log, and monitoring labor hours and expenses to help determine the fair market value of your product. Jim also advises to start small and grow as you gain confidence, don't be afraid to make mistakes, and diversify.

Jim's logs are mostly four to six inches in diameter and about three feet long. As a result of his research experience, Jim thinks that less is more, so he makes very few holes in his logs. When he first started, working alone, he inoculated logs with a series of two to three diagonal chainsaw kerfs, packed them with sawdust spawn and



waxed them just the way you would with dowel or sawdust plug spawn. Today, with the information he got from his research grant, and from many trial and error processes, Jim has expanded his operation and now has 1,000 to 2,000 logs in production, which have been producing about 1,300 pounds of mushrooms in a March to December growing season.

Since one of his best ideas was to diversify, in 2007 he built another, larger hoop house where he now grows gourmet greens, squashes (for the flowers), peppers and some oyster mushrooms, and is beginning to expand to outside production of other crops. He has an online order and delivery service and has turned his little "farm" into an economic success.

Randy and Cindi Beavers

OrganiPharm

Dalton, Georgia

On their 40-acre family farm, Beavers and his wife Cindi own OrganiPharm and grow *Hydrastis canadensis* or goldenseal, a plant valued for its antimicrobial properties. From goldenseal, they manufacture liquid dietary supplements. Goldenseal is on the endangered species list due to overharvesting in the wild. Beavers developed a domesticated form of the plant that small farmers and landowners can grow. They have 23 growers in the Southeast and are a 100-percent, grower-owned company.

In 1993, Randy and Cindi Beavers saw that they would one day be faced with the choice of either selling her grandfather's farm or moving there and trying to make a living. The couple spent three years learning about different crops. In 1996 they decided to build on their long time interest in native medicinal plants and try to grow several plant types organically, especially those considered endangered or threatened such as goldenseal (*Hydrastis canadensis*).

In the beginning, they did have another source of income. Although they could recognize certain medicinal plants where they grew naturally in the forest, Randy and Cindi had no farming experience. Starting out was even harder because there was very little information available on how to grow and market these plants profitably. After some "trial and error" in their first five years, they came to two important conclusions:

1. The small, independent grower is faced with an extremely limited market and therefore faces a very high degree of risk when trying to produce medicinal plants successfully. Producing these plants as a group of growers instead of alone allows the possibility of a wider distribution as well as the sharing of production techniques.
2. Producing science-based, value-added products from native medicinal plants as a group or cooperative offered the greatest economic return for all the growers.

Using these ideas, Randy applied for grants and awards from the US Department of Agriculture's Small Business Innovation Research Program (SBIR). Randy formed OrganiPharm, LLC

(OP) in 2007. OrganiPharm is a botanical product company that specializes in forest-grown medicinal plants. The company grows the raw material and processes it into various skin care products. OP currently has 12 member farms plus 11 additional participating growers located in Georgia, Alabama, Tennessee, and North Carolina. Over the past four years the group has developed about 10 acres of forest-cultivated goldenseal along with other medicinal plants such as ginseng, black cohosh, purple coneflower (*Echinacea*), and both elderberry flowers and fruit.

OrganiPharm increases grower/owner profits by producing a line of certified organic herbal extracts (USDA National Organic Program). The quality and reliability of their products have been recognized by the National Institutes of Health (NIH) through a new SBIR award to develop a series of goldenseal products to be used in NIH-funded clinical studies.

Medicinal plant production is a type of “forest farming” which holds much economic promise for the future. Randy believes that the current trends of a) increased consumer awareness of where the products they buy come from, b) tighter regulations about product purity, and c) environmental concerns, will come together to make medicinal plant production a practical crop choice for an increasing number of family farms. However, growers must be careful when choosing the medicinal plant crop to grow, and should work with other growers of the same crops in order to maximize their marketing ability and share production and marketing information.

