FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE

Inside Agroforestry

Rocky Mountain Research Station, Agroforestry Center

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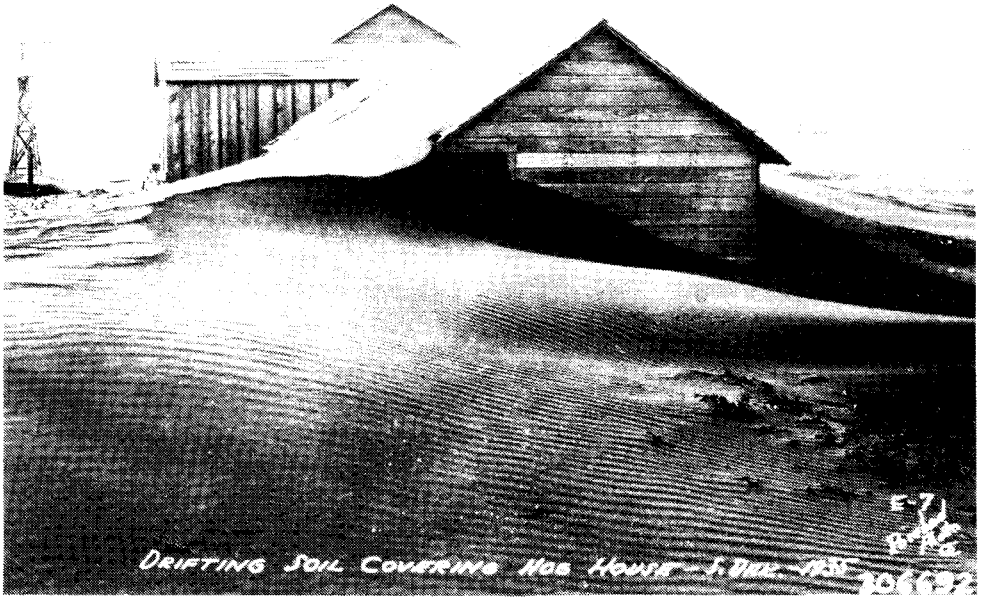

Drifting soil covers a South Dakota hog house prior to the Prairie States Forestry Project initiated in 1935 by the USDA Forest Service.

Learning From the Future

In 1880 Kansans were told, "Those settlers who planted shelterbelts and groves are fixtures on their land, while those who never planted trees have pulled up stakes and gone elsewhere."[1]

In 1936, after the Forest Service initiated its first tree planting program, Earl W. Tinker, then Assistant Chief of the Forest Service, reported, "many thousands of the young trees planted during the 1935 season are now six feet high and are already bringing about a lessening of wind movement within their protective range...Height growths up to 16 feet have been noticed in some instances. I saw fields of cantaloupes and watermelons growing in what were formerly dust fields, protected by rows of the newly planted trees."[1]

Did we stumble on something in 1880? How about 55 years later in 1935? Here it is 1995, have we caught on yet? We're finally beginning to. Are trees an important part of an agricultural system? You bet!

A favorite saying of Fred Deneke, Assistant Director of Cooperative Forestry, State and Private Forestry, USDA Forest Service in Washington, DC, is "You can't do things differently until you *see* things differently." And, that's exactly what he encouraged participants of the first *Agroforestry and Sustainable Systems* Symposium held in Fort Collins, Colorado in August, 1994 to do. As the wrap-up speaker he asked the delegates to put themselves in the year 2025 and fly over where they live and work today. He asked them to imagine what would be happening in terms of sustainability and what they and their agencies would be doing. Then he asked them to identify the steps that took place to

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The Year is 2025

Warning: This article contains exaggerated accounts of what our world could be like!

Picture yourself living in the year 2025. The world population has reached 8.5 billion. Natural resources are faced with tremendous pressure to produce food and raw materials. Rivers, streams, lakes, and oceans have become polluted and restoration and cleanup isn't economically feasible. Clean water for drinking costs a premium, and daily household consumption is closely monitored. Agricultural production levels are teetering on the verge of collapse because precious topsoil, that was abundant in 1995, has been nearly depleted by wind and water erosion. Wood products are increasingly more expensive because the few sources of raw materials that remain are limited. Forests and grasslands, even those that were once declared "protected," have been overutilized and taken over by agricultural production and urban development. With the loss of so much forestland and grassland, wildlife habitat is gone too. The world ecosystem has undergone tremendous damage.

