



25  
years

In 1990, the Farm Bill authorized the establishment of the USDA National Agroforestry Center to accelerate the development and application of agroforestry technologies to attain more economically, environmentally, and socially sustainable land-use systems.



## NAC Director's Corner

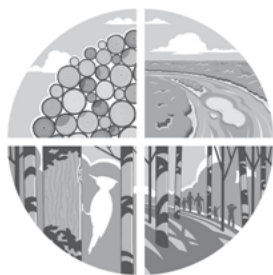
*A commentary on the status of agroforestry by Susan Stein, NAC Director*

In 1990, the Farm Bill authorized the establishment of the USDA National Agroforestry Center (NAC) to accelerate the development and application of agroforestry technologies to attain more economically, environmentally, and socially sustainable land-use systems. Since then, NAC has delivered more than 1.3 million requested publications into the hands of natural resource professionals who use them to promote agroforestry at workshops, trainings, and other events across the country. Throughout the last 25 years, NAC researchers have fostered practical science and created tools to further agroforestry adoption. But the Center's work involves a lot more than its research and technology transfer publications. NAC has had many impacts in the field of agroforestry through its tool development, outreach, education,

and partnerships across the country. The articles in this issue of Inside Agroforestry review many of these technology transfer and research efforts carried out through a partnership of U.S. Forest Service Research and Development, U.S. Forest Service State & Private Forestry, and the Natural Resource Conservation Service.

Our Nation's agricultural and forested lands, upon which we all depend, will be facing numerous challenges from climate change, weather, markets, and other unforeseen influences. Agroforestry is now recognized – nationally and globally – as a management option to assist farmers, ranchers, forest landowners, and communities across the landscape in addressing these concerns. As we go forward into the next 25 years, we at NAC, along with our many partners, will continue our tradition of exploring new agroforestry horizons and sharing agroforestry science, tools and assistance.

## USFS S&PF Cooperative Forestry and the USDA National Agroforestry Center



Through these efforts, the program encourages and promotes the creation of healthier, more livable urban environments across the nation.

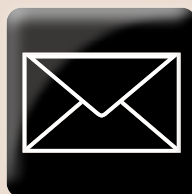
Cooperative Forestry's early partnerships with NAC centered on trees on private lands, including those not in forests. The FSP also played a key role in promoting windbreaks in the Great Plains. More recent collaborations have resulted in the creation of an agroforestry resource element in Forest Stewardship Plans. This encourages landowners to consider practices like silvopasture and forest farming when making decisions about managing their land. In urban forestry, NAC and the U&CF program have promoted the idea of "working trees" as a part of green infrastructure. Additionally, NAC research on trees' abilities to reduce nutrient pollution, create wildlife habitat, provide food, and create other benefits has continued to contribute to green infrastructure implementation. ♣

**Kate MacFarland**  
USDA National Agroforestry Center

The National Agroforestry Center began as a partnership of two Deputy Areas of the U.S. Forest Service, Research & Development and State & Private Forestry. Within State & Private Forestry, the Forest Stewardship Program and Urban and Community Forestry Program, both part of Cooperative Forestry, have been key partners in sharing ideas about the relevance of agroforestry practices to family forest owners and to communities. Like NAC, these programs were established in the 1990 Farm Bill and are celebrating their 25th anniversaries.

Through the Forest Stewardship Program (FSP), state forestry agencies work one-on-one with landowners to provide technical advice on forest management and tree planting. These recommendations are provided through long-term, comprehensive, multi-resource, Forest Stewardship Plans. The Urban and Community Forestry (U&CF) Program responds to the needs of urban areas by maintaining, restoring, and improving urban forest ecosystems on more than 70 million acres.

## Stay Connected with Agroforestry Connection



Agroforestry Connection is a periodic email update from the USDA National Agroforestry Center that includes information on new publications and upcoming events.

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# Developing the Technical Standards for Agroforestry

**Kate MacFarland**

USDA National Agroforestry Center

The Natural Resources Conservation Service (NRCS) is an important part of the USDA National Agroforestry Center. Developing NRCS Technical Standards for agroforestry practices has been an important step in the implementation of agroforestry. These standards improve the technical assistance that NRCS provides for these practices and allows landowners to access financial assistance for these practices through Environmental Quality Incentives Program and Conservation Reserve Program.

NRCS National Technical Standards can be developed in multiple ways. Sometimes a new technology is recognized to have national application. National specialists for NRCS then develop the national standard. The draft is then sent to the states for input before being posted for public review in the Federal Register. In other cases, a new technology without an existing Technical Standard is recognized at the state level. In this case, the state can develop an interim standard and test it for three years. After three years, the interim standard is evaluated. It can become a new national standard, get incorporated into an existing national standard, or be rejected. To be accepted, practices must address resource concerns identified by NRCS.

While National Technical Standards exist for alley cropping (311), multi-story cropping (379), riparian forest buffers (391), silvopasture (381), windbreak/shelterbelt establishment (380), and windbreak/shelterbelt renovation (650), it is up to individual states to adopt and develop state standards for these practices. This decision is up to NRCS and is guided by the state specialists responsible

**Bruce Wight**

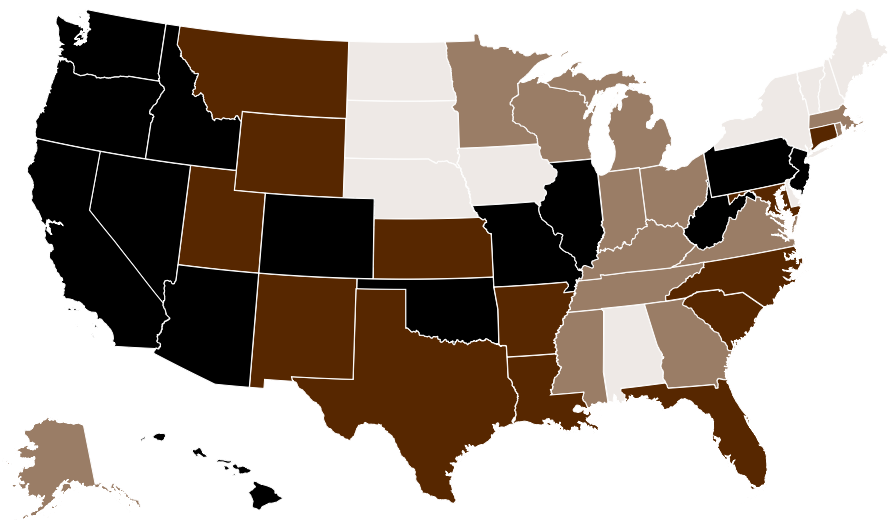
USDA NRCS (Retired)

for the particular practices. Some states have adopted the NRCS technical standards for all five agroforestry practices (see map).

