

Inside

Agroforestry



National Agroforestry Center



Winter/Spring 1996

To more efficiently and effectively serve our customers across the United States, the National Agroforestry Center is now a full partnership of the USDA Forest Service and the USDA Natural Resources Conservation Service. This issue of *Inside Agroforestry* will give you an *inside* look at agroforestry nationally and locally, as well as the National Agroforestry Center's role.

Agroforestry For Farms, Ranches, and Communities

Agroforestry — the intentional integration of agriculture and forestry practices to attain more productive, profitable, and sustainable ecosystems.

This is how we describe agroforestry today. It's a holistic concept that supports sustainable agriculture, sustainable forestry, and sustainable communities. Agroforestry is pragmatically marketed as "working trees for agriculture" and "working trees for communities" — planting the right tree in the right place for a specific purpose. Agroforestry puts trees and shrubs to work in both rural areas and communities to meet people's economic and social needs.

Agroforestry practices include alley cropping, windbreaks, riparian buffers, streambank bioengineering, tree/pasture systems, living terraces, living snowfences, tree/specialty crop systems, and wildlife habitat. Benefits are: increased crop production, alternative crops and diversified rural economies, improved water quality, soil erosion/sediment control, filtering, sequestering, and processing excess nutrients and chemicals, reduced flooding, microclimate moderation, and diversified habitats for wildlife and humans.

The ultimate success of agroforestry depends on the willingness of landowners and/or community leaders to care for the land and pass on sustainable systems to future generations.

Inside this issue you'll find information and tools that the National Agroforestry Center has developed to help you educate and encourage landowners and community leaders to apply agroforestry practices.

The National Agroforestry Center is Evolving

To support the growing national interest in agroforestry, the National Agroforestry Center has evolved into a

full partnership of the USDA Forest Service (FS) and the USDA Natural

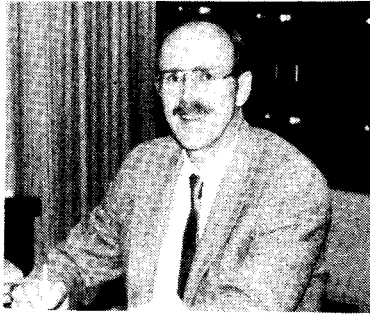
————— (See *Evolving* on page 6)



On December 14, 1995, NRCS Chief Paul Johnson, FS Associate Chief Dave Unger, NASF President Stanley Hamilton, and NASF Past-President Bill Farris signed a Memorandum of Understanding as Under Secretary Jim Lyons and representatives of the Natural Resources Conservation Service, Forest Service, and National Association of State Foresters look on. This agreement strengthens the partnership and cooperation in forestry and related natural resources, including agroforestry.

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Message From the Manager

A commentary on the status of agroforestry as reported by Program Manager, Bill Rietveld

Plowing New Ground

The National Agroforestry Center (NAC) is now a full partnership of the USDA Forest Service and the Natural Resources Conservation Service. The partnership enables an

“We’re excited about the new partnership and the future of agroforestry.”

—Bill Rietveld

enhanced effort to catalyze the development of agroforestry technologies and apply them nationwide in resource management systems for farms, ranches, and communities.

NAC staff from the two agencies has been busy developing a strategic plan, implementation plan, and annual work

plans to establish teamwork in Agroforestry Research and Development, Technology Transfer & Applications, and International Technology Exchange.

This is a special issue of *IA* to launch the new partnership. But, we don’t want to focus only on us. We wanted to put the partnership into perspective with what it means for our cooperators and customers, and with working together to develop the numerous opportunities for agroforestry technologies. This issue tells the “agroforestry story.”

We’re excited about the partnership and the future of agroforestry. The partnership is a big step in the right direction. But, we must recognize the divergence that is taking place between the increasing popularity of agroforestry on the one hand, and decreasing funding on the other hand. Most agencies and institutions are seeing the same trend. Now, more than ever, we *must* work together to make a difference!

Working Trees for Communities Brochure

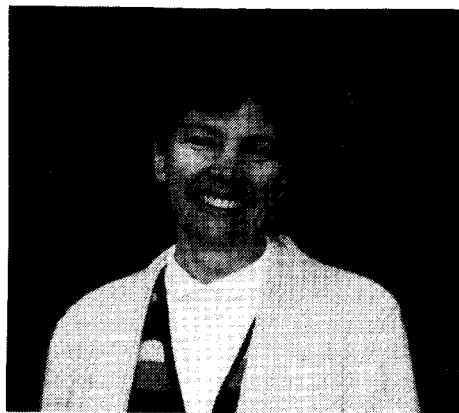
Working Trees for Communities, a companion brochure to the *Working Trees for Agriculture*

brochure, is now available! It discusses the application of agroforestry technologies to address

community

conservation needs. The brochure combines color illustrations and easy-to-understand text. Contact Kim Isaacson at the Center for a sample or a supply.

NAC Initiates International Exchange Program



Dr. Sarah Workman, NAC International Coordinator

In cooperation with the US Agency for International Development (USAID), the Center has initiated a new international exchange program. Dr. Sarah Workman, NAC’s new International Coordinator, will facilitate the development of agroforestry projects with international cooperators and selectively involve agency and university professionals for mutual benefit.

Workman received her PhD in Forest Soils and Biology from the University of Georgia, a MS in Plant Ecology from Western Washington University, and a BS in Biology from Agnes Scott College in Georgia. She has agroforestry field experience in Senegal, West Africa, Costa Rica, and Brazil as well as a wealth of international coordination experience.

