

# ALLEY CROPPING

A relic from the past or a bridge to the future?

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FOR the past 35 years, agroforestry researchers at the University of Missouri have been touting the benefits of alley cropping. Alley cropping, one of the five temperate zone agroforestry practices, requires the planting of trees at wide spacings creating alleyways within which companion crops are grown. Companion crops can be conventional (corn or

soybeans) or unconventional (biomass for energy or elderberry for jellies and wine). They can be a crop of high economic value (blueberries) or one of low economic but high aesthetic value (tall grass prairie for quail and other wildlife). Alley cropping can serve to transition fields of row crops into forests or, because of its desirable stewardship qualities, can be viewed as a stand-alone practice designed to provide a source of income, conservation and environmental benefits. Regardless of the need, alley cropping has something to offer every landowner.

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## NAC Director's Corner

*A commentary on the status of agroforestry by Andy Mason, NAC Director*



### Alley cropping: getting beyond the “chicken or the egg”

WITH alley cropping, is it the chicken or egg dilemma? If USDA assistance were more widely available for alley cropping, would producers ask for and apply for assistance through Farm Bill programs? Or, do producers need to express more demand for alley cropping first before USDA assistance becomes more widely available?

Of the five agroforestry practices, alley cropping is the least adopted nationwide based on NRCS reporting, which tells us that alley cropping has been applied on less than 500 acres over the past three years! We also know that many USDA Service Centers do not currently offer financial and technical assistance for alley cropping through federal conservation cost-share programs because of limited acceptance of this practice in Field Office Technical Guides.

Sound science and technology to support the practice of alley cropping is certainly important, but what else influences the adoption process? Several important non-technical factors influence a producer's decision to adopt or reject a new practice/system. In this issue of Inside Agroforestry, we discuss

these very important “human considerations” in the adoption process. I believe the “human dimension” of adoption applies not only to producers but also to the natural resource professionals who provide agroforestry assistance. They may be asked by their client one day, “What do you think about alley cropping?” How would you respond to this question? Can NAC help you improve your alley cropping expertise?

The good news is that we know of several landowners who are establishing alley cropping systems, and with this issue we are telling their stories. These stories illustrate the economic and conservation benefits of alley cropping, and they also provide insights into factors that led them to adopt alley cropping.

**Are you aware of other alley cropping stories in your area? I encourage you to share with me your stories and perspectives about alley cropping. Please email me at [amason@fs.fed.us](mailto:amason@fs.fed.us).**

Sincerely,  
Andy Mason

## What has NAC been up to lately?

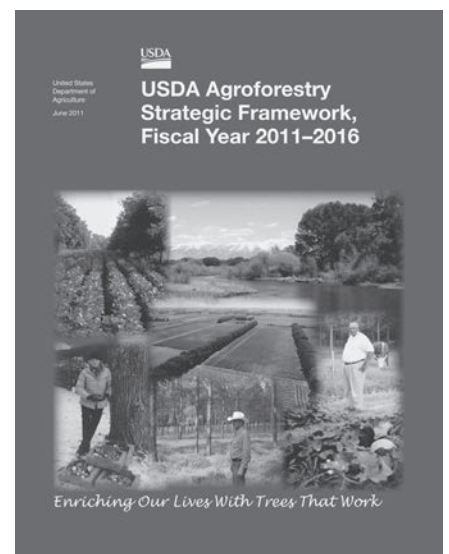
### CanVis update

Ready to create some new agroforestry visual simulations? CanVis has now been updated to run on Windows 7. The CanVis image-editing software is a free, entry-level program that allows resource professionals to create photo-realistic planning simulations. CanVis can now be downloaded or ordered at: [www.unl.edu/nac/simulation/download.htm](http://www.unl.edu/nac/simulation/download.htm).

### A new road map to sustainable agriculture

USDA Deputy Secretary Kathleen Merrigan unveiled a plan recently that will help farmers,

ranchers and woodland owners enhance productivity, profitability and environmental stewardship by using the practice of agroforestry. The USDA Agroforestry Strategic Framework, 2011-2016 ([www.usda.gov/documents/AFStratFrame\\_FINAL-lr\\_6-3-11.pdf](http://www.usda.gov/documents/AFStratFrame_FINAL-lr_6-3-11.pdf)) has three strategic goals: 1) **adoption** – increase the use of agroforestry by landowners and communities; 2) **science** – advance the understanding of and tools for applying agroforestry; and 3) **integration** – incorporate agroforestry into an all-lands approach to conservation and economic development. 🌳





Native persimmons sold at local markets. Photo by Tom Wahl.