Among the agroforestry Technical Standards, the windbreak standards have been around the longest. These were developed in the 1930s and 1940s and were widely accepted, particularly in the regions most affected by the Dust Bowl. A separate standard for Windbreak Renovation was developed in the late 1970s, as windbreaks planted 30 to 40 years earlier were declining and required improvements. The development of a national standard for riparian forest buffers took place in the early 1990s, as understanding of the applications for these buffers increased. This standard has also been broadly accepted as many states face the resource concerns that riparian forest buffers can address. An alley cropping standard was implemented in 1997, in part as a result of the research carried out by the University of Missouri on walnuts and annual crops. This standard has been accepted by many states, though not all. The silvopasture standard was developed during the early 2000s, drawing from significant data in the southeast as well as research from other regions. Multi-story cropping was the last standard to be developed in the 2000s. This standard arose from agroforestry practiced in the Pacific and Caribbean Islands but has relevance throughout the U.S. Together, these standards help to support agroforestry implementation through USDA programs, policies, and technical and financial assistance. †

## States that have adopted NRCS Technical Standards

Number of agroforestry standards adopted by state (5 max)



For more details on which agroforestry technical standards your state has adopted, please see: <http://nac.unl.edu/practices>

# How did the five most common temperate agroforestry practices evolve?

## Windbreaks

**Bruce Wight**

USDA NRCS (Retired)

Using trees and shrubs to protect fields, crops, livestock and people from climatic extremes has long been recognized throughout the world, starting in the 1600s with English hedges separating fields. As European settlement of North America progressed from the eastern forests to the western plains, people soon realized how harsh the climate can be without tree protection. Tree groves and hedgerows were successfully planted on the prairies of Ohio, Indiana, Illinois and Iowa during the early 1800s, but the Great Plains was a greater challenge. Incentives like the Timber Culture Act had good intentions, but essentially failed. Mennonites who migrated to Dakota Territory in the 1870s from the Russian Steppes tried to duplicate the shelterbelts (known as windbreaks today) from the steppes. Drought and lack of good planting stock were all hindrances. In 1916, the Northern Great Plains Field Station of the Agricultural Research Service at Mandan, North Dakota began experimenting with tree planting with cooperating landowners (ND, SD, MT, WY) resulting in about 1.5 million trees established in over 1,200 shelterbelts by 1920. Probably the greatest windbreak establishment push in the U.S. came during the Dust Bowl with the Prairie States Forestry Project, more commonly known as the Shelterbelt Project, led by the U.S. Forest Service. From 1935 to 1942, the project planted about 18,600 miles of shelterbelts (about 144 million trees and shrubs) on over 30,000 farms in six states (ND, SD, NE, KS, OK, TX). In 1942 the national leadership for

windbreaks was transferred to the USDA Soil Conservation Service (now NRCS).

In more recent times the conservation value of windbreaks continues to be recognized. The Conservation Reserve Program (CRP) through the Farm Services Agency (FSA) began with the 1985 Farm Bill. Windbreaks, along with select other conservation practices, were given special emphasis with a Continuous Sign-up option. Land with windbreaks could be enrolled at any time without competing with other bids.

Hundreds of miles of windbreaks were established through the CRP. In the last few years, windbreak application has averaged 2,000 miles per year through USDA programs. From the early days of conservation to the present, NRCS has continued to provide technical and financial assistance and leadership to landowners to establish windbreaks throughout the U.S. from Maine to Hawaii.

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## Riparian Forest Buffers

**Richard Straight**

USDA National Agroforestry Center



Aerial view of riparian forest buffer.  
Photo by Richard Straight

THE ECOLOGICAL IMPORTANCE OF VEGETATION in riparian areas has been widely documented over the last 50 years. In the 1960s, riparian grazing lands in the arid southwest and intermountain regions became recognized as critical habitat and migration corridors for wildlife. Soon thereafter, riparian vegetation was identified as critical for maintaining and protecting cold-water fisheries in the Pacific Northwest and New England. In the 1970s, passage of the Clean Water Act spurred subsequent studies on relationships between riparian vegetation and water pollutants, particularly on agricultural lands.

Some of the earliest documentation of runoff sediment and nutrient attenuation by riparian forest buffers was recorded by Richard Lowrance at the Southeastern Watershed Research Laboratory in Tifton, Georgia. At about this same time John Gilliam at North Carolina State University and David Correll at the Smithsonian Environmental Research Center in Maryland were documenting similar effects at different locations along the U.S. east coast. Wildlife and fisheries biologists were also confirming the value of riparian habitat and corridors through developed and agricultural landscapes.

In 1991, David Welsch of the U.S. Forest Service synthesized the results of these early studies into one publication, "Riparian Forest Buffers: Function and Design for Protection and Enhancement of Water Resources." This publication proposed the now-familiar three-zone riparian forest buffer concept. However, most of the research supporting its conclusions about sediment and nutrient filtering had

been conducted in coastal areas. So, researchers throughout the U.S., including at the National Agroforestry Center, began studies to determine how riparian buffers work in different landscapes and under different conditions.

Around 1995 the USDA Natural Resources Conservation Service adopted the Riparian Forest Buffer standard in the Field Office Technical Guide (FOTG). This standard was modeled after the three-zone concept proposed by Welsch and opened the door for the USDA and many conservation groups to promote and support the implementation of riparian forest buffers.

## Silvopasture

**Richard Straight**

USDA National Agroforestry Center

GRAZING UNDER TREES occurred in North America long before cattle and horses were brought to this continent and opportunistic grazing of livestock on less productive woodlands has been practiced for centuries. But the intensive silvopasture approach to integrating livestock, trees and forage has gained attention in research and application only since the late 1980s and early 1990s.

Some of the early research that confirmed the potential of silvopasture systems began in the 1950s with southern pine species. But it was in the 1990s when research in the Pacific Northwest and Southeastern U.S. began to quantify the impacts on soil, livestock, forage production and wood quality in silvopasture systems. Soon after this some innovative landowners began to take notice of the research and began creating their own silvopastures.

In 1999, the National Agroforestry Center dedicated one NRCS-funded employee to pull together a cadre of specialists to promote silvopasture to universities, state forestry agencies and NRCS staff across the southeast from Texas to North Carolina. Soon, organizations like the Long Leaf Alliance and the 1890 Agroforestry Consortium, along with too many others to mention here, were also investigating silvopasture



Cattle walk through silvopasture containing loblolly and slash pine with bahama grass for forage.  
Photo by Andy Mason

systems. Another significant step forward in silvopasture began when the University of Missouri and Cornell University began to research and promote silvopasture in central and northern hardwoods. Though much needs to be done to better understand hardwood silvopasture management, the understanding and use of this land management approach continues to advance in many forest types and regions.