This is definitely a grim look at our future. Realistically, in order to prevent such a picture from developing, a proactive approach towards protecting, conserving, and efficiently using our natural resources must be taken. A report issued in 1992 by the United Nations, National Academy of Sciences and Royal Society of London began: "If current predictions of population growth prove accurate and patterns of human activity on the planet remain

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Inside This Issue

Message From the Manager

A column of important events and programs as reported by Program Manager Bill Rietveld

'94 Was A Good Year

We're pleased with the Center's 1994 technology transfer accomplishments. In summary: we responded to 1,446 requests for agroforestry information; contracted with cooperators for seven new assessment, application, or demonstration projects; continued to coordinate the existing 35 projects; hosted numerous visitors; made 12 presentations on agroforestry at various conferences and workshops; sponsored three workshops and one symposium; conducted a westwide agroforestry research and technology transfer needs survey; published four issues of *Inside Agroforestry*; distributed a conservation tree planting video *Green Side Up*; distributed five news releases; and organized 17 showings (121 days) of our "Working Trees for Agriculture" travelling display. Of course these accomplishments would not have been possible without the help of our many partners and cooperators.

In addition to these accomplishments, memorandums of understanding have been signed with partners to implement the "Working Trees for Tomorrow's Communities" (WTTC) program which will apply agroforestry technologies to help mitigate environmental problems in communities, as well as in the rural/urban interface (see Summer, 1994 *IA*). The "Plant a Tree-Help a Kid Foundation" has in turn signed agreements with Big Brothers/Big Sisters of America, Boys Clubs/Girls Clubs of America, and Habitat for Humanity; is finding sponsors; and is planning to implement the program in 1995 with focus projects in several key cities. The benefit to agroforestry is that the WTTC program will provide high visibility demonstrations of agroforestry technologies in and near urban areas, where 70 percent of the population lives.

Agroforestry made some dramatic advances in 1994. The release of the Resource Conservation Act (RCA) national assessment for agroforestry in February was a stimulus that lead to a national workshop in June that formulated a unified national strategy to develop and implement agroforestry. A white paper presenting the national strategy, and an agroforestry policy paper for the 1995 Farm Bill are available from the Association for Temperate Agroforestry. Contact Dr. Michael Gold, AFTA President, MSU Dept. Forestry, 126 Natural Resources Building, East Lansing, MI 48824-1222. Phone: 517-353-4751.

As 1995 unfolds, it promises to be another good year for agroforestry. In cooperation with Northeastern Area State and Private Forestry and Southern Region State and Private Forestry, the Center will begin to expand its scope to 48 states. This will be accomplished through partners and networking. Funding is limited, so activities will be targeted to provide general benefits to the most people. We are expanding our *Inside Agroforestry* mailing list to reach a broader audience of natural resource professionals throughout the United States. Also, our new application notes series *Agroforestry Notes*, will be launched in 1995 and will be available to natural resource professionals nationwide.

A goal we have set for 1995 is to put the "agro" in agroforestry. So far, most of the interest in agroforestry has resided in the forestry community. That's changing, and we want to change it even more. 1995 will be the year of the Farm Bill debate, and we are gratified to see strong interest in agroforestry from the agriculture and environmental communities. This indicates more recognition of the capacity for agroforestry practices, integrated into agricultural land-use systems, to generate the ecosystem diversity, ecological processes, buffer zones, and diverse products and services important to long-term sustainable systems. We look forward to building more bridges between the forestry, agriculture, and environmental communities.

We hope that 1995 will be a rewarding and productive year for you and your work.

See What We've Got for You!

Agroforestry Notes

Agroforestry Notes will be available this spring! *AN* will be a quick, easy-to-use technical series designed especially for natural resource professionals.

"Working Trees" Display

Our 8' X 10' portable "Working Trees for Agriculture" display is available for your use again this year. It graphically depicts various agroforestry practices and what the benefits are. It's attractive, easy to set up, and a perfect communication tool to aid natural resource professionals in informing and educating landowners. Be sure to book it early!