Workman will coordinate US activities with the International Center for Research in Agroforestry (ICRAF) in Nairobi, Kenya, provide technical assistance to USAID missions and the Peace Corps, and develop a program to apply agroforestry technologies in cities and communities. She is excited about pioneering the International Exchange program for NAC and says “working in this capacity is a great opportunity to develop agroforestry linkages between organizations, and I’m looking forward to working with a wide range of natural resource professionals in an effort to accomplish our goals.”

The Partnership Approach — A Must For More Widespread Agroforestry Adoption

by Thomas Christensen, State Conservationist,
USDA Natural Resources Conservation Service
Champaign, Illinois

The essential and cost-effective production of food and fiber for human sustenance has led to today's farms, often a much simpler version of the natural ecosystems they replaced. Even in a prairie environment such as Northern and Central Illinois, natural landscapes supported dozens of plant and animal species that have been replaced by fields growing a few species. The result has been a trend toward an environment populated principally by a few introduced or generalist species — those species most able to exploit these simpler ecosystems.

Agroforestry presents a practical and economically defensible tool for restoring some species diversity to the landscape, while maintaining (if not enhancing) farm profitability, improving environmental quality, and creating more aesthetically pleasing and people-friendly conditions. The trend of the last few decades toward simple, less stable, and more fragmented natural systems can be abated to some extent by the sound, voluntary application of agroforestry.

Agroforestry also affords an exciting opportunity to develop stronger partnerships between a broad array of agencies, organizations, and private sector concerns. Conversely, the further development of agroforestry in the United States will require a partnership approach between these many concerns. Based on my experiences, I am convinced that a partnership approach is essential if we are to achieve a more widespread application of agroforestry systems. At the same time, a partnership approach will create opportunities for greater collaboration as partners gain confidence, trust, and more awareness of each other's capabilities. Successful partnerships will beget further partnerships, and the opportunity for even greater success in agroforestry application.

The US Department of Agriculture's Natural Resources Conservation Service (NRCS) is but one partner that is working collaboratively to further agroforestry

implementation in the United States. NRCS Chief Paul Johnson recently has established a cadre of Cooperating Agroforestry Scientists within the agency who will concentrate on agroforestry development and collaboration. Moreover, Chief Johnson is re-emphasizing the importance of a total resource approach to conservation planning and management, and he is creating and fostering an agency environment where locally driven, creative solutions to natural resource concerns are encouraged and supported. Certainly, agroforestry as a conservation tool has the opportunity to develop and flourish in this environment.

As an NRCS State Conservationist, my career has taken me through positions in the Northeast, South, West, and Midwest. Along with having traveled in all but two states, I have seen firsthand the many landscape situations where agroforestry systems would benefit the natural resources, the farmer's profitability, and even the community's aesthetics and comfort. In all the regions of our diverse country, carefully planned agro-

forestry systems have a place for willing and able landowners. However, except for pockets of success, agroforestry systems have not been widely adopted. The reasons for their limited adoption are many, but principal among them has been the lack of widespread, focused cooperation, coordination, and collaboration in the delivery of agroforestry technology and assistance. We can and must do more through a strategic approach if we are to succeed in our efforts to encourage the more widespread adoption of agroforestry systems. Partnerships will provide the vehicle for greater success.

The same driving forces that necessitated the reorganization of the NRCS and many other government agencies, create the opportunity and incentives for more effective and expanded partnerships. Driving forces such as the need to reduce staffing levels and operating costs, minimize duplication of effort, place more emphasis on client service, improve empowerment and accountability at all levels, and provide more effective tech-

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Symposium *Agroforestry: An Integrated Science*

**American Society of Agronomy Annual Meetings
Indianapolis, Indiana • November 3-8, 1996**

Sponsors

ASA Division A-8: Integrated Agricultural Systems
Association for Temperate Agroforestry (AFTA)
National Agroforestry Center

Symposium Purpose

Synthesize current knowledge of temperate agroforestry in the US
Enhance awareness of the benefits of integrated systems
Stimulate interdisciplinary research

Format

Invited Presentations
Volunteer Poster Papers

For more information, contact Dr. Bill Rietveld, 402-437-5178, ext 27 or
Dr. Gene Garrett, 314-882-3647

Agroforestry Success Keeps Growing



Preparing a planting bed for ginseng under a canopy of black walnut trees.

Editors Note: Bill Slagle is a true success story that keeps growing. It's through his success that other landowners have been, and continue to be encouraged to apply agroforestry practices on their property, earn a profit, and help conserve our natural resources. Slagle recently won the 1996 National Arbor Day Foundation's Good Steward Award which is issued for excellence in tree planting and conservation work on private property. Congratulations! Following is only a part of what Slagle has done at his "Walnut Meadows" farm, but a part that has been personally and financially successful for him.

His father taught him about managing the forest and how to make a living off the land. In the 1930's and 1940's his family sold evergreens and moss to florists for Christmas decorations. They also imported and raised registered Limousine breeding cattle and were on the cutting edge of embryo transfer. Today, the William Slagle "Walnut Meadows" farm near Bruceton Mills, West Virginia, among other things, raises black walnuts, ginseng, and shiitake mushrooms.

"In West Virginia the agricultural industry has really shut down," Slagle says, "In the 1970's when the beef cattle market got so bad, we had to get out. We couldn't rent our land out for much of anything either...it's hard to make a profit. I hate to see land lay idle and I need an income while my ten acres of black walnut trees are maturing." So, Bill Slagle currently has six acres of cultivated ginseng growing in a variety of sites under his trees.