## Forest Farming

**Catherine Bukowski**

Department of Forest Resources and Environmental Conservation  
Virginia Tech University



Flags mark goldenseal on forest floor. Photo by Richard Straight

FOREST-GROWN AND CULTIVATED CROPS have been produced by cultures all around the world. Much of this knowledge has been passed down through oral tradition, and in many cases, has been held closely within these cultures. Interestingly, as much of this traditional knowledge is being lost, there has also been an increased interest by the larger public in forest-grown foods, herbs and craft materials. In March of 1990, the New York Times ran an article about the increasing availability of seasonal foods, particularly specialty items of high interest. However, products such as wild mushrooms, fiddlehead ferns and ramps, were noted as specialty crops defying cultivation. We now know these products are in demand and can be cultivated through forest farming methods. In 1994, an *Inside Agroforestry* article introduced alternative and specialty crops that could be incorporated into agroforestry practices to diversify and add income. Today, these crops are most often associated with forest farming. The following people deserve special recognition for their major contributions to developing forest farming as a practice over the last twenty five years.

Deborah B. Hill (University of Kentucky) was one of the main contributors to the field of non-timber forest products and spent much of her career creating the first extension resources on forest farming. Out of Cornell University and Cooperative Extension have come experts in ginseng cultivation (Robert Beyfuss), extensive research on forest cultivated mushrooms (Kenneth Mudge), work on integrating ducks with forest farming (Steve Gabriel) and publicly available online forest farming training modules (Kenneth Mudge and Louise Buck - forest farming education and social learning networks for agroforestry). Kenneth Mudge and Steve Gabriel also co-authored a recent book, *Farming the Woods*, which offers a contemporary overview of forest farming practices in

**SEE "PRACTICE EVOLUTION" PAGE 15**

**The recognition of the market value of nontimber forest products has escalated such that people are interested in some sort of quality certification of these products.**



# Agroforestry Policy at USDA

Eric Norland  
Forest Resource Management  
USDA National Institute of Food and Agriculture

Agroforestry has a long history at USDA. It can be traced back to the Dust Bowl years when windbreaks were established to reduce soil erosion in the Great Plains. More widespread interest in agroforestry began in the mid-1980s but it was not institutionalized in the Department of Agriculture, despite several working group reports over the years. However, things have changed at USDA and agroforestry is an important topic for the Department.

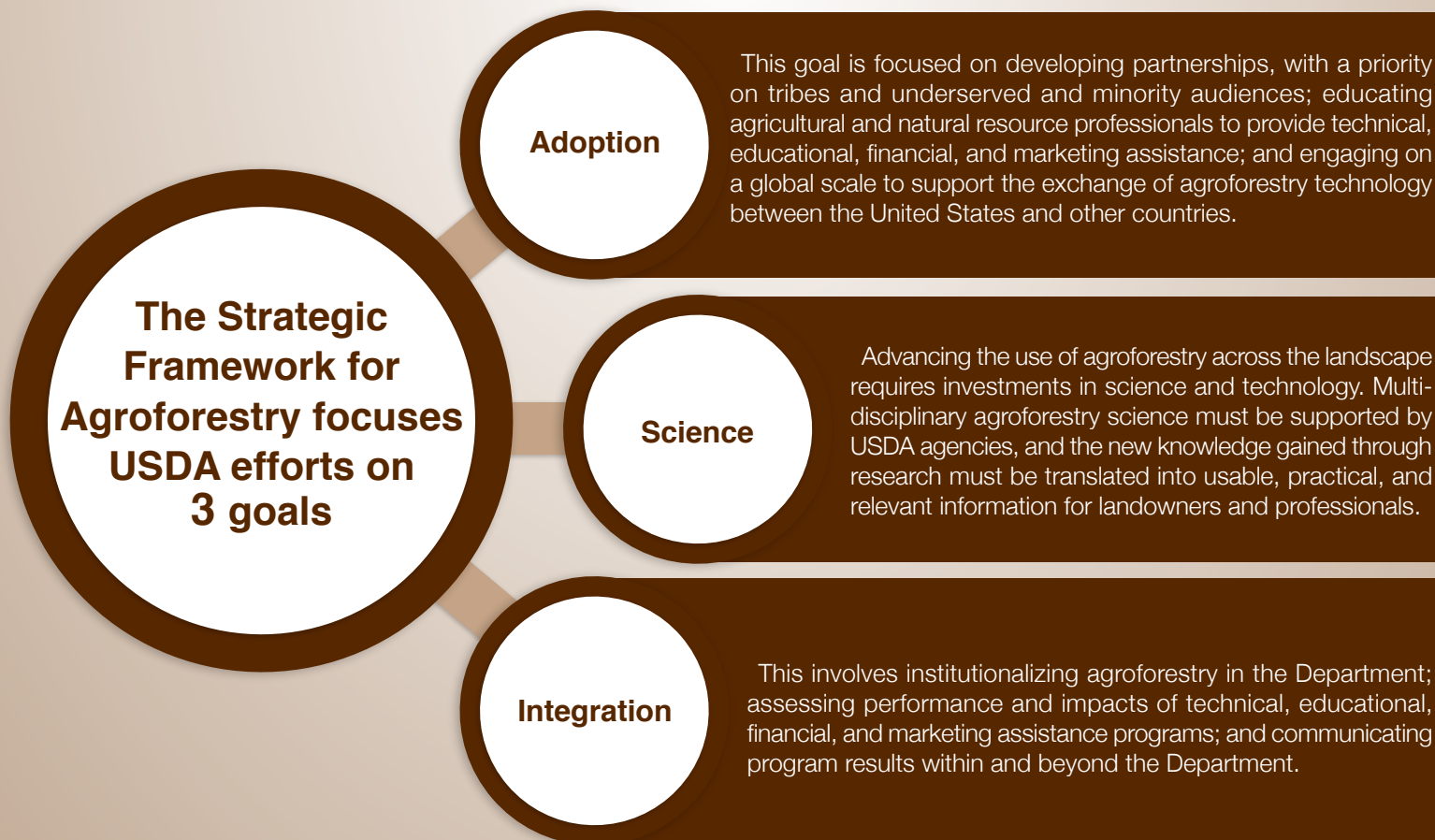
The approach of Tom Vilsack, the Secretary of Agriculture, to the nation's agriculture and natural resources can be summed up by "all-lands, all-hands." Agroforestry can figure prominently in the creation and management of diverse landscapes that are more resilient to the changing climate, improve the vibrancy of rural economies, and increase the economic security of those who work the land by growing additional crops and protecting existing crops in agroforestry systems in order to generate more income.

In 2011, Secretary Vilsack released a Strategic Framework for Agroforestry, FY 2011-2016, which provides direction for agroforestry efforts in the Department. The framework grew out of a roundtable meeting of more than 100 stakeholders who provided recommendations for expanding agroforestry interest and programs in USDA. The strong support, interest, and enthusiasm of these

stakeholders led to the development of the framework by senior program leaders from eight USDA agencies: Agricultural Marketing Service (AMS), Agricultural Research Service (ARS), Farm Services Agency (FSA), Forest Service (FS), National Agricultural Statistics Service (NASS), National Institute of Food and Agriculture (NIFA), Natural Resources Conservation Service (NRCS), and Rural Development (RD).