The information from the Beavers’ project was used to develop potential on-farm forest sites to match natural sites as closely as possible. They suggest the following preparation and planting procedures:

- Clear six to eight foot wide alleys between the larger trees of scrub and undergrowth using a small backhoe.
- Till four foot wide beds within the alleys.
- Adjust soil pH to natural conditions (pH 6.0 - 6.5) with dolomitic lime.
- Use goldenseal root pieces (rhizomes) as planting stock and divide into small pieces, each with a bud and at least one root.

(Based on their research, the rhizome is expected to double in size every two years, resulting in a harvest size of 18 to 20 grams after four years.)

- Plant the goldenseal rhizomes on a 6 x 6 inch spacing pattern - 400 plants per 100 square feet. Because of tree locations, hills and slopes, and the need to keep enough space to work around the goldenseal beds, about 25% or 10,000 square feet of bed space is usable per acre, providing room for roughly 40,000 plants per acre.

A summary of the production and yield assumptions underlying the 5-year financial projections for the project are presented in the tables below.

Table 1: Production Assumptions and Estimates

Planting stock cost: \$5,000 per acre
Labor: 120 man hours per acre for clearing, tilling, planting, mulching (labor supplied by family)
Plants per acre: 40,000 (harvest weight = 18 grams each)
Alkaloid content: Sleepy Hollow Farms' average = 7.159%
\$10 for each 1% alkaloids/pound farm price for goldenseal (i.e., 3% alkaloid = \$30/lb.)
1/3 of the harvest replanted
Drying recovery factor: .32

Table 2: Yield Assumptions

Estimated Yield and Return per ¼ Acre	
Yield per ¼ acre	400 lbs (10,000 plants per ¼ acre)
Yield allocation	133 lbs replanted, 277 lbs net fresh harvest, 89 lbs net dry harvest
Return per ¼ acre	\$6,372 (89 lbs dry harvest x \$71.59/lb)

Table 3 indicates an annual net income potential of \$5,600 per acre for a small farmer with 1 acre of forestland suitable for goldenseal production and planted according to the following totally sustainable production system:

- The farmer would plant 1/4 acre of goldenseal per year for 4 years.
- In the 5th year the farmer would harvest the goldenseal planted in the 1st year.
- About 1/3 of that harvest would be replanted and harvested in another 4 years.
- No income is received in years 1 through 4. In year 5 (the first harvest year), the farmer recovers 85% of the out-of-pocket expenses incurred in years 1 through 4.
- The price per pound received by OrganiPharm growers is roughly 3 times the bulk market price.
- Costs of production are based on actual information produced through the SBIR awards.
- The system is sustainable, with the planting stock cost of the first four years becoming a capital investment which doesn't have to be repeated.
- This system gives individuals thinking about starting a forest farming project an opportunity to develop a reliable income stream on a part-time basis before going full time.
- It also allows existing farmers to diversify their operations without taking away from acreage used for other crops.

Table 3: Net Profit or Loss from One Complete 8-year Goldenseal Production Cycle

Item	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Planting Stock & Seed	\$1,250	\$1,250	\$1,250	\$1,250	\$0	\$0	\$0	\$0
Tractor & Equipment Cost	\$250	\$250	\$250	\$250	\$125	\$125	\$125	\$125
Soil Amendments	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100
Property Taxes	\$50	\$50	\$50	\$50	\$50	\$50	\$50	\$50
Organic Certification					\$500	\$500	\$500	\$500
Out of Pocket Expense	\$1,650	\$1,650	\$1,650	\$1,650	\$775	\$775	\$775	\$775
Income	0	0	0	0	\$6,372	\$6,372	\$6,372	\$6,372
Profit or (Loss)	(\$1,650)	(\$1,650)	(\$1,650)	(\$1,650)	\$5,597	\$5,597	\$5,597	\$5,597