## A new way in Iowa(y)

**Richard Straight**  
USFS Lead Agroforester  
Lincoln, NE

“SOMETIMES we make things more complicated than necessary,” says Tom Wahl of Red Fern Farm in Louisa County, Iowa. Tom says, “I like a simple definition of agroforestry as the intentional management of woody crops for agricultural purposes.” In 1992 Tom and his wife and business partner Kathy Dice began planting chestnuts, persimmons, pawpaw, and hazelnuts on about 20 acres of farmable land just south of Grandview, IA. To date they have more than 50 species of plants, mostly woody plants, which are grown for food and income production. Tom and Kathy are continually planting new species in new arrangements to evaluate their potential as a source of income and how they might fit into their “Comprehensive Integrated Agroforestry” operation.

Tom writes on the Red Fern website: “In his classic book *Tree Crops*, J. Russel Smith describes what he called “two story agriculture” (now called “alley cropping”) in which crops were planted between rows of nut bearing trees. Comprehensive Integrated Agroforestry takes this idea a few steps

further, to what I call “four story agriculture.” Intensive management is applied and crops are harvested at four levels: medicinal roots from underground, livestock forage and/or medicinal plants at ground level, wood from the tree trunks up to about twelve feet, and at the fourth level the fruit, nuts, and leaves are produced.”

Chestnut trees are the dominant crop in the fourth level of agriculture. Black walnuts, heartnuts, persimmons, and pawpaws are also producing valuable food and income in the upper canopy. A large variety of fruit and nut bearing shrubs including hazelnuts, spicebush, black currant, medlar, aronia, cornelian cherry dogwood, and kousa dogwood are in production or being evaluated as a part of the third-level. The forage or second level agriculture at Red Fern Farm is largely brome/alfalfa or bluegrass and clover and helps protect the soil from erosion as well as providing bug habitat for foraging chickens. There are also underground crops like Echinacea grown in the sunny alleys between rows of chestnuts, and ginseng and goldenseal grown in the shade under the chestnuts and other trees.

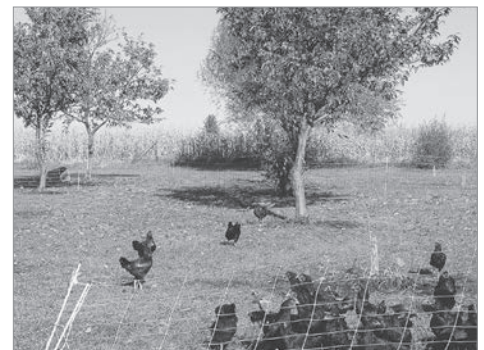
The less shade tolerant shrub and small-

Chickens grazing in alley ways between chestnut trees. Photo by Tom Wahl.

tree species are grown in the alleyways between the taller chestnut, walnut, and heartnut trees. These species often yield a plentiful crop at younger ages than the nut-bearing trees which helps improve the cash flow of the system. The primary crop on Red Fern Farm is chestnuts. At about 15 years of age the chestnut plantings are yielding about 2,000/ac and each year the yield continues to increase. So far, demand exceeds production and is expected to continue that way well into the future. Much of the chestnuts sales are wholesale, making it easy to move larger quantities of product, the balance is at the gate sales and some internet sales each year.

Not too surprising, wildlife also finds Comprehensive Integrated Agroforestry very attractive. The squirrels begin foraging chestnuts in the morning while deer would feast all night if the family didn’t make chestnut harvesting an evening labor practice. Many if not all pest problems are controlled using a similar approach of altering management practices rather than relying on pesticides. The most commonly used “pesticide” is grown right at Red Fern Farm, and it is eggs. Deer browse has almost become a national epidemic for tree and shrub plantings. Tom says that a mixture of one dozen eggs to five gallons of water, stirred not shaken, and run through a screen and then sprayed on the foliage and stems makes a good deer repellent for about two weeks. But try and push it to 15 days and you are courting with disaster.