In 2013, the Secretary issued a USDA Departmental Regulation on the Department's agroforestry policy to ensure that agroforestry programs will continue to evolve and be utilized. This established the Agroforestry Executive Steering Committee and the Interagency Agroforestry Team, who have worked to implement the framework. The team has carried out many activities, including adding an agroforestry question to the 2012 Census of Agriculture, developing a Southeastern Silvopasture Initiative, and initiating webinars on agroforestry for USDA employees.

Agroforestry is definitely on the move in USDA! The Secretary has given it prominence, and the Departmental Regulation and the interagency committee and work team have given it "legs." Watch for more USDA agroforestry news at [www.usda.gov/agroforestry](http://www.usda.gov/agroforestry).



## Adoption

This goal is focused on developing partnerships, with a priority on tribes and underserved and minority audiences; educating agricultural and natural resource professionals to provide technical, educational, financial, and marketing assistance; and engaging on a global scale to support the exchange of agroforestry technology between the United States and other countries.

## Science

Advancing the use of agroforestry across the landscape requires investments in science and technology. Multi-disciplinary agroforestry science must be supported by USDA agencies, and the new knowledge gained through research must be translated into usable, practical, and relevant information for landowners and professionals.

## Integration

This involves institutionalizing agroforestry in the Department; assessing performance and impacts of technical, educational, financial, and marketing assistance programs; and communicating program results within and beyond the Department.

# TECH TRANSFER BACK TO THE FUTURE

**Kate MacFarland**  
USDA National Agroforestry Center

TECHNOLOGY TRANSFER and outreach have long been an integral part of the USDA National Agroforestry Center (NAC). The Technology Transfer team examines the results of research and products from researchers at NAC as well as other agroforestry researchers around the country and shares it with natural resource professionals through workshops and trainings, publications, electronic communications, and other forms of outreach for natural resource professionals. The current NAC Technology Transfer Team is comprised of Richard Straight (Lead Agroforester), Kate MacFarland (Assistant Agroforester), Nancy Hammond (Secretary and Project Manager), and Joe Banegas (Information Assistant and Designer). The team works closely with partners across the country to accomplish its goals.

Workshops and trainings remain an important part of the work of the Technology Transfer Team. In FY2015, the team participated in a range of agroforestry activities all over the country including trainings in Kansas, Minnesota, Missouri, and Oregon. They also attended meetings and conferences in Iowa, Minnesota, Nebraska, New York, and Pennsylvania. In recent years, the team has also facilitated and promoted webinars on important agroforestry topics.

The Technology Transfer Team has also played an important role in promoting many agroforestry tools developed by NAC researchers and other partners. These tools help landowners make decisions about how to implement agroforestry practices on their land. Some NAC tools include AgBufferBuilder, Buffer\$, the Conservation Buffer Guide, CanVis (visual simulation), and the Windbreak Economic Model, as well as training materials and presentations that others can use.

NAC's Technology Transfer publication outreach has evolved from producing a few technical notes and newsletters on agroforestry each year into a suite of publications on a wide range of topics. All NAC publications and tools are available at no cost.

**Inside Agroforestry newsletter:** Each issue presents topics applicable to agroforestry and explores the latest agroforestry news and information on this topic.

**Working Trees brochures:** These 6-page color publications serve as a great introduction to agroforestry. They illustrate agroforestry practices that landowners can apply to help meet their production and conservation objectives.

**Working Trees displays:** NAC also produces stand-up displays that correspond to the brochures for use at conferences, trainings, and other events.

**Working Trees information sheets:** New in 2012, these single page publications, front and back, describe the role agroforestry can play in addressing a specific issue or providing some benefit.

**Agroforestry technical notes:** These technical notes provide agroforestry information in a useful "how to" format. Agroforestry Notes are numbered and sorted by agroforestry practice.



Looking forward, NAC has begun implementing many additional outreach methods to reach natural resource professionals, landowners, and other audiences. Some of these include:

**Agroforestry Connection email update:** This periodic email update includes information on new publications, upcoming events, and other agroforestry topics. To subscribe, go to: <http://eepurl.com/4HKB1>

**Social media:** NAC engages in social media through the U.S. Forest Service Twitter and Facebook accounts. Follow the U.S. Forest Service on twitter and Facebook to get additional NAC updates, along with information about other Forest Service activities.

**NAC website:** The NAC website contains PDFs of all of NAC's technology transfer publications available for download as well as other updates, tools, and resources. It can be accessed at: <http://nac.unl.edu/> NAC plans to expand the information available on its website in the coming year.

**Blog posts:** NAC occasionally writes blog posts for the Forest Service and USDA blogs about important topics in agroforestry, new publications, or other exciting agroforestry news. To see these blog posts or sign up to receive USDA blogs in your email, visit: <http://1.usa.gov/1JBvxin>

# 25 Years of Research at NAC

**Michele Schoeneberger**  
USDA National Agroforestry Center

**Kate MacFarland**  
USDA National Agroforestry Center



**A**s part of the newly established Center for Semi-Arid Agroforestry in 1992, the Forest Service Research Work Unit (RWU) in Lincoln focused their efforts on the selection and production of trees that could withstand the extreme conditions experienced in the Great Plains, a long standing effort since the unit was initiated in 1953.

NAC's research program has evolved much over the past 25 years — from developing stress and pest resistant plant materials for the Great Plains to providing science delivery on a wide range of ways agroforestry can best be used to address the many concerns now facing our agricultural lands. From working predominantly only on field and farmstead windbreaks, NAC's RWU now provides input on all five categories of agroforestry, along with a growing sixth category of adaptations of agroforestry technologies to meet emerging needs.

The expansion of NAC's RWU program started during the mid-1990s as NAC researchers began to ask how one could better design and plan agroforestry plantings to improve their performance. Much of this early work was in response to the growing awareness of water quality issues in America's agricultural heartland. Spurred by Richard Lowrance's research on the benefits of riparian buffers and Dave Welch's 1991 booklet that synthesized this research for the Forest Service, NAC initiated a riparian buffer program in 1994. Research Riparian Ecologist at NAC, Mike Dosskey studied whether and how riparian buffers could improve water quality in the Great Plains as well as nationally. Important questions such as "how do riparian buffers work in the Great Plains landscape?" and "how should riparian buffers be designed to be effective?" were addressed. Those results have been translated into design models and tools.