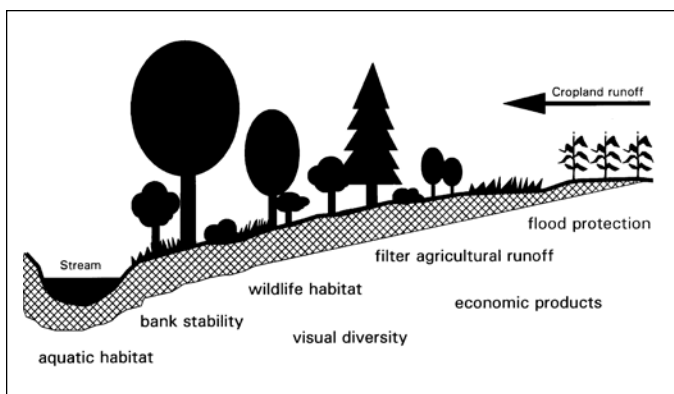
RIPARIAN BUFFER STRIPS

Colmore S. Christian, Rory Fraser and Joshua Idassi

Introduction

Riparian or streamside forests can improve your farm income by saving money or earning income. When planted correctly, they can protect water quality, stop erosion of stream banks, improve food and cover for wildlife, improve habitat for fish and other water creatures, and improve opportunities to make farm income through products harvested from the buffer. Lon Strum in Story County, Iowa, for example, says he has saved \$10,000 since putting in a riparian buffer. Before he did, his tractor would occasionally get stuck on the banks of the creek. Now, he no longer loses his crops from flooding and enjoys the benefits of a healthy stream and improved wildlife habitat. Buffer strips and riparian zones around streams improve and maintain the overall integrity of the waterway and improve aesthetics.





Many designs for a riparian buffer strip include three zones of vegetation, each planted parallel to the stream.

The combination of trees, shrubs, and grasses in a riparian buffer helps protect the stream and creates a better system than just planting a single type of tree. In addition, trees and shrubs provide well developed root systems and nutrient storage close to the stream. Landowner Strum says, “I don’t think we’ve lost hardly any stream bank since (the big floods of) 1993, but before, we were moving fences almost every year.”

One of the biggest benefits of a riparian buffer is making good wildlife habitat. Native grasses and forbs provide different heights, densities, shapes of stems and leaves, different flowering times, and different flowers and fruits to attract several different species of wildlife. Strum says his riparian buffer “is the hunting paradise of Story County right here, especially for pheasant hunting. People have come from Alaska, Michigan, and all over Iowa. The demand is very large.”

The Basics

A typical riparian forest buffer usually has three primary management zones:

Zone I. A 30-foot area closest to the stream that is mostly trees that can withstand periods of flooding. The main effect of Zone 1 is to stabilize the bank and provide woody “trash” for the stream habitat.

Zone II. A narrower (12 to 15 feet) area inland from Zone I with fast growing native shrubs that can withstand some flooding. Their primary water quality purpose is to take up and store nutrients. Woody stems also slow floodwater. This zone can be managed for additional income from nuts, berries or woody floral products.

Zone III. A wider (15 to 25 feet) area between crop fields or grazing lands and the shrub zone of the buffer strip that filters and absorbs nutrients and chemicals from the fields, keeping them from polluting the stream. Native grasses, forbs, sedges, reeds, and wildflowers are good for their multiple benefits and ability to withstand changing conditions, but dense, stiff-stemmed introduced grasses can also be effective.

Design

The first step in creating a buffer is developing a design that will work. You are strongly encouraged to make a sketch of the buffer on an aerial photo of the property and identify major problem areas, such as severe bank erosion, gullies, drainage tiles, and so forth. List the cash crops to be considered and make sure those trees, shrubs, and grasses grow in your plant zone (contact your local NRCS office for help with this).

If the stream banks are badly damaged, you may need to mend them with either plant or rock systems, or a combination of the two. To get professional help with this restoration contact your local Cooperative Extension Office, state forestry agency, USDA Service Center, or Conservation District.