An 8 1/2" X 11" trifold leaflet is also available to accompany the display or to be used by itself. It parallels the display, with added depth in explaining the concept of "Working Trees for Agriculture." It's another excellent tool for natural resource professionals. Contact Kim Isaacson at the Center, 402-437-5178, ext. 13, to book the display or for brochures.

Green Side Up

Green Side Up is a short, practical, three-module video designed to train tree planting professionals. Each module: 1) transportation and on-site care; 2) hand planting seedling trees; and 3) machine tree planting, is narrated and takes the viewer step-by-step through the processes. A facilitator's guide, viewer handout, and training quizes are included. For your own copy contact Western Cine, 312 S. Pearl Street, Denver, CO 80209. Phone: 303-744-1017. Prices start at $12.95. The more videos you order, the lower the price. Postage and handling are not included.

The Future of Temperate-Zone Agroforestry -- A Perspective

By H.E. "Gene" Garrett, Director
Center for Agroforestry, University of Missouri

Aldo Leopold, one of the world's greatest conservationists, wrote in 1945 that "a farm can be regarded as a food factory and the criterion for its success is saleable products. Or, it can be regarded as a place to live, and the criterion for its success is harmonious balance between plants, animals, and people; between the domestic and the wild; and between utility and beauty." Family farms must first be profitable, but they must also nurture human well-being. Only through the combination of the two can we have a truly "successful" family farm. And only through the creation of harmonious balance between plants, animals, and people; between the domestic and the wild; and between utility and beauty can we nurture psychological well-being. Stable environments are required for individual and family health as well as for rural community vitality. To create stable environments on family farms requires a new and different emphasis in agriculture and natural resource management. In contrast to the industrial agriculture/forestry models which have dominated development through the 1900's and are now being challenged on the basis of high environmental costs, there is a need for a kinder, more holistic land-use management model for the 21st century and beyond. This new model must be one of synthesis, integration, and diversification. It must meet the specific needs of the landowner and society while preserving the integrity, stability, and beauty of the biotic community.

Agroforestry "an intensive land management system that optimizes the benefits from the biological interactions created when trees and/or shrubs are deliberately combined with crops and/or livestock" is a rapidly emerging field in the temperate zone worldwide and will become a part of this new model. It is an interdisciplinary approach that bridges production agriculture and natural resource conservation with environmental protection while meeting all human needs, both physical and mental. Agroforestry generates ecosystem diversity, enhances ecological processes, and provides buffer zones all of which are important to the development of long-term sustainable agroecosystems.

Agroforestry is not intended to compete with agriculture, but to enhance it economically, environmentally, and socially. Specifically, integration of practices like riparian buffers, streambank bioengineering, alley cropping, living terraces, windbreaks, tree/pasture systems, and tree/specialty crop systems can result in many benefits. Among these benefits are increased crop production, alternative crops and diversified rural economies, improved water quality, soil erosion and sediment control, filtering and biodegrading of excess nutrients and pesticides, reduced flooding, microclimate moderation, natural pest control, and diversified habitats for wildlife and people.

Agroforestry requires a shift in our thinking and perspective, and demands skills in managing rather than reducing complexity. It challenges land managers to transcend disciplinary boundaries and explore the potential synergisms created from integrating production agriculture, natural resource management, and forestry technologies. It offers the basis for the development of a comprehensive land-use strategy that emphasizes the desirability of treating value-creating biological systems as holistic management units rather than as a collection of individual components.

The potential for temperate-zone agroforestry is substantial but varies by region, reflecting the diverse landscapes, values, and regional/local economies. Temperate-zone agroforestry has evolved into five distinct systems: alley cropping, silvopasturing, windbreaks, riparian vegetative buffer strips, and forest farming. Each has its region of emphasis but potential application exists throughout the entire temperate zone. A recent assessment of the potential for agroforestry in the US (Agroforestry: An integrated land-use managment system for production and farmland conservation -- 1994 Resource Conservation Act Appraisal, SCS, Washington, DC) clearly demonstrates the need, and the vast acreage available, to accommodate the application of agroforestry. In the five states of Missouri, Illinois, Indiana, Iowa, and Ohio, more than 19 million acres of highly-erodible cropland were identified that could benefit from the application of alley cropping or windbreak systems. An additional 16 million acres were found in the plains states of Nebraska and Kansas. Throughout the US, more than 700,000 miles of minimally protected streambank exist which could benefit from applying vegetative buffer strip management principles. Moreover, millions of acres of forest and pasture lands exist that would provide more products and services if silvopastoral management and/or forest farming practices were applied.