The research focus expanded to address the question of where in the landscape these buffers should best be placed to get the biggest return in terms of water

quality services. This work soon led to a more holistic look at how water quality effectiveness could be increased when riparian buffers are combined with other upland conservation practices. Quantifying the water quality improvements that buffers can provide helped to promote the idea that more than just riparian buffers are needed. About this same time, NAC began to shift its research strategy and operations away from field/lab-based efforts maintained internally to one that could capitalize on the many field efforts by others around the U.S. and beyond. This approach allowed NAC to begin providing more timely science delivery by synthesizing from this existing data, better meeting the needs of those having to make decisions pertaining to land management now. Dosskey's paper "Toward Quantifying Water Pollution Abatement in Response to Installing Buffers on Crop Land" is an excellent example of this approach to provide timely science delivery that could advance our understanding and therefore hopefully use of buffers as a water quality tool.

This planning and design focused effort at both practice and landscape scales was greatly facilitated by NRCS Landscape Architect Gary Wells, who was cohoused at the Center. As part of NRCS' Area-Wide Planning and Streambank Bioengineering teams, he brought to NAC a broader perspective regarding the full range of functions that buffers can perform in agricultural landscapes, how one might go about attaining them, and how NAC could then develop tools and information more likely to be used by NRCS field staff and others.





Dust storm closes in on farmstead during the 1930s Dust bowl. NAC photo

Research into buffers' multiple functions continues at NAC today. Gary Bentrup, Landscape Planner at NAC, began working with NAC GIS specialist Tim Leininger and later Todd Kellerman to develop tools to assist in identifying conservation needs. This work began with an online Conservation Atlas. Bentrup's work on how to design and place conservation buffers continues. His Conservation Buffer Guide, first published in 2008, provides illustrated design guidelines that describe how buffers can be applied to protect soil, improve air and water quality, enhance fish and wildlife habitat, produce economic products, provide recreation opportunities, or beautify the landscape. This synthesis of over 1400 research articles provides information in a useful format for natural resource professionals.

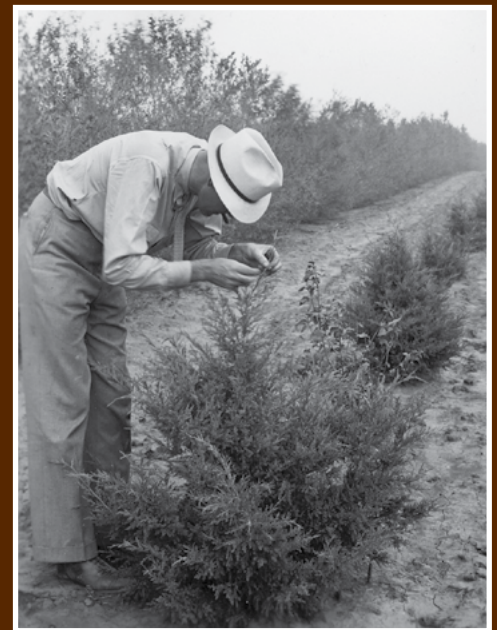
Along with demonstrating the many functions of buffers, the Conservation Buffer Guide also exemplifies NAC researchers' approach to developing tools that support the planning, design, and establishment of conservation buffers. Other tools developed at NAC include AgBufferBuilder (a GIS-based computer program for designing buffers around agricultural fields), Buffer\$ (a spreadsheet tool that can be used to analyze cost and benefits of buffers compared with

traditional crops), and CanVis (visual simulation software).

Having been with the Center as NAC's Research Program Lead since the beginning, Michele Schoeneberger has worked for many years to initiate and facilitate efforts and partnerships needed to address key areas of these multipurpose 'trees-outside-of-forests'; from a broader view of buffers as 'ECOBELTS' to address rural/urban interface issues to inclusion of agroforestry in the climate-smart 'tool box'. Early efforts begun in the mid-1990s with University of Nebraska partners is now providing guidance in the estimation of biomass and carbon in agroforestry trees. Most recently she has been involved in pulling together scientists to develop a scientific consensus on temperate agroforestry's roles in mitigating and adapting to climate change and in building more resilient ranch and farm operations. Branching Out, the title of the 2012 U.S./Canadian climate change paper, perhaps best sums up not only the 25 years of NAC's R&D efforts to date but also what you can expect from this program as we grow into the future. 🌱

# Before the Center

**Agroforestry has long had ties to Lincoln, Nebraska. The Prairie States Forestry Project, which planted millions of trees into windbreaks across the Great Plains after the Dust Bowl, was based in Lincoln. In 1953, the U.S. Forest Service established a Research Work Unit in Lincoln that focused on tree improvement, developing trees with the best characteristics for windbreaks growing in region that has long dealt with weather extremes. This work on tree improvement continued for many years.**



A forestry foreman inspecting cedars for red spider mites in shelterbelt in 1938. Photo by Carl A. Taylor

# Evolution of U.S. Agroforestry Research and Formalization of Agroforestry Education

**Michael A. Gold**

Center for Agroforestry  
University of Missouri

## **U.S. Agroforestry Research: From Tropical to Temperate**

In the 1980s-1990s agroforestry researchers were active at a number of U.S. universities including Berkeley, Cornell, Florida, Hawaii, Idaho, Kentucky, Michigan State, Minnesota, Purdue, Virginia Tech, Washington State, and Yale. Research and education efforts were heavily slanted toward tropical agroforestry and international development. Initial research was focused on the biophysical aspects of agroforestry, while socioeconomic research emerged as an important focus in the late 1990s.

The earliest U.S. temperate agroforestry efforts centered on conferences. Training and education programs started in the late 1980s and increased in quantity and scope throughout the 1990s and 2000s. One of the earliest U.S. agroforestry conferences was the “International Hill Land Symposium” at West Virginia University, in

1976. From 1980-2000, a number of notable conferences and workshops took place: “Tree Crops for Energy Co-Production on Farms” at the Solar Energy Research Institute (SERI) in Estes Park, Colorado in 1980; “Foothills for Food and Forests” at Oregon State University in 1983; “1st International Windbreak Symposium” at the University of Nebraska in 1986; “International Agroforestry Short Course” at Colorado State University in 1986; “Mid-South Conference on Agroforestry Practices and Policies” in West Memphis, Arkansas in 1990; and “Agroforestry and Sustainable Systems” at Colorado State University in 1994. Later, the focus broadened to include specialty crop markets, as demonstrated by the “North American Conference on Enterprise Development through Agroforestry: Farming the Forest for Specialty Products” at the University of Minnesota in 1998.

The first North American Agroforestry Conference (NAAC), organized at Guelph University in Ontario, Canada in 1989, was the first comprehensive agroforestry

conference to include all existing dimensions of temperate agroforestry, biophysical and socioeconomic, and subsequently turned into the pre-eminent biennial agroforestry research conference for North America. Fourteen biennial NAACs (1989-2015) have been held across the U.S. and Canada, and since 1993 all NAACs have been sponsored by the Association for Temperate Agroforestry (AFTA) which was organized in 1993.