The design should also address special problem areas, and should address three different locations:

In the Stream. What is the present condition of the streambed and the stream banks? You may want to consider the channel bed material, and whether or not the stream is downcutting. Look at points of erosion on the stream bank, such as slipping or bank undercutting. These areas may need to have their bank reggraded with equipment, and then properly stabilized to slow or stop future bank erosion. Fish habitats may be a consideration in designing changes to the streambed.

Table 1. Typical riparian forest buffer species for the Southeast

Common name	(Scientific name)
Trees	
ash, green	(<i>Fraxinus pennsylvanica</i>)*
ash, white	(<i>Fraxinus americana</i>) *
baldcypress	(<i>Taxodium distichum</i>)
birch, river	(<i>Betula nigra</i>)
cottonwood	(<i>Populus deltoides</i>)
hackberry	(<i>Celtis occidentalis</i>)
hickory, shellbark	(<i>Carya laciniosa</i>)
maple, boxelder	(<i>Acer negundo</i>)
maple, silver	(<i>Acer saccharinum</i>)
maple, red	(<i>Acer rubrum</i>)
oak, bur	(<i>Quercus macrocarpa</i>)
oak, pin	(<i>Quercus palustris</i>)
oak, Nuttall	(<i>Quercus nuttallii</i>)
oak, willow	(<i>Quercus phellos</i>)
oak, laurel	(<i>Quercus laurifolia</i>)
oak, overcup	(<i>Quercus lyrata</i>)
oak, swamp white	(<i>Quercus bicolor</i>)
oak, cherrybark	(<i>Quercus pagoda</i>)
oak, shumard	(<i>Quercus shumardii</i>)
native pecan	(<i>Carya illinoensis</i>)
persimmon	(<i>Diospyros virginiana</i>)
sugarberry	(<i>Celtis laevigata</i>)
sycamore	(<i>Platanus occidentalis</i>)
walnut, black	(<i>Juglans nigra</i>)
Shrubs	
alder, hazel	(<i>Alnus serrulata</i>)
buttonbush	(<i>Cephalanthus occidentalis</i>)
cane, giant	(<i>Arundinaria gigantea</i>)
dogwood, silky	(<i>Comus amomum</i>)
dogwood, rough leaf	(<i>Comus drummondii</i>)
hawthorn, green	(<i>Crataegus viridis</i>)
holly, deciduous	(<i>Ilex opaca</i>)
privet, swamp	(<i>Forestiera acuminata</i>)
Eastern wahoo	(<i>Euonymus atropurpureus</i>)
willow, black	(<i>Salix nigra</i>)
willow, coastal plain	(<i>Salix caroliniana</i>)

* Use these species with caution due to potential emerald green ash borer concerns.

Success Story

Frances and Will Powers

Oconee County, Georgia

For three generations, the Breedlove family in Oconee County raised their children on the family homestead. Ann (Breedlove) Powers wanted to do the same thing. Rising property taxes, increasing pressure to sell to developers in this highly lucrative market, and the cost of maintaining the farm was making hanging onto the land more and more difficult.

That's when the Powers family heard about something called the Farm and Rangelands Protection Program (FRPP) and made a visit to the United States Department of Agriculture Service Center in Watkinsville.

The first step was to develop a conservation plan for the farm with the help of USDA-Natural Resources Conservation Service (NRCS). NRCS provides the technical expertise on the land that helps determine the best use of all their resources in a way that conserves the natural resources for future generations. To participate in the federal conservation programs, you must have a conservation plan.

Cost-share programs from USDA's Farm Services Agency, NRCS, the Georgia Forestry Commission and others helped provide the funds to implement the farm renovation. Large riparian buffers were established and alternate water sources for livestock were constructed to help keep water clean and safe. Trees were planted to provide habitat for wildlife. Nutrient and pest management assistance is provided on an ongoing basis.