The adoption of agroforestry within the US is currently on the upswing thanks to greater landowner awareness. This heightened awareness is attributed to a dramatic increase in the number of professionals actively researching and teaching agroforestry principles, better national and regional organization of agroforestry enthusiasts, and greater involvement of these enthusiasts and their organizations in securing state and national policies to support agroforestry.

During 1994 major steps have been taken to institutionalize agroforestry at the national level through a highly coordinated effort. The Association for Temperate Agroforestry (AFTA) in concert with USDA/USDI agencies and a host of institutions and organizations have created a national agroforestry initiative. Among other things, this group is asking the USDA to provide greater leadership for agroforestry at the national level. In addition, regional agroforestry associations have been formed in the northeast and west and are soon to be formed in other regions to provide better communication between professionals and practitioners. And, Missouri has become the first state to develop a program specifically advocating the adoption of agroforestry.

In a short span of just a few years, agroforestry has gained acceptance within the US. However, our job is far from complete. While numerous successes critical to the broad-scale adoption of agroforestry in the United States have been realized, agroforestry is at a formative and critical stage in its development. The writing of the 1995 Farm Bill offers yet another important opportunity for us to institutionalize agroforestry at the federal level as part of a strategy to reduce the public cost of resource conservation, avoid regulation of conservation, and to develop a more environmentally and socially sustainable form of forestry and agriculture production. The demonstrated desirability of management practices that are ecosystem based and provide multiple and long-term benefits clearly identifies the wisdom of embracing agroforestry. The application of its principles will enable us to better meet our needs of products and services of the land, now and in the future.

Appearance of an article in Inside Agroforestry does not imply that the Agroforestry Center agrees, nor endorses, the facts or opinions contained.

It's Soil Bioengineering to the Rescue!

Streambank erosion is a serious threat to land along many streams and rivers and to reservoirs downstream. Eroded bank materials are eventually deposited into lakes and reservoirs and water quality can be adversely affected. Streambank erosion is an old problem that continues to grow in severity. For centuries, creeks and streams meandered through the countryside gently shaping and reshaping the landscape. But in recent years, many have turned into raging torrents capable of destroying property and people's lives. But, not to worry...soil bioengineering will save the day! Don Roseboom, Professional Scientist for the Office of Water Quality Management, Illinois State Water Survey in Peoria, Illinois is doing all that he can to help alleviate this problem. He, along with several others, are at the forefront of the soil bioengineering movement. Don's specialty is in what is called the willow-post method, which was actually developed by the Civilian Conservation Corps in the 1930's.

Soil Bioengineering combines biological elements with engineering design principles to create environmentally sensitive solutions to both upland slope protection and streambank stabilization. It's an applied science that utilizes woody species that can root from cuttings to create a living structure. Initially, the arrangement of the cuttings provides mechanical protection for the soil. As plants grow, the roots reinforce the soil, and other species invade to create a self-sustaining community. The willow-post method simply uses cut willow trees to accomplish this (cuttings can be as large as two to six inches in diameter and six to 10 foot long).

Why willow posts? Project research was done on many different species and willow was found to have, by far, the most viability. It's not only a pioneer species, but it's found almost everywhere in the United States. Willow cuttings are low maintenance and easily establish themselves in heavily eroded areas, quickly stabilizing the site, thus allowing other species to take root. Traditional bioengineering methods cost $50 to $200 per foot, while the willow-post method can be installed for just $7 to $15 per foot. The willow-post method remains inexpensive because most landowners can locate and cut their own willows from nearby stands and bring them to the site, which helps to keep the cost of materials down. Combining the low installation cost with cost-share programs such as SIP and ACP keeps the willow-post method affordable and attractive to landowners.