Coinciding with the start of the biennial NAAC series in the early 1990s and accelerating since 2000, both biophysical and socioeconomic aspects of temperate agroforestry research have emerged as major foci at a number of U.S. universities including (but not limited to) Cornell, Florida, Georgia, Illinois, Iowa State, Minnesota, Missouri, Nebraska, Penn State, Southern Illinois and Virginia Tech, along with a number of 1890 Land Grant institutions (including Alcorn, North Carolina A&T, Tennessee State, and Tuskegee).

## **U.S. Agroforestry Training**

Over the past 30 years, as temperate agroforestry research developed the science underlying the five recognized practices, localized short-term trainings focused on the application of agroforestry practices to temperate regions of the U.S. For example, the University of Nebraska and

Two men drill holes in logs to prepare for growing mushrooms at an 1890 Agroforestry workshop.  
Photo by Richard Straight





the USDA Soil Conservation Service, now the Natural Resources Conservation Service, offered windbreak short courses in the 1980s including the development of extensive training materials. The University of Missouri Center for Agroforestry (UMCA) began offering 1/1.5 day agroforestry short courses in the late 1990s and created an Agroforestry Training Manual in 1998, with updates in 2001, 2006, 2013, and 2015.

The USDA released its Agroforestry Strategic Framework in 2011, as a road map for advancing the science, practice, and application of agroforestry. In response to the needs identified in the USDA Strategic Framework, a week-long pilot agroforestry academy was created by the UMCA and the Mid-American Agroforestry Working Group (MAAWG – organized in 2009) to train

agroforestry education was held in 1988. Articles from the conference, “Agroforestry Education and Training: Present and Future” held at the University of Florida, Gainesville, were published as a Special Issue of *Agroforestry Systems* in 1990 (Vol. 12: Number 1). Overarching themes at this conference included: current status and trends in agroforestry education and training, current and future needs in agroforestry education, current and future needs in training, and current and future needs in resource development and networking. A 1988-89 survey revealed that 14 of 39 SAF-accredited U.S. forestry schools offered a course in agroforestry (Warren and Bentley 1990), mostly focused on the tropics.

From 1990-2010, individual agroforestry undergraduate and graduate courses

### **The Way Forward: Creating a Professional Agroforestry Credential**

Since AFTA’s establishment in 1993 there have been ongoing discussions about the need to create a formal agroforestry credential for practicing agroforesters similar to that offered to certified crop advisors, certified horticulturalists and professional foresters. In 2012, a number of co-authors published a commentary in the *Journal of Forestry* “Advancing Agroforestry through Certification of Agroforesters: Should SAF have a Role?” addressing this issue. In 2015, SAF’s Certification Review Board (CRB), which oversees the Certified Forester credential, contacted the Agronomy Society of America (ASA) to propose the formation of a joint

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## Since AFTA’s establishment in 1993, there have been ongoing discussions about the need to create a formal agroforestry credential

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natural resource professionals, extension agents, and other agricultural educators who work with landowners. Academies in 2013 (Missouri) and 2014 (Minnesota) were attended by 56 educators from 9 States and Washington, D.C. The academies provided advanced training on the five recognized temperate zone agroforestry practices and concluded with an applied planning and design exercise. These efforts have since been replicated in other parts of the Midwest, and other regions of the country have begun offering variations on the academy training approach.

### **U.S. Agroforestry Education**

Short courses, workshops/conferences, and academies are essential forms of agroforestry outreach and education. However, some working professionals and landowners across the U.S. and overseas are seeking more in-depth and comprehensive programs in the form of undergraduate courses along with graduate certificates or degrees. The first U.S. conference specifically focused on

continued to be offered at numerous U.S. universities, with some universities dropping agroforestry and others creating new courses. However, as of 2010, no U.S. university had created a graduate program specifically designed to offer an agroforestry certificate or M.S. degree targeted to meet the needs of working professionals whose options are limited by time and geography. In 2011, the Center for Agroforestry at the University of Missouri formally launched an online Graduate Certificate and Master’s degree program in agroforestry to help address current and future needs of the agroforestry profession. One important outcome of the online M.S. is that it is catalyzing additional interest at other U.S. colleges and universities (e.g., an online agroforestry M.S. graduate recently created two new agroforestry courses at Sterling College in Vermont).

SAF-CRB-ASA task force to explore the costs and benefits of establishing a national joint agroforestry credential, certificate, or certified agroforester program. Certification can draw upon existing agroforestry academies and graduate certificate programs designed to meet the needs of working professionals. If brought to fruition, the establishment of a “Certified Agroforester” will not only create new job opportunities, but more importantly, will expand the growth of agroforestry practices “on-the-ground” with professional guidance. †



# Agroforestry Working Groups, Communities, and Networks



Forest Farming Workshop (2014)



Agroforestry Academy in Minnesota (2015)



1890 Agroforestry Consortium (2011)

**Kate MacFarland**  
USDA National Agroforestry Center

The mission of the National Agroforestry Center is to accelerate the application of agroforestry through a national network of partners. While NAC supplies research, tools, and technology transfer materials to the public, implementation of agroforestry practices occurs at the local level. This means that regional partners – those that work with landowners in a particular area – have always been important partners for NAC.

In 2009, the Mid-American Agroforestry Working Group (MAAWG) was formed. Its goals include identifying core issues for advancing agroforestry in the region, initiating and coordinating actions to address and resolve these core issues, and communicating effectively with key audiences about the group's purpose, core issues, and findings. Members include the Agricultural Marketing Resource Center, the Center for Agroforestry (University of Missouri), the Center for Integrated Natural Resources and Agricultural Management (University of Minnesota), Green Lands Blue Waters,

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To share expertise, resources, and ideas, these partners often work together at the regional level. Partners also come together around specific topics, practices, or areas of interest. These working groups have had a long history in the implementation of agroforestry.

One community for agroforestry, formed in 2004, is the 1890 Agroforestry Consortium, a team of 1890 land-grant universities and USDA agency partners. Its mission is to develop and advance agroforestry research, teaching, and extension among the 1890 land-grant universities plus Tuskegee University using multi-disciplinary teams of faculty and staff working in partnership with government agencies and other entities. Over the years, this consortium has conducted numerous trainings and workshops, carried out locally specific research, and established demonstration sites.

the Leopold Center for Sustainable Agriculture (Iowa State), NRCS, Trees Forever, University of Wisconsin extension, U.S. Forest Service, and the USDA National Agroforestry Center. In conjunction with some of the MAAWG members, the University of Missouri received a grant from North Central SARE to develop an Agroforestry Academy curriculum and carry out two pilot train-the-trainer Agroforestry Academies in 2013 and 2014. These successful academies attracted participants from throughout the region and have been adapted and replicated in other regions of the U.S.