You could say that the 100-acre farm has been good to the Slagle family and that they have been good to the land. In addition to a good land ethic, Slagle has a knack for staying on top of "what's new" and taking advantage of an emerging product, while moving on to something else when a particular market becomes saturated. Ginseng is highly valued by Asian customers for its medicinal qualities and is becoming more and more popular in the United States. The dried roots are so valued for their health qualities that the wild variety can sell for as much as \$450 to \$500 per pound and woods-grown ginseng for about half that much! Typically one acre of woods-grown ginseng yields about 3,000 pounds. Slagle digs anywhere from 200 to 1200 pounds per

year, which he sells to outlets in Hong Kong and New York. ...now, you do the math!

"It's not always easy," Slagle says. "Ginseng requires intense management, you must work the ground by hand and grow it in raised beds." Slagle also says that he has made a lot of mistakes along the way, but this is how he educates himself. For Slagle it has definitely paid off.

Slagle is a vocational education teacher at the Preston County Education Center, and has been for 20 years. As his profession would indicate, he enjoys educating others. His students benefit from applying classroom skills to a real working farm. Each class gets to come out to Walnut Meadows to help with the ginseng, or the shiitake mushrooms, or the walnut trees, or build a house! Slagle says that he's "driven by teaching others." "I'm not afraid to give out my secrets. In fact, I work with the University to help others get started."

As a result, of his innovative nature and willingness to teach others, Bill Slagle has unknowingly become quite beneficial to the agroforestry movement. Dr. Gene Garrett, Director of the Center for Agroforestry at the University of Missouri, first met Slagle in December, 1986 when *Successful Farming Magazine* sponsored a conference on *Agriculture Diversification Adds Profit Today — 100 Ideas for Farmers* in Des Moines, Iowa. Slagle was attending the conference and heard Garrett speak about opportunities for trees with other crops.

Today Garrett regularly speaks to groups, oftentimes using Slagle and his achievements as an example to educate and encourage other landowners about the benefits of agroforestry. Garrett feels good about Slagle's success because "he had an idea and it came to fruition." Garrett feels strongly that an individual landowner should make a profit from an agroforestry technology, while protecting the land and serving as an example for others to follow. After one presentation Garrett made to a forestry fisheries & wildlife conference, he received ten phone calls. The most common request was for information on the type of system Slagle has.

Slagle has created a lot of interest and plans to retire soon, but his ideas definitely won't retire. Garrett is excited about the future of agroforestry and feels that "Slagle's success is spawning other success and that's very exciting!"



Ginseng is a small plant with mighty properties.

Agroforestry From A State Forester's Point of View

by William Farris, State Forester
Iowa Department of Natural Resources
Des Moines, Iowa

Agroforestry is forestry in Iowa. Iowa like many midwestern states, is primarily agricultural. When you think of Iowa, and other agricultural states, you think of corn, soybeans, hogs, and cattle. Most people don't think about trees and forests. With agriculture so dominant, the growing of trees and forests must be blended with and integrated into agricultural production.

Agroforestry has been practiced since settlement of our country. It may not have been called agroforestry but the practices certainly meet the definition of what we now call agroforestry. The first plantings were for farmstead windbreaks, orchards

for food, woodlots for a source of fuel and raw material for building and they were blended into farming/ranching operations. These practices are as important to agricultural operations today as they were 150 years ago, maybe more so.

We have added to our repertoire of practices that are being used to address economic, environmental and social needs. Agroforestry practices such as riparian buffers, streambank bioengineering, alley cropping, energy plantations, specialty tree and forest crop systems are becoming more and more common and assist farmers and ranchers develop sustainable agricultural systems.

The establishment of riparian buffer strips is one agroforestry practice that has great potential for agriculture. Research on the design and placement of multi-species riparian buffer strips by the Iowa State University Agroforestry Research Team shows the effectiveness of this practice in reducing sediment, fertilizer and pesticides entering water courses. Riparian buffer strips have been designated as a high priority practice by Iowa's Forest Stewardship Coordinating Committee. Stewardship Incentives money has been set aside to establish at least one riparian buffer strip in each of Iowa's 12 forestry districts within the next year. We hope to use these plantings as demonstrations to educate other landowners on their effectiveness for environmental as well as wildlife benefits. The riparian buffer strip effort is gaining interest on a national scale to help improve our environment.

Our urban areas can also take advantage of the many benefits of agroforestry practices. Wastewater and sludge disposal is one area that is currently being studied at Ames, Iowa. Community windbreaks are also being utilized to control snow, wind and dust at the Woodward State Hospital in central Iowa and to protect entire rural communities. Adapting agroforestry technologies for use in communities is showing great promise throughout the United States.

Iowa's Rural Development Through Forestry Program (RDTF) was developed to increase rural economic activity through the wise use of all forest resources including water, wildlife, recreation, scenic beauty and wood products. Projects funded through this program have been in the areas of recreation and tourism; specialty forest products; forestry assistance (consultants and vendors); forest products related business startup; aquaculture; and wood waste utilization and marketing. Agroforestry principles and practices are essential to the success of this program. Many states are utilizing agroforestry practices to protect our precious natural resources. The future for agroforestry looks bright and the rewards will be many.

Trees May Offer New Social Benefits

Scientists at the University of Illinois have reported findings that may place urban trees even higher on the pedestal of social importance. Drs. William Sullivan and Frances Kuo have reported preliminary findings to the national Urban and Community Forestry Advisory Council that suggest powerful new arguments on behalf of planting trees in urban areas.

The study took place at public housing areas in Chicago. Buildings with virtually identical architecture and social status of residents were used in the study, with the exception that some of the buildings had nearby trees, grass, and perhaps a small garden. The others were surrounded by "urban deserts" of concrete.