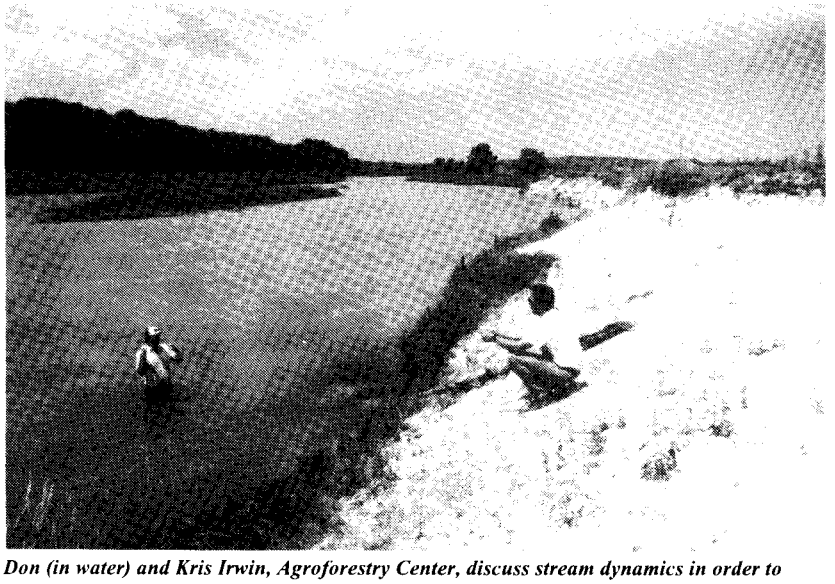
According to Roseboom, soil bioengineering is actually more of an artform than a science. It's principals are carried over from other procedures dating back to Europe and the 1800's. Even Indian tribes built "living fences" in flood plains to maximize deposition. It was in the early 1900's that we got away from these techniques and turned towards using concrete and metal structures that are so common today. Fortunately, traditional soil bioengineering is making a comeback.

Early in the 70's Roseboom got his start in bioengineering from retired Phoenix, Arizona Soil Conservation Service forester John York. Prior to this, Roseboom spent his time installing tree revetment projects, monitoring channel erosion, and researching different techniques to improve streambanks. The goal was always to find the most economical, environmentally sensitive, and effective means to control erosion. This led him to soil bioengineering and the willow-post method.

Roseboom has since installed over 20 demonstration projects and many workshop site projects throughout Illinois and the Midwest. The demonstration sites help to educate people about different bioengineering techniques and how they can protect and improve a severely eroded area. In recent years, he's shifted away from the installation portion of the practice and has become more active in education. He believes in "training the trainer" and spends about 40 percent of his time teaching streambank stabilization training workshops. Last year, Roseboom was involved with 15 workshops throughout the United States and Canada. He found out early that most people don't read scientific reports so he's spent many hours putting together educational materials, including videos and color brochures, that workshop participants can use after their training to assist them in educating landowners, co-workers, and the general public. Roseboom feels that educating more natural resource professionals about soil bioengineering, combined with their knowledge of the land, the stream, and most importantly, the landowners will improve the quality of the project and keep costs down. Roseboom gages the success of his workshops by if a project was installed better and for less cost by workshop participants than it would have been if he had done it himself. Roseboom continues to hold workshops, but is broading his scope of interest and is now researching bioengineering techniques for lake shoreline erosion problems and gully/ravine erosion.

As for the future of soil bioengineering, Roseboom feels that if we can make it more economical, and further improve the environmental benefits, "the engine will drive itself, we'll just need to get out of the way."

Much of the credit for giving soil bioengineering a new start and honing the knowledge and skills of natural resource professionals goes to Don Roseboom. Thank you Don!



Don (in water) and Kris Irwin, Agroforestry Center, discuss stream dynamics in order to determine an appropriate project site for a workshop that the Agroforestry Center held in Halsey, Nebraska in October, 1994.

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get to what they were envisioning. Finally, he asked them to identify one thing that they could do once they got back home to make those steps happen.

Some of the participants saw a continuation of the environmental degredation currently taking place because of a lack of long-term perspective and limited funding for conservation programs. But, a consensus was that agencies, organizations, and individuals need to work together. Many saw a need for landowner and farmers to take more personal responsibility. There was a desire to plan workshops and programs to educate and accelerate the flow of information about agroforestry with realistic expectations for change, especially with a global context of ideas. And, finally a popular response was the setting of specific goals about changing personal lifestyles and a desire to better hometown communities by taking personal responsibility.

If we can just *see* ourselves taking this personal responsibility and taking steps to move toward a more sustainable future, it will happen. How about making a new year's resolution to do just one positive thing that might help us reach our goal. We, at the Agroforestry Center, are hoping that information from the 1994 Agroforestry Symposium reflect a year of positive change. Have a wonderful 1995!