The Chesapeake Bay Agroforestry Working Group emerged from the Chesapeake Bay Agreements and the Chesapeake Forestry Workgroup. The 2010 Chesapeake Bay Total Maximum Daily Load for nutrients led to state-level Watershed Implementation Plans and

the Chesapeake Executive Order Strategy. This strategy includes recommendations for forest restoration and agroforestry, particularly riparian forest buffers. The Chesapeake Bay Agroforestry Working Group had its first in-person meeting in May 2014. Its members include Frostburg State, MD Department of Forestry, NRCS, PA Department of Agriculture, PA Department of Conservation and Natural Resources, Penn State, USDA National Agroforestry Center, U.S. Forest Service, Virginia Tech, and the WV Division of Forestry. A related group, the Northeast and Mid-Atlantic Agroforestry Working Group, overlaps with this Chesapeake Group. It has successfully applied for a Northeast SARE grant for Northeast Advanced Agroforestry Training for Natural Resource and Agricultural Educators, to be held in 2016 and 2017.

The Pacific Northwest Agroforestry Working Group was formed as a result of a workshop held in May 2013 to assess the current status of PNW agroforestry education, research, and outreach activities and to discuss forming a working group. Its members include the Benton Soil and Water Conservation District, NRCS, Oregon Department of Forestry, Oregon State University, and others. Since that initial meeting, the group has held workshops in October 2014 and July 2015 for natural resources professionals.

In addition to geographically focused groups, other groups focus on particular practices. Some of these communities are virtual and rarely if ever gather in person. The Forest Farming eXtension Community of Practice is a network of forest farming experts from across the United States, initiated with support from a NIFA grant and NAC. It provides information on a variety of forest farming topics through articles, frequently asked questions, webinars, newsletters, and social media. Cornell Cooperative extension moderates a silvopasture forum, which is a growing network of silvopasture practitioners who share ideas, information and experiences. This site also publicizes relevant webinars, workshops, and conferences. The Temperate Forest Mushroom Growers Network of North America is another group focused on sharing information. This group of growers discusses questions, events, and activities that advance the practice of forest mushroom cultivation.

In addition to the groups mentioned here, there are many other working groups and networks that help implement agroforestry practices. Many of these groups include agroforestry along with a variety of other approaches to encourage conservation and sustainable agriculture. NAC is thankful for the important work carried out by all of these groups. ‡

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# Agroforestry @ The National Institute of Food and Agriculture

**Eric Norland**  
Forest Resource Management  
USDA National Institute of Food and Agriculture

The National Institute of Food and Agriculture (NIFA) is USDA's external funder of research, education, and extension at the nation's land-grant universities, and agroforestry is one of the areas of agricultural and natural resources science that is supported by NIFA.

Agroforestry research is conducted by several universities. Over the years, most of the agroforestry practices have each been the focus of different research projects at land-grant institutions. Studies have examined the benefits and applications of windbreaks and shelterbelts, riparian buffers, silvopasture, multi-story cropping (also known as forest

farming), bioenergy products, and special uses such as living snow fences. The land-grant universities that were established in 1890 to serve the African American population have established an Agroforestry Consortium that takes advantage of the expertise across all 19 institutions.

NIFA funding to the Cooperative Extension System supports agroforestry extension workshops, academies, working groups, websites, field days, and publications. In addition, through the Sustainable Agriculture Research and Education program, SARE, landowners and professionals around the country have received grants to advance the understanding of agroforestry. The USDA National Agroforestry Center (NAC) has been an important partner with NIFA in recent years to expand agroforestry in the U.S. NIFA and NAC co-funded agroforestry

projects through the Sustainable Agriculture Research and Education (SARE) program to conduct on-farm producer trials and professional development for Extension educators. In 2011, NIFA and NAC also co-funded an electronic Extension (known as eXtension) Community of Practice on Forest Farming ([http://www.extension.org/forest\\_farming](http://www.extension.org/forest_farming)). This Community of Practice is lead and coordinated by Virginia Tech University. No matter where you are in the U.S. or the world, current and potential producers of agroforestry crops grown in the shade of a forest canopy can find information on the internet about growing and marketing a wide variety of plants for medicinal and food use.

Agroforestry will continue to be an important interest for NIFA and its many partners well into the future. ‡

# Direct(ors') Perspective

**Rich Straight**

USDA National Agroforestry Center

Over the last 25 years the USDA National Agroforestry Center has had four Directors. The fourth, Susan Stein, began her tenure in June 2014. A center director has a unique perspective and more insight can come with additional time away from the position. So, we decided to ask the three previous Directors questions about the issues they worked on as Director and the significant advances in agroforestry that occurred while they held the position. Unfortunately, we were unable to reach the Center's first Director Bill Rietveld. He's probably been out backpacking. Bill was leader of a Forest Service Research Unit in Lincoln when the discussion of creating a U.S. Forest Service center for agroforestry first came up. Bill proceeded to work with a fairly large group of people in the Forest Service and USDA, Congress and universities who wanted to see the center created. And so the Center for Semi-Arid Agroforestry came into being with authorization in the 1990 Farm Bill.

In 1998, Greg Ruark took over the Director position. When asked about the big issues he worked on, Greg said, "Agroforestry was, and to a large extent still is, a new set of concepts for most natural resource professionals working for the Forest Service or the Natural Resources Conservation Service in the United States. Many natural resource professionals have strong technical training in forestry or agriculture but not in both fields. Likewise, federal and state agency landowner assistance programs are often targeted at either forestry or agriculture."

Ruark said the two main achievements that occurred trying to meet this challenge

involved the RC&Ds and the 1890 Universities. He explains, "One of the exercises we undertook around 2000 was to conduct a national survey of the USDA Rural Conservation and Development Councils, RC&Ds, to find out where agroforestry was being utilized, what practices were being employed, and where there was interest in using more agroforestry. The survey revealed a strong national interest in agroforestry." The results of this survey helped the NAC plan its research and technology programs and better target its efforts for landowners.

The other important achievement still bears fruit today. Ruark said, "In the late 1990s, the USDA Commission on Small Farms identified agroforestry as a set of technologies that held promise for limited resource farmers and recommended that USDA increase its efforts. In 2000, the NAC initiated a partnership with the 1890 Land Grant Universities as a way of equipping university faculty to incorporate agroforestry information into their teaching and extension efforts." Each summer for six years NAC brought together faculty from up to 15 of the 17 1890 institutions for a week-long train-the-trainer workshop on various aspects of agroforestry. Several years later when the 1890 Universities were included in the USDA McIntire-Stennis research funds, many of them used these funds to establish agroforestry research projects. Today, faculty at the 1890 Universities continue to advance agroforestry research and convey technology to minority and underserved landowners.