Using questionnaires and hour-long interviews with 300 residents of the lower floors of the apartment buildings, the scientists found some remarkable psychological differences between people in the two kinds of buildings. Where there were trees and "accessible nature," residents reported stronger ties and better relations with their neighbors than did individuals in the more barren housing areas. Individuals near pockets of trees also felt safer and liked living in the apartments more than people in the other study group. Perhaps more importantly, the residents near trees had less violence in their homes. They were said to be more likely to use reasoning to overcome conflict with a child and less likely to engage in violence against their partners.

How can trees make such a difference? After observing use patterns of outdoor common spaces near the buildings, Kuo and Sullivan theorized that places with trees provide settings in which relationships grow stronger. This, in turn, reduces frustrations by offering means of support via friends and, therefore, alternatives to violence. The scientists also pointed out that symptoms found in the non-tree study group can be termed "mental fatigue," which can be chronic and severe in people coping with poverty and a difficult environment. If trees and a bit of nature can help reduce mental fatigue, individuals are likely to be more "future oriented," less irritable, more likely to generate creative solutions to problems, and more likely to try working their way out of poverty.

More research is planned to attempt confirming the positive results from this study. If substantiated, the findings that trees help reduce domestic violence and fight endless poverty will offer another strong argument for supporting urban forestry programs.

Source: Adapted from *Arbor Day*, May/June, 1995

The National Agroforestry Center serves the needs of agroforestry through building awareness, involving stakeholders, acting as a clearinghouse, developing concepts and principles, and leveraging resources. The Center works in concert with a national network of cooperators to research new ideas, transfer known technology, and apply agroforestry practices locally.

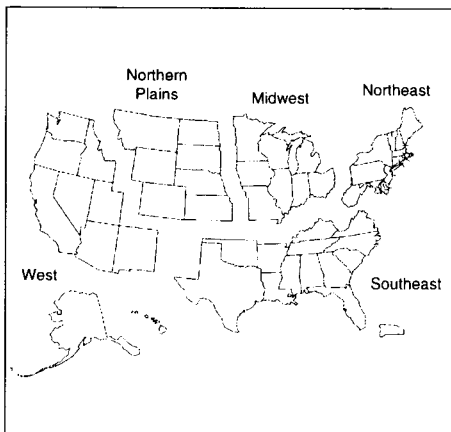
Resources Conservation Service (NRCS). On October 1, 1995, the Center began service as an "Agroforestry Institute" for both agencies to more efficiently and effectively serve natural resource professionals across the United States.

"Through the National Agroforestry Center, NRCS is working closely with the Forest Service to expand both agencies' outreach and effectiveness," said Paul Johnson, NRCS Chief, in a recent article in the *Journal of Forestry*. While the roles of the USDA Forest Service and the USDA Natural Resources Conservation Service differ in significant ways, the agencies share a common interest in encouraging the ecologically sound stewardship of the Nation's natural resources. The National Agroforestry Center is a pioneering program to accelerate the development and application of agroforestry, a science and practice that integrates agriculture and forestry land uses to create more sustainable systems. The partnership combines resources of the two agencies to develop and apply agroforestry technologies in appropriate conservation and/or production systems for farms, ranches, and communities. The partnership is open-ended and NAC is seeking the participation of other agencies and institutions as active partners.

The National Agroforestry Center

serves the needs of agroforestry through building awareness, involving stakeholders, acting as a clearinghouse, developing concepts and principles, and leveraging resources. The Center works in concert with a national network of cooperators to research new ideas, transfer known technology, and apply agroforestry practices locally. The primary clients of the Center are technical assistance providers who help landowners with natural resource conservation planning. The Technology Transfer and Applications arm of the Center also develops and distributes agroforestry technical information including a quarterly newsletter, how-to technical notes, training workshops, and technical support to special field projects.

To help serve our clients more effectively, our Technology Transfer and Applications group has designated an initial contact person for each region of the country (see map and legend). The initial contact person will assist you in locating the information you need which may mean referring you to someone else in the Center or agroforestry network who has the needed expertise. We value your interest and support of agroforestry and strive to provide information, tools, and options to enable you and your clients to make wise land stewardship decisions.



West — Gary Kuhn, Seattle, WA 206-616-7166

Northern Plains — Jerry Bratton, Lincoln, NE 402-437-5178, ext. 24

Midwest — Bruce Wight, Lincoln, NE 402-437-5178, ext. 36

Southeast — Jim Robinson, Fort worth, TX 817-334-5282, ext. 3624

Northeast — Bruce Wight, Lincoln, NE 402-437-5178, ext. 36

Stakeholders Workshop Held in DC

Stakeholders and agency staff interested in agroforestry met in Washington, DC in late March to review current efforts, provide input to improve program delivery, and set the future direction of agroforestry.

Attending were representatives of the USDA Forest Service, USDA Natural Resources Conservation Service, USDA Cooperative State Research, Education and Extension Service, USDA Farm Services Agency, Environmental Protection Agency, Association for Temperate Agroforestry, Biomass Energy Alliance, National Tree Trust, Renewable Natural Resources Foundation, and the Wildlife Habitat Council.

Participants discussed what agroforestry is and the key issues addressed by agroforestry. They also had a "visioning" session where they discussed the desired future condition for agroforestry in agriculture and community systems. Finally, the group discussed how to achieve the desired future conditions, including how to overcome the challenges and barriers to agroforestry.

Merging agriculture and forestry creates tremendous opportunities to benefit landowners and the environment. Themes that emerged from the workshop were linkage to the USDA sustainable development initiative (which is connecting sustainable agriculture, forestry, and communities); the need to make appropriate agroforestry practices available for all the different regions of the country; the necessity for *local* involvement, support, and collaboration to advance agroforestry; and the need for more economic information about various agroforestry systems.