Now the heart of the farm, the home place, has been preserved through the joint efforts of the Athens Land Trust, Oconee County, the Georgia Greenspace Program, NRCS, the Oconee County Partnership for Farmland Protection and, of course the Powers themselves.

The development rights for 60 acres have been purchased using funds from Oconee County's GA Greenspace grant and

SILVOPASTURE

O. U. Onokpise and J. Hamilton

Introduction

A silvopasture system integrates trees, forages, livestock and related animals and plant species. This practice can occur under planted pines, fruit and nut orchards, and/or other types of woodland, depending on the objectives and circumstances of the landowner. Silvopasture systems are managed to produce high-value timber products and possibly fruit crops in the long term while obtaining short-term economic benefit from the livestock and forage components. In the southeastern United States, livestock may be large ruminants such as bison and cattle, small ruminants, such as goats and sheep, or even domestic geese sometimes used in fruit tree orchards.

Establishing a silvopasture system requires many economic and management considerations to ensure its success in the long run. Landowners have shown impressive revenue benefits from their silvopasture practices. For example, George Owens in Florida realized more than a 10% increase in annual revenue by combining beef cattle with pine trees on his land. Allen Edwards, highlighted in the USDA National Agroforestry Center publication *Inside Agroforestry*, showed that a traditional tree farm focused on sawlog production may net \$150 per acre per year, while an integrated enterprise (of trees and sheep and/or goats) may yield up to \$500 per acre per year. In woodlands, other than pine plantations, which have problems with invasive woody shrubs, managed browsing by goats and other small ruminants can be effective. This will also reduce fuel loads and lower fire risks from wildfires. These sites can then be developed into permanent silvopasture systems. The end result will be a more sustainable land use. It should be noted that other animals, such as geese, when used as weeders in fruit and nut tree orchards assist in the management of insect pests.

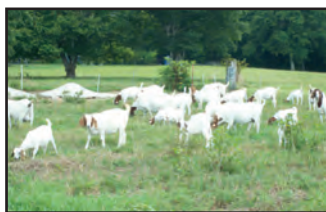
Various options for silvopasture systems exist for landowners, for example:

- Wood and pasture for hay and silage
- Wood and grazing livestock (cattle, bison, sheep, llamas)
- Wood and browsing livestock (goats)
- Fruits and nuts with weeder birds (geese, ducks, turkeys)
- Christmas trees and sheep

Agencies such as the USDA-Natural Resources Conservation Service (NRCS) and the USDA-Forest Service (FS) assist with the establishment and management of silvopasture by providing specialized funding and technical assistance. Procedures and methods for designing and managing silvopasture systems are given in the next section.



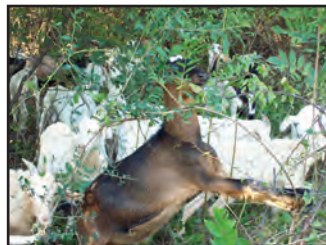
Goats grazing on a thinned hardwood stand. *Courtesy O.U. Onokpise and A. McKenzie-Jakes (Florida A&M University)*



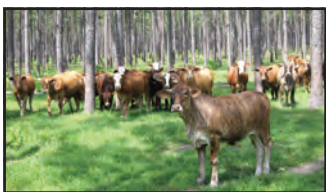
Fenced paddocks for rotational grazing goats. *Courtesy Uma Karki (Tuskegee University)*



Goats browsing underbrush in woodland. *Courtesy Uma Karki (Tuskegee University)*



Goats pulling down a vine from a tree in woodland. *Courtesy Uma Karki (Tuskegee University)*



Cattle grazing in a mature pine silvopasture system. Enough light reaches the ground floor to promote forage growth, yet the shade reduces heat stress and allows cattle to retain better weight. *Courtesy Jim Hamilton (NC Cooperative Extension)*



A beautiful silvopasture with slash pine and mixed forage. *Courtesy Jim Hamilton (NC Cooperative Extension)*