Andy Mason became the NAC Director in 2009. Visibility and recognition of

agroforestry both within the USDA and throughout the many conservation organizations continued to be priorities. Andy says, "The reorganization/realignment of the NAC organization from the Southern Research Station to Washington Office Research & Development was the biggest issue I dealt with as NAC Director. Very simply, when you are a national center it needs to be more than just in your name; it needs to be reflected in the way you are organized and who you report to in the larger organization."

Andy also worked tirelessly to elevate the recognition of agroforestry beyond the US Forest Service and the Natural Resources Conservation Service. "The completion in 2011 of the USDA Agroforestry Strategic Framework, FY 2011-2016 was – and I believe will continue to be – a very significant advancement for agroforestry in the United States. This first ever USDA-wide strategic direction for agroforestry was strongly supported by USDA as evidenced by Deputy Secretary Kathleen Merrigan's public release of the strategy on June 6, 2011, at the 12th North American Agroforestry Conference in Athens, GA." And Mason continued, "The Strategic Framework led to USDA chartering the Agroforestry Executive Steering Committee (AESC) to guide implementation of the Framework. This committee was made up of senior executives from eight USDA agencies. The AESC supported a first-of-its-kind Agroforestry: USDA Reports to America, Fiscal Years 2011–2012." Mason concluded, "As a result of these USDA-wide efforts, I believe USDA and its cooperators are much more aware of agroforestry, its



"Agroforestry was, and to a large extent still is, a new set of concepts for most natural professionals"

-Greg Ruark, NAC Director (1998-2009)





“The completion in 2011 of the USDA Agroforestry Strategic Framework, FY 2011-2016 was – and I believe will continue to be – a very significant advancement for agroforestry in the United States.”

-Andy Mason, NAC Director (2009-2014)

relevance to today’s issues, and the vital work of the National Agroforestry Center.”

The former Director also says, “Another important accomplishment that helped advance agroforestry in North America was the completion of a Memorandum of Understanding (MOU) in 2012

between USDA and Agriculture and Agri-Food Canada (AAFC).” The MOU encourages NAC and Canada’s Agroforestry Development Center (ADC) in Indian Head, Saskatchewan to collaborate in “... areas of mutual interest, including advancing agroforestry science and tools for climate

change mitigation and adaption in temperate North America...”

A lot has changed over 25 years, but as former Director Ruark says, “The challenge of establishing agroforestry as a core set of practices for both forestry and agriculture still remains.”

## PRACTICE EVOLUTION, CONTINUED FROM PG. 5

temperate North America. James Freed (Washington State University) studied the contribution of non-timber forest products to local economies in the Northwest U.S. and implications for sustainable forest management. James L. Chamberlain’s (USDA Forest Service) research on non-timber forest products has provided an inventory of natural populations for conservation management and cost-effective forest farming methods and necessary growing conditions of forest farmed products such as ramps, ginseng, goldenseal and cohosh. Jeanine Davis (North Carolina State University) has co-authored a book, *Growing and Marketing Ginseng, Goldenseal and other Woodland Medicinals*, in addition to cultivating learning networks for producers in the Southeastern U.S. The recognition of the market value of nontimber forest products has escalated such that people are interested in some sort of quality certification of these products. Sarah Workman (USFS Southern Research Station) has contributed research to understanding landowner preferences for agroforestry practices, participatory approaches of nontimber forest product inventorying and monitoring and the potential of forest farming in the Southeastern United States. Becky Barlow’s (Auburn University) research on how to incorporate forest farming practices into pine stand management supported the use of pine straw as a value-added product for farms in the Southeast. Erik Burkhart (Penn State) has been working with Pennsylvania Certified Organic to develop the first forest grown certification for ginseng produced using forest farming methods. Many others have contributed to the continuously growing practice of forest farming, making it the only agroforestry practice with a dedicated national eXtension Community of Practice.

## Alley Cropping

**Gene Garrett**  
Center for Agroforestry  
University of Missouri

Alley cropping likely had its beginning in Southeast Asia in the early 19th century when the British developed the “Taungya System” of forest management in Burma. However, a research and demonstration emphasis has only been underway in the U.S. since



Corn is grown in between walnuts in this alley cropping system. Photo by Shibu Jose

the 1960s when the Crown Zellerbach Corporation and others, established plantings of fast-growing poplar in the Mississippi Delta that were alley cropped with cotton and soybeans. These companies reasoned that cropping the alleyways would enhance the early growth of their trees while providing a cash flow until their trees could be harvested. Unfortunately, sustained studies on alley cropping were few even though advocates spoke out on the benefits of growing trees and food crops together, including researchers studying closely related practices in Florida and Nebraska. In the 1970s the Food and Agriculture Organization (FAO) of the United Nations advocated for an emphasis on alley cropping research.

In 1975, the Center for Agroforestry at the University of Missouri and Hammons Products Company of Stockton, Missouri began a long-term cooperative research effort to evaluate the benefits of alley cropping black walnut, which clearly demonstrated the production and conservation benefits. This research continues today. Between the late 1980s and early 2000s other universities such as Purdue, Iowa State and the University of Florida began their own alley cropping research. ♣

USDA National Agroforestry Center  
1945 N 38th St.  
Lincoln, NE 68583-0822

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## Upcoming Events

### September 18-20, 2015

Farming the Forest  
Rowe, MA

<http://rowecenter.org/events.php?event=385>

### November 3-4, 2015

Green Lands Blue Waters Conference  
Minneapolis, MN

<http://greenlandsbluwaters.net/2015-conference>

### November 13-14, 2015

Northeast SAWG It Takes a Region  
Sarasota Springs, NY

<http://nesawg.org/our-work/conference>

### September 20, 2015

Tree Crops for the Greater Good  
Oregon, IL

<http://www.savannainstitute.org/events>

### November 6-7, 2015

Women Protecting Pollinators,  
Protecting Food

Davenport, IA  
[bit.ly/1MOBGeF](http://bit.ly/1MOBGeF)

For more upcoming events, visit our  
website calendar:

<http://nac.unl.edu/events>



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- **Susan Stein**, NAC Director
- **Michele Schoeneberger**, FS Research Lead (ext. 4021)
- **Richard Straight**, FS Lead Agroforester (ext. 4024)
- **Vacant** - NRCS Lead Agroforester
- **Kate MacFarland**, FS Assistant Agroforester (ext. 4012)
- **Joseph Banegas**, Information Assistant/"Inside Agroforestry" Designer (ext. 4014)

<http://nac.unl.edu>

### Mission

The USDA National Agroforestry Center (NAC) is a partnership of the Forest Service (Research & Development and State & Private Forestry) and the Natural Resources Conservation Service. NAC's staff is located at the University of Nebraska, Lincoln, NE. NAC's purpose is to accelerate the development and application of agroforestry technologies to attain more economically, environmentally, and socially sustainable land use systems by working with a national network of partners and cooperators to conduct research, develop technologies and tools, establish demonstrations, and provide useful information to natural resource professionals.

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