"This workshop was only the first step to meet with our stakeholders," says the National Agroforestry Center's Bruce Wight, NRCS Lead Agroforester, "we want to hear ideas and concerns from everyone who has an interest in agroforestry."

Windbreak Evaluation Software Available

Researcher Jim Brandle at the University of Nebraska-Lincoln and John Kort from the PFRA Shelterbelt Centre in Saskatchewan, Canada have released a new version of their Windbreak Evaluation software, WBECON.

For those of you who already have the program, Jim and John have released a new Version, that corrects an error. To receive the new version follow instructions at the end of this article.

The program evaluates field windbreak plantings for any rectangular shaped field with dimensions greater than 500' by 500'. It allows the user to select from a number of windbreak tree species and designs for local growing conditions. The program considers 27 common crops and allows additional crops to be added. It considers all input costs such as establishment and maintenance, crop production, land, and interest. Crop production benefits are assumed to begin in the fifth year after planting and are phased in as the trees mature. Results of the analysis include the annual economic return, the total return on investment, and a net present value based on the life of the windbreak investment. Results can be viewed on the screen or printed.

The program is designed primarily for use by consultants, extension agents, or other professionals and can be used by producers too. The initialization portion of the program allows the user to customize the analysis program to fit their conditions, making it usable almost anywhere in the United States and Canada.

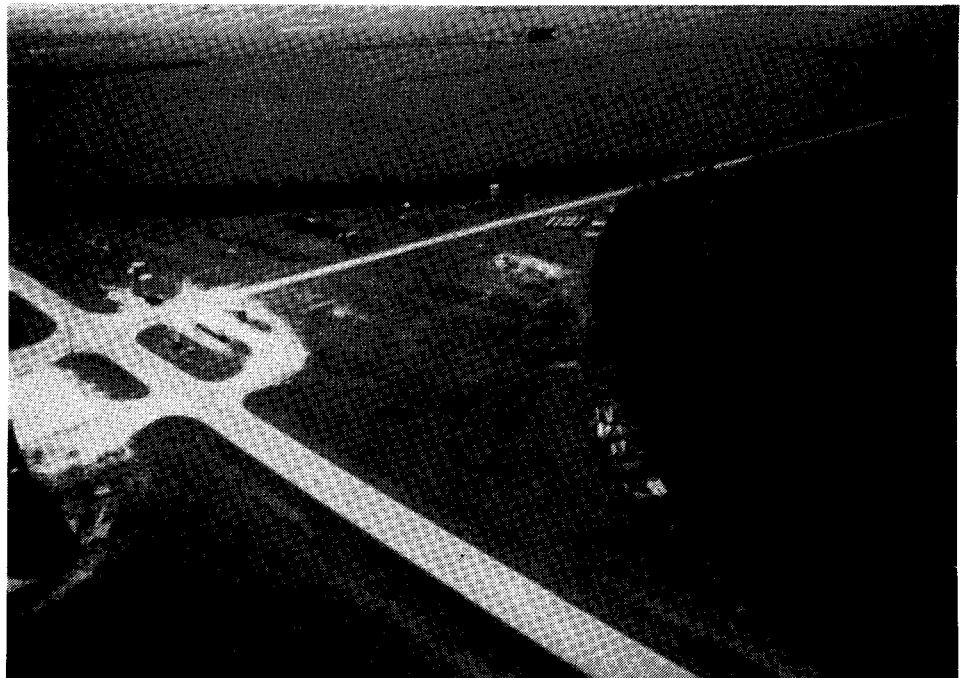
Copies of the program are available by sending one 5 1/2 or 3 1/2 inch formatted, double-sided, high-density disk, and a computer disk mailing envelope to Dr. Jim Brandle, UNL, Department of Forestry, Fisheries, and Wildlife, 101 Plant Industry, Lincoln, NE 68583-0814 or to John Kort, Shelterbelt Centre, PFRA, Indian Head, Saskatchewan, Canada S0G 2K0.

In-Field Demonstration Projects — A Valuable Technology Transfer Tool

If you're looking for an effective way to encourage landowners to adopt agroforestry technologies, an in-field agroforestry demonstration project is what you need. In-field agroforestry demonstration projects are excellent teaching tools that: 1) promote the use of appropriate technology to address a problem; 2) show proper design, installation, and maintenance techniques; 3) are located on a highly visible site and are easily accessible; 4) are maintained and utilized as an outdoor classroom; 5) have an adequate supply of printed educational materials available for distribution; and 6) have signs installed to describe the project and mention partners involved.

Demonstration plantings are a valuable technology transfer tool because they create a living example for people to see and touch, making it easier for them to understand and accept the technology. Hosting tours of the demonstration site is an excellent method to convey technology concepts and design rationale to visitors. Ultimately, the demonstration serves as an example of appropriate technology for people to follow and apply on other landscapes.

Mattawa, Washington is home to a new in-field agroforestry demonstration project. The project is located on state-owned, high-value cropland. It will serve as an example of how windbreaks protect crops from wind erosion, thus reducing the volume of wind-borne soil particles that degrades air quality. The Washington State Department of Natural Resources and Natural Resources Conservation Service are working together to introduce windbreak technologies to this region of the country and demonstrate the cost effectiveness of properly designed windbreaks. This planting will demonstrate how windbreaks can be designed around fields with center pivot irrigation systems, and establishment techniques (drip irrigation and weed control) necessary to ensure the trees and shrubs will survive and grow. In addition to being highly visible, the site will be utilized as a showcase by both agencies, and receive the attention of the local media to promote its existence. If you would like to know more about this demonstration project contact: Milt Johnston, Washington DNR Southeast Region, in Ellensburg, Washington at 509-925-6131.