Advantages of Silvopasture	
Livestock creates short-term cash flow not available with traditional forestry	
Shade from trees protects animals and improves their health	
Shade improves growth of forages	
Makes property more beautiful and adds additional habitat	
Improves nutrient cycling	
Adds to on-going pasture operations	
Nitrogen fixing forage crops also benefit trees and vice-versa	
Reduces erosion on grazing land	
Disadvantages of Silvopasture	
Using equipment may be more difficult	
Intensive grazing management is required	
Fencing cost will increase as more paddocks are formed	
Animals may be exposed to fruits/seeds or toxins from certain shrubs or trees	
The three parts of the system require skilled labor for management	
In the beginning, finding markets for additional products can be challenging	
Livestock can harm trees and shrubs if not protected properly	
Source: Center for Agroforestry, University of Missouri, Missouri Training Manual for Applied Agroforestry Practices	

Success Story

The Legacy Continues

By Angela McKenzie-Jakes

Extension Animals Science Specialist

Research and Cooperative Extension Programs

Florida A&M University

The land grant universities and their Cooperative Extension programs throughout the Southeast provide educational programming, events and activities to small-scale farmers/producers on alternative land use enterprises. These include programs on livestock enterprises such as beef cattle, meat goat, pastured poultry, and small-scale swine production and marketing, as well as timber and non-timber land use alternatives such as forest farming and silvopasture. The three ladies featured in this article are from Florida. With assistance from their land grant university, they converted their traditional family farm into a meat goat enterprise. They implemented a silvopasture system that integrates meat goats into their managed pine woodlands. Here is their story:



Eunice Cornelius, Norma Tillman and
Willonese Adams

“My father was born in Jasper, Florida on my grandparent’s farm in 1919,” explains Eunice Cornelius. “At six years old, his father died leaving behind his mother and four children to farm the land. When his brother and sisters grew older, they moved away and my father and my grandmother stayed in Jasper and continued to farm. In the early years, they grew peanuts, tobacco, soybeans and they raised fowl, cattle and hogs. Eventually, my father began buying his own property. In 1948, he built a grocery store and he sold watermelons, corn and peas

that he grew on his farm. He also sold other traditional items in his store. As far as I know, he was the first black man in Jasper, Florida to own a grocery store.”

She continues, “In the early 90s, he became a member of the local Cattleman’s Association in Hamilton County and he donated some space on his land for the association to put a billboard which could be seen northbound on I-75. The billboard read, ‘Home of Alberta and Charlie Cross’ and below on the billboard was written ‘sponsored by the Cattleman’s Association.’ Shortly after my father passed, I started attending classes on goat production and management at Florida A&M University (FAMU) to become a better manager of my goat herd. When my mother became ill, I couldn’t go as often so, I asked two of my dearest friends, sisters Norma Tillman and Willonese Adams, to attend some of the training activities and bring the information back to me.”

“When I retired,” Norma explains, “I was looking for a way to pay the taxes on our land. We weren’t making any money from the land and the taxes were very high. I thought if we did something on the land we could at least get an agriculture exemption.” Her sister Willonese adds, “Our goal was also to keep the land in the family because it’s tied to our heritage. We had a lot of wonderful memories of what our grandfather did on the land. He grew tobacco, peas, corn, tomatoes, okra and beans on his land, and he loved gardening.”

Norma continues, “When I started accompanying Eunice to the workshops, I slowly became interested in raising goats on our farm.” Willonese laughs, “I thought that was the craziest thing I had ever heard. However, I became involved with raising goats because I could see Norma needed help. It’s really a lot of work for one person to manage a goat herd by themselves. Some things I am better at than Norma such as record keeping, but Norma is an excellent herdsman.”