[1]*Source: Trees, Prairies, and People -- Tree Planting in the Plains States by Wilmon H. Droze, 1977.*

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unchanged, science and technology may not be able to prevent either irreversible degradation of the environment or continued poverty for much of the world."[1] This is a sobering statement. It puts the burden of land stewardship in the hands of its occupants — us.

To meet the challenges of the future we must design and implement environmentally sustainable strategies. A vital component of any strategic plan should include agroforestry. Agroforestry — integrating trees and shrubs into agricultural land-use systems to provide tree products and to protect, conserve, diversify, and sustain vital economic, environmental, human, and natural resources — combines production and conservation forestry practices. It puts trees to work.

Agroforestry systems can assume various design configurations to meet individual objectives and goals. To illustrate this, visualize a parcel of land somewhere in the western United States. This acreage is predominantly covered with grass and has a cold-water trout stream winding its way through the landscape. The landowner wants to build a house, several out buildings, and start a small cattle operation. With a genuine concern to be environmentally correct, what conservation and production forestry technologies should this person employ? The answer includes agroforestry.

To illustrate this, agroforestry technologies applicable to this particular scenario could include: trees strategically planted to create an outdoor living barn for livestock to protect and increase animal health, lower feed costs, and increase financial returns; riparian buffer systems to protect water quality and maintain integrity of the fishery; farmstead windbreaks to reduce home heating and cooling costs (15 to 25 percent savings); living snowfences to increase hay production and protect the farmstead, livestock, and farm to marke roads; and block plantings on marginal land areas for production of forest products and wildlife habitat. Now, this brief description of potential agroforestry applications is by no means definitive, but it represents some of the many ways agroforestry can be applied.

Communities can benefit from agroforestry technologies as well. Adapting rural agroforestry systems to fit the urban landscape is very doable. Trees and shrubs will provide the same conservation benefits in urban settings as they do in rural areas. The rural-urban interface, in particular, is an excellent location for applying agroforestry technologies. All that is required is a little creative thinking and a desire to improve the environment.

There are many ways to put trees to work in any urban landscape. For example, buffer systems will sequester chemicals carried in surface and subsurface runoff to improve water quality. Working trees can serve as living snowfences to protect emergency routes, major roads and highways, and reduce snow removal and maintenance costs (they cost about one-third that of slatted or manufactured board fences). Working trees, properly designed and located, have many other functions too. They provide wildlife habitat, screen unsightly industrial areas, serve as sound barriers along busy roadways, block wind around recreational areas, and reduce energy consumption by shading buildings, roads, and parking lots. You can find trees at work most everywhere you look!

Agroforestry technologies can easily be a component of any strategy to maintain ecosystem health. The application of agroforestry to both rural and urban ecosystems provides a foundation for sustainable development. Natural resource managers, researchers, teachers, parents, organizations, special interest groups, and any person with any desire to improve the world can apply agroforestry practices and put trees to work for tomorrow's agriculture and tomorrow's communities.

[1]*Source: State of the World by Lester R. Brown, 1993.*

Honeylocust Agroforestry Scenario

While honeylocust (*Gleditsia triacanthos* L.) has several potential uses in agroforestry, the most promising is as a pasture fodder tree. Honeylocust produces pods which can provide animal feed during autumn and winter when pasture grass production declines. Livestock may harvest the pods directly from under the trees, minimizing harvesting and processing costs. Using tree protectors and/or electric fences, honeylocust orchards can be established in operating pastures and hayfields, permiting cash flows from livestock sales to continue while the trees mature. Pods have a nutritional value between oats and barley, depending on the cultivar, growing conditions, and location. Because sheep can digest the honeylocust seed and require less expensive tree protection, they offer a better fit with silvopastoral honeylocust than cattle or hogs. Economic evaluations of silvopastoral honeylocust indicate internal rates of return of 9 percent to 25 percent, depending on a variety of cost and production assumptions. Although not easily quantified, additional benefits include reduction of water runoff and topsoil erosion, shade for livestock, a productive pollen and nectar source for bees, a more diversified and aesthetically pleasing pasture environment, and lumber or fuelwood upon project termination.

Source: Honeylocust Research Group Newsletter, March 1994