Windbreaks around and through irrigated fields can reduce evaporation losses from sprinklers and improve water-use efficiency. Windbreaks can also reduce damage to seedlings from wind blown soil and improve crop yields.

Together, We Can Make A Difference

The National Agroforestry Center functions as a contact point, clearinghouse, and catalyst to advance the science and practice of agroforestry. As a catalyst, the Center is a small ingredient that acts as a driving force to accelerate a process that would otherwise occur slowly or not at all. In an effort to accelerate the development and application of agroforestry technologies, the Center has the following activities and tools available to assist you. We encourage you to take advantage of these products so that together, we can make a difference!

Current Information. In our quarterly newsletter *Inside Agroforestry* we strive to keep you informed on current events and developments in agroforestry.

Technical Support. The Center provides technical support to resource professionals through consultation, development of application tools and guidelines, and training workshops. If you need technical support, see page 6 for the name and telephone number of your regional contact person.

Conferences and Workshops. NAC develops and delivers targeted, specialized workshops, conferences, and symposia to assemble and exchange information, stimulate new thinking and ideas, identify obstacles and opportunities, and promote cooperation. NAC is co-sponsoring a symposium on "Agroforestry: An Integrated Science" at the American Society of Agronomy Annual Meetings in Indianapolis, Indiana November 3-8, 1996. See page 6 for more information.

Technical Information. Through various media, the Center strives to provide you with the latest agroforestry technologies and information. *Agroforestry Notes*, a new technical series, will be debuting this year and will provide technical information in a useful "how-to" format. Other tools NAC has available include: *Green Side Up*, A short, practical, three-module training video for professional tree planters; a "Working Trees for Agriculture" display available on a loan basis; technical guides; and published papers. Also available are "Working Trees for Agriculture" and "Working Trees for Communities" brochures.

Demonstrations. The Center facili-

tates and cost-shares demonstrations of agroforestry technologies in both rural and community environments to encourage adoption of new, improved, or unused technologies.

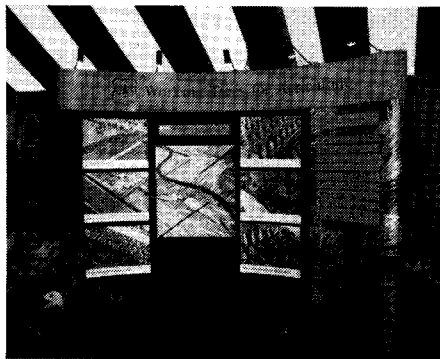
Applications projects. NAC facilitates and cost-shares applications projects with cooperators to evaluate and adapt technologies under local conditions, to pave the way for general adoption.

Assessments. The Center cost-shares assessment projects to assemble information needed to advance agroforestry, such as evaluating the need and potential for agroforestry technologies in specific regions or situations, and developing information on the benefits of agroforestry.

Special Projects. The Center initiates special projects to address special needs or unique opportunities. For example, the Center has developed a Native American Agroforestry Project to assess and demonstrate how agroforestry systems on Tribal lands meet their unique, societal, economic, and spiritual needs; and a "Working Trees for Communities" project to apply agroforestry technologies in communities and the rural/urban interface.

If you would like more information about any of these projects or products that NAC has available, contact Kim Isaacson at the Center.

Our mission is to advance the science and practice of agroforestry by providing information and tools to assist you. Together, we can make a difference!



The "working trees for agriculture" display is available for you to use on a loan basis. It is a wonderful informational aid to use at meetings, fairs, workshops, field days, or just in your office. Brochures are available to accompany the display. The only cost involved is the cost of sending it by UPS to the next user. Contact Kim Isaacson at the Center to reserve it.



The Winnebago Tribe of Nebraska is cooperating with NAC to establish a windbreak demonstration to show how windbreaks can protect specialty crops in the Missouri River bottom.



Filming "Green Side Up," a tree planting video for professional tree planters, is just one of the tools that NAC has produced and provides to resource professionals.

Proceedings of the "Agroforestry and Sustainable Systems" Symposium are still

available...For a free copy, contact

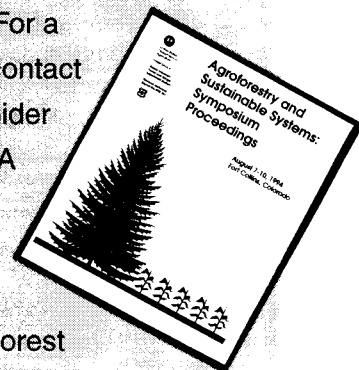
Dick Schneider
at the USDA

Forest
Service,
Rocky

Mountain Forest
& Range Experiment

Station, 240 West Prospect
Road, Fort Collins, Colorado
80526 or call 970-498-1719.

Copies are also available from
Kim Isaacson at the Center.



Science in Agroforestry

by Bill Rietveld, Program Manager, National Agroforestry Center
and Gene Garrett, Professor, University of Missouri, Columbia

Agroforestry is the integration of agriculture and forestry to create more productive, profitable, and sustainable systems. There are two key principles in agroforestry:

Integration. Through integration, we increase the number of simultaneous crops by more efficiently utilizing soil, growing space, growing season, and growth factors (light, water, temperature, nutrients).

Interactions. More diverse, integrated systems generate many beneficial bio-physical and socio-economic interactions that are not obtained from monocultures.