When asked what was the key to their success, they all agreed that attending educational and training activities has helped them tremendously. “We don’t know everything because new things are happening with our goats that didn’t occur the year before,” says Norma. “I was the first child in our family to go

to college,” Willonese continues. “I went to Talladega College and majored in biology.” Norma adds, “I earned a degree in social science at Florida Memorial. Therefore, we know the value of a good education and that knowledge is power. Besides, as teachers we had to keep our certificates updated, so why not keep up with the changes in the goat industry? As certified Master Goat Producers, we really feel more confident in managing our goat herds and more confident in standing by the prices we ask for our animals. If we can get more producers on the same page, we feel we all can get a fairer price for our animals.”

When asked whether they were sharing the information they received with other producers in the community, Willonese responded, “Many of the farmers we know, especially minority farmers, are not aware of the different programs that are available to them. So, we are establishing a black farmer’s association in Hamilton County to keep minority farmers informed about the educational opportunities and services available to them.”

At the feed store in Lake City, Florida the employees often recommend to other goat producers, products that Norma buys for her goats. If someone calls the store about a question concerning goats they are referred to Norma.

Willonese was recently appointed to serve on the Southern Region Risk Management Education Center Advisory Council and also serves on the SARE Advisory Board for Florida which means she will have more insight on other programs available to small and limited resource farmers. Norma is also on the SARE Advisory Board for Florida, the Florida Small Farm Expo Planning Committee with the University of Florida and she continues to present the poisonous plants segment of the Master Goat Producer’s Certification Program at FAMU to other producers.

When asked about their future goals, Eunice stated that her goal is to open a bed and breakfast on her farm where guests will have an opportunity to pet and feed the goats and pick various fruits and vegetables from her garden. “We want to incorporate value-added products in our business to enhance

our profit margin,” Willonese continued. “My son-in-law is also a certified Master Goat Producer and my daughter, granddaughter and niece are helping with our goat business, so the legacy will continue.”

For more information about the Master Goat Producer’s Certification Program at FAMU, contact Angela McKenzie-Jakes (Program Coordinator) at (850) 875-8557 or [angela.mckenziejakes@famu.edu](mailto:mckenziejakes@famu.edu). And visit their websites at <http://www.famu.edu/goats> and <http://www.famu.edu/herds>. Reprinted with permission of Cierra Publishing Company, Minority Landowner Magazine, Victor L. Harris, publisher and editor.

WINDBREAKS

Sarah Workman

Introduction

When designed and planted correctly on a farm, a windbreak can improve farm income opportunities and the environment, define property lines and create wildlife habitat. By looking at how the windbreak (trees and shrubs) relates to the neighboring fields or buildings, you can think how its layout can meet your production or protection needs.

Wind causes erosion, transports dust, and carries spray drift and other pollutants. Wind also slows plant growth and can damage plants and buildings. Windbreaks can protect soil from erosion, create shelter for livestock and help reduce the loss of irrigation water. A good windbreak can serve as a sound barrier to decrease traffic noise and help reduce odors from animal barns and sheds. They often screen ugly views as well as help reduce the spread of dust.

Production of many fruit and vegetable crops improve with protection from wind and from early or late season frost. For example, these protections can improve flower and fruit quality of peppers, tomatoes, melons, and strawberries or the stem form of cut-flowers. Protecting livestock from too much heat and cold lowers animal stress and increases their weight gain or milk production. Windbreaks can help save energy in the home and on-farm by keeping cold wind away from buildings in winter months.

A windbreak is a continuous, but not solid, barrier of trees and shrubs. The height of the plants controls how far wind protection is effective on the downwind side, and the tree spacing (density or thickness) determines the level of protection. The general rule is a windbreak will reduce wind to a distance 10 times the height (H) of the trees and reduce wind speed 70%

to 80% immediately inside the barrier. Windbreaks also reduce wind speed for 2 to 5 times the height of the windbreak (2H to 5H) on the upwind side.



Though it may take awhile to establish a good windbreak, you will find the benefits outweigh the cost.