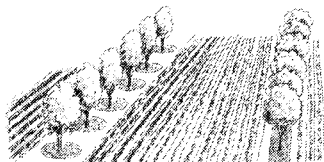
If these principles are used successfully, the results are increased productivity, profitability, and sustainability of the overall system.

An Integrated Science

Our present paradigm is based on the traditional segregation of land uses in the United States, i.e., agriculture or forestry. We have developed an extensive institutional infrastructure to address research problems within similar disciplinary boundaries. When research problems transcend disciplinary boundaries, or individual disciplines have failed to answer specific questions, we use an interdisciplinary approach synthesized from several disciplinary viewpoints. When this need is pervasive, a new integrated discipline emerges.

An integrative, synthetic approach is also needed to address system-level questions, where system properties, functions, and processes need to be understood and optimized. A traditional "reductionist" approach (dividing complex phenomena into simpler components) is not appropriate for studying systems, because the whole is more than the sum of its parts.

Agroforestry matches both situations. It is inherently interdisciplinary since it is the integration of trees with crops and/or livestock. And the agroforestry component generates key ecosystem processes important to sustainability. Agroforestry science requires the combined application of forestry, agronomy, ecology, soil science, tree genetics, animal science, watershed science, and other



Alley cropping is growing an agricultural crop simultaneously with a long-term tree crop.

applied fields. When this fusion occurs, and agroforestry is a recognized science, what an exciting one it will be!

Scales of Agroforestry Science

There are two primary scales of agroforestry science: 1) Within an agroforestry system. We need to combine trees with crops and/or livestock in a way that maximizes complementary effects and minimizes competitive effects. Within an optimized system there would be minimal competition for growing space, light, water, and nutrients, so two or more crops can effectively be grown at once. Such multi-story systems moderate the microclimate, allowing the production of a variety of high-value sensitive crops.

2) Within the landscape. The integration of agroforestry systems within the landscape provides many ecosystem-level benefits from the bio-physical and socio-economic interactions that trees generate. Properly designed and located agroforestry practices provide buffer zones, moderate microclimates, provide habitat for natural pest controls, provide habitat and corridors for wildlife, hold soil in place, reduce runoff, and filter out contaminants. The system-level benefits realized are stability, resilience, diversity, reduction of wind and water erosion, regulation of pests, moderation of stresses, soil generation, and waste management. These system-level functions are a major contribution to "ecosystem health".

The Agroforestry Challenge

We need to move away from the traditional segregation of agriculture and

forestry in our minds and on the landscape. This barrier is not unique to the agroforestry movement. The concept of integrated systems and an ecological approach is also advocated in sustainable agriculture and sustainable forestry. The environmental impacts of conventional agriculture and the viability of small family farms are driving forces. Fundamentally, the shifts are from segregated systems to integrated systems, traditional crops to alternative crops, exploitative to sustainable, short-term outlook to longer term, top down to bottom up grassroots efforts, engineering/chemical approaches to biological approaches, etc.

We lack a science-based understanding of integrated systems. We must provide answers for how agroforestry adds value to the system and is profitable. There is an urgent need to develop, evaluate, and document the benefits of agroforestry technologies, and the interactions they generate in conservation and production systems for farms, ranches, and communities. This need is shared with other stakeholders who advocate sustainable development. When the needed fusion of agriculture and forestry technologies occurs, we will be poised to make major advances in attaining sustainable agricultural land-use systems.

Agroforestry Science Needs

The major gaps are in research dealing with complexity, profitability, and sustainability (both bio-physical and socio-economic). Agroforestry is practiced on private lands that people depend on for their livelihood. Thus, to go from concept to practice, agroforestry must (1) add value to the production system, and (2) be profitable. To meet that mandate, the science of agroforestry needs to advance in a number of areas:

Integration. To successfully grow multiple crops, there is a need to fully utilize vertical and horizontal space, utilize as much of the growing season as possible, and minimize competition. Multiple agroforestry systems need to be appropriately integrated into whole farm production systems, and multiple farm

(See Science on page 10)

“For natural resource conservation advocates, it seems incumbent on us to further explore, develop, and pursue agroforestry solutions that make good business sense, help conserve natural resources, improve species diversity, and maintain the long-term viability of agricultural production and ecosystems.”

—Thomas Christensen

nology transfer and training set the stage for carefully crafted, well-defined partnerships to flourish. Effective agroforestry partnerships will require that we first come to the table and through a deliberate, open process define our mutual goals, delineate what we have to offer, and decide who will provide what, when, where, and how.

(Science from page 9)

systems need to be integrated into watershed and landscape systems.

Bio-physical Interactions. We need to better understand and document the bio-physical interactions that are generated or enhanced when trees are introduced into agricultural ecosystems. These include microclimate moderation, habitat for natural enemies of crop pests, habitat and corridors for wildlife, agricultural pathosystem fluxes, soil retention and quality, reducing runoff, and filtering of contaminants in runoff water.

Socio-economic Interactions. We need to evaluate the economic and social dimensions of integrated systems, especially in relation to the needs of small family farms. More emphasis must be placed on products derived from agroforestry systems and their potential value. As with any new product or small business enterprise, a full analysis of the economic and social impacts, infrastructure required, and development of guidelines are needed to facilitate adoption. Related to this is the need for risk analysis, valuation of non-product benefits, and policy analysis to identify barriers to adoption.

Case Studies and On-Farm Research.

As an element of our partnership contribution in Illinois, I recently have established an NRCS Agroforester position to provide technical guidance, support, and the impetus for a more concerted approach toward agroforestry. During the coming year, NRCS in Illinois will be seeking the formation of a coalition designed to help landowners establish more working trees in agricultural settings — trees to help them enhance their natural resources while sustaining their agricultural production and profitability. Based on my experiences, this coalition can do the following: improve coordination of both public and private sector assistance to maximize limited staffing and incentives; increase landowner awareness of the benefits of agroforestry (including its economic dimensions); increase agency/ organization/private sector recognition of agroforestry benefits; bridge the gap between the developers of technology and the end user — the landowner; increase the use of pilot and demonstration projects to improve

Case studies are needed to evaluate alternative integrated systems and predict what their outputs would be. On-farm research is needed to adapt technologies to local conditions and validate the predicted outputs.

Plant Materials. There is an ongoing need for development of multi-purpose trees and shrubs that are well adapted to the site and suited to the intended purpose.

System-level functions. We need to understand the role and function of agroforestry practices in the watershed to maximize environmental benefits at minimal cost. This addresses the National Research Council’s recommendation for more emphasis on “field and landscape buffer zones”. System-level benefits are the result of the bio-physical interactions discussed above. We know that agroforestry is key to creating buffer zones that provide these functions, but we need to determine where the practices should be located, how they should be combined with other key technologies like constructed wetlands and bioengineering, and what the extent and value of these functions are.

Decision and Application Support Tools. Because system-level diagnosis

landowner adoption; and, furnish training to landowners and technical assistance providers to improve their skills in the planning and installation of agroforestry practices.

For natural resource conservation advocates, it seems incumbent on us to further explore, develop, and pursue agroforestry solutions that make good business sense, help conserve natural resources, improve species diversity, and maintain the long-term viability of agricultural production and ecosystems. Using a partnership approach, we must pursue further research, demonstrations, and pilot projects to clearly articulate and market the economic and conservation benefits of agroforestry if we are to succeed. The efficient, economic production of agricultural commodities must continue, but we must collectively work to create more resilient, diverse ecosystems. Agroforestry success stories have demonstrated that efficient, profitable, agricultural production and working trees are not mutually exclusive.

and applications are inherently difficult to understand, computer-based decision and application support tools are needed to facilitate planning and technical assistance. These models would allow the evaluation of different options by comparing their predicted outcomes, and will be a big help in whole farm planning and watershed analysis approaches.

Meeting the Challenge

Researchers have a choice: they can change the research questions to fit their disciplines, or they can override disciplinary boundaries to deal with problems as they occur in the outside world. The first approach is easier, but it is not what applied sciences are supposed to do. If we take seriously the responsibility that comes with accepting society’s support of research to solve agricultural problems, then the problems must dictate the structure of research, not the other way around.

Agroforestry is well on its way to becoming a specialized science, and is exciting because of its multidisciplinary mix. The advances in agroforestry science in this decade are impressive, but there is still a long way to go.



The National Agroforestry Center
 A Forest Service — Natural Resources Conservation Service Partnership



History: The “Center for Semiarid Agroforestry” was authorized in the 1990 Farm Bill. In February 1995 the Center’s name was changed to the National Agroforestry Center (NAC) in response to strong national interest in agroforestry. In June 1995 a partnership agreement was signed by the Chiefs of the Forest Service and Natural Resources Conservation Service, making the NAC an interagency joint-venture.

Purpose: NAC is a pioneering program to accelerate the development of agroforestry, a science and practice that integrates agriculture and forestry land uses. The partnership combines resources of the two agencies to develop and apply agroforestry technologies in appropriate conservation and/or production systems for farms, ranches, and communities.

Role: The Center serves as a catalyst to form partnerships, promote cooperation, and leverage resources. NAC cooperates with a national network of agencies, universities, and organizations to encourage agroforestry research and technology transfer. The Center strives to develop and deliver agroforestry technologies based on the needs of resource professionals assisting landowners.

Programs:

Research & Development: Forest Service scientists and co-located NRCS scientists from the Watershed Sciences Institute and the Wetlands Science Institute work with university cooperators to develop and integrate agroforestry technologies to attain more economically, environmentally, and socially sustainable ecosystems.

Technology Transfer & Applications: Forest Service and NRCS Agroforesters work with a national network of cooperators to develop and distribute agroforestry technical information.

International Exchange: An International Coordinator facilitates the development of agroforestry projects with international cooperators and selectively involves agency and university professionals for mutual benefit.

For more information, call 402-437-5178 (extensions listed below):

Administration

- Dr. Bill Rietveld, Center Director, ext. 27

Research & Development

- Dr. Michele Schoeneberger, Research Program Leader and Soil Scientist, ext. 21

Technology Transfer & Applications

- Jerry Bratton, FS Lead Agroforester, ext. 24
- Bruce Wight, NRCS Lead Agroforester, ext. 36. Voice Mail: 1-800-384-8732, Box 945-5956
- Gary Kuhn, NRCS Agroforester, located at the NRCS Watershed Sciences Institute, Seattle, WA. Phone: 206-616-7166. Voice Mail: 1-800-384-8732, Box 851-1570
- Jim Robinson, NRCS Agroforester, located at the NRCS Grazing Lands Technology Institute, Ft. Worth, TX. Phone: 817-334-5232, ext. 3624. Voice Mail: 1-800-384-8732, Box 965-2290

International Technology Exchange

- Dr. Sarah Workman, International Coordinator, ext. 40

Geographic Contacts

- Northeast — contact Bruce Wight, NAC
- Southeast — contact Jim Robinson, Ft. Worth, TX
- Midwest — contact Bruce Wight, NAC
- Northern Plains — contact Jerry Bratton, NAC
- West — contact Gary Kuhn, Seattle, WA