The Basics

A major key to a successful windbreak is recognizing what you want it to do on your land. The next step is to understand how a successful windbreak works and what makes a good design. The final step is planting the kinds of trees and shrubs in the windbreak that will make it work for you. Also, a relatively low value fencerow that you already have, with some imagination, common sense, and effort can be converted into a valuable windbreak investment. There is a lot of online information on windbreaks available through the Internet (see the Resources section at end of this document).

Design

Windbreak design depends on the goals and uses you have in mind. In planning, think about your land, what you want to do, and the wind related problems: What do I want from this planting? What needs to be protected: crops/orchards; livestock; roads or fields/soil; buildings; privacy? This careful look at your land and your goals brings up questions such as:

- *Which direction(s) does wind cause the most problem(s)?*
- *When do your livestock or crops need the most wind protection?*

- *Are there concerns about summer air movement in the livestock area or planting zone?*
- *Are you interested in choosing tree and shrub types and a design that will add beauty, or attract songbirds or wildlife to your yard?*

Pay attention to practical things, too, such as not blocking the

Elements that make Windbreaks Work

Height Density
Length Location
Width
Cross-sectional shape

winter sun or scenic views, or being able to see oncoming traffic near driveways. Make sure you have enough room to use your mowing equipment around the whole windbreak and between the rows inside the windbreak. The main thing to remember is that once you plant trees and shrubs,

they will be there for a long time. Choose the site carefully for planting the windbreak, hedgerow or shelterbelt. Space trees so that there are no gaps big enough to funnel wind, but the trees and shrubs are dense enough to break the force of the wind. Ask for assistance when making decisions about the technical parts of installing the practice, like how many rows to plant, how to space the trees, and if the types of trees and shrubs you want to grow will grow well on the planting site. How bushy the trees/shrubs are, how closely they are planted and how they are arranged between rows will affect the success of the windbreak. By combining low shrubs with medium and tall trees, you can create a windbreak that is effective for its entire height. Mixing rows of evergreen trees with trees that drop their leaves helps the windbreak work better all year long. A windbreak needs a density ranging from 60% to 80% to be most successful. All tree rows, single or multiple, work best when placed at right angles to the problem wind direction. A field windbreak has one to three tree rows. A homestead windbreak should have at least three rows with 10 to 15 feet between rows and different spacing within each row. Tree spacing within a row depends on the kinds of plants used. Be sure to protect and weed around planted seedlings for the first 2 to 3 years.

Conservation tree and shrub groups have selected trees and shrubs that are likely to be successful on different kinds of soils

and climates, and they also predict height growth of those plant species at 20 years. These guides are available from your USDA Service Center and found online in the state NRCS Technical Field Office Guides.

Management

Remove weeds from the planting sites. Regular maintenance of weeds and checking regularly for any insect or disease problems will help your windbreak continue to do its work for many years. Because gaps in windbreaks will create big problems it is very important to keep livestock out of the windbreak. Keep new plantings watered at least through the first growing season and replant where seedlings have died or been eaten. Because the usefulness of a windbreak depends on complete rows of trees/shrubs, check for and replace dead seedlings for at least three years. Mulch around trees at planting and continue as needed for at least the first five years.

Economic Considerations

Placing windbreaks around homesteads and farm buildings can help cut heating bills by as much as 30%. Correct placement of windbreaks can shade air conditioning compressors. Windbreaks reduce wind chill effects for less stressful and safer outdoor work and feeding areas. Marketable fruits or nuts can also be harvested from windbreaks and sold locally, either

Advantages of Windbreaks

- Protect structures (homes, buildings, roads)
- Capture water runoff and nutrients
- Improve irrigation efficiency
- Visual screen
- Filter and reduce dust
- Help control odors
- Provide wildlife travel corridors and habitat
- Decrease noise
- Improve attractiveness
- Improve yields
- Protect soil from wind erosion
- Shelter livestock and crops

from UMCA