Tom and Kathy find that a polyculture of perennial plants is a much more sustainable food production system than one of a monoculture of annual plants. Comprehensive Integrated Agroforestry may not be for everyone or everyplace, but if you are ever in southeast Iowa and want to learn more about it, make an appointment to visit Red Fern Farm ([www.redfernfarm.com](http://www.redfernfarm.com)). 🌱



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## The human considerations in the adoption of alley cropping

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**Gail Brant**  
NRCS Sociologist  
Royersford, PA

IN natural resource circles, SWAPAE+H (Soil, Water, Air, Plant, Animal, Energy and Human) summarize the success formula for “getting conservation on the ground.” Giving equal consideration to both human and physical resource factors will facilitate practitioners in their mission to promote the adoption of alley cropping.

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### Producers typically follow six stages of adoption—Awareness, Interest, Evaluation, Trial, Adoption, and Adaptation—to make decisions about the use of alley cropping.

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#### Information

Information is vital in acquiring new skills and identifying the agronomic, economic and environmental costs and benefits associated with alley cropping. Information is a main driver in the adoption process and must be: **timely, accurate, easy to obtain, equally accessible, and inexpensive.**

The sources of information will vary by the types of producer groups and the stages of adoption.

Note that minority, beginning and/or women producers are oftentimes left out of the main information loop. These groups are known to rely on other producers, family, and friends. Attention needs to be given to ensure that information is current and available to these out of the mainstream groups.

#### The adoption process “at work”

Human considerations are vital in



managing natural resources. The “human consideration” is critical when planning and implementing any agroforestry practice, including alley cropping. Human considerations strongly influence the adoption and adaptation of alley cropping. Studies have shown that factors from within all categories of human characteristics were found to be significant in decision making. Personal characteristics such as, planning horizons, tenure, experience with alley cropping and gender were found to be important. Owner operators, especially with absentee landowners were found to be important in some situations. Early adopters are typically highly respected, and they could be useful in setting up demonstrations and pilot projects, and providing testimonials to support agroforestry.

#### Challenges

Embedded within all categories of human considerations are challenges. The following list represents a summary of challenges and limitations that have been cited as relevant to establishing and implementing agroforestry systems, in general, and alley cropping in particular.

- Familiarity and information
- Technical assistance throughout the adoption process
- Demonstrations
- Training for field staff and producers
- Appropriate financial incentives
- Labor

- Land and pressure from rural urban interface
- Skills to manage equipment, competition between trees and crops
- Markets for niche crops
- Appropriate designs based on producer goals

These challenges and limitations become opportunities for practitioners to “practice” the consideration of any number of human factors when planning and implementing alley cropping as an agroforestry system.

#### A practical summary for practitioners

The following statements summarize and suggest ways that practitioners can practically “apply” human consideration in their day to day work.

- Use the formula SWAPE+H: to ensure that alley cropping “gets on the ground.”
- Remember that at any time throughout the adoption process, producers can and do return to any one of the six stages—Awareness, Interest, Evaluation, Trial, Adoption, and Adaptation—to make decisions about the use of alley cropping.
- Understand the human environment, the personal, farm structure and community characteristics—as decisions are based on human factors
- “Tag” early adopters as leaders: their opinions and experiences are highly respected, and they will be useful in setting up demonstrations, pilot projects and providing testimonials.
- Consider information and open communication links as a main driver in adoption. Disseminate information that is timely, accurate, equally accessible, easy to obtain, and inexpensive, and use mediums that reflect the types of producers.
- Ensure that minority, women, and beginning producers are “in the loop.”
- Personalize assistance by determining the short and long term goals for the operation in order to guide the “best mix” of direct technical assistance.
- Develop training packages for producers, practitioners, and private consultants that incorporate both human and physical resource considerations.
- Remember challenges are opportunities that underscore the need to understand and utilize human considerations in all phases of the adoption process. 🌱

# Profits, not problems

**Doug Wallace**  
NRCS Lead Agroforester  
Lincoln, NE

IF you follow the Richland Electric Cooperative lines through the rolling open hills of Richland County to Ash Ridge near Viola, Wisconsin, you will discover someone who is on the cutting edge of green farming and agroforestry—Mark Shepard.

From wind turbines, to daffodils, to chestnuts, to asparagus, Mark's poly-culture systems (many diverse plants that support one another) are pushing the boundaries of agroforestry. Influenced by a book written by Russell Smith titled "Tree Crops," Mark began to formulate his idea to transition from the usual traditional annual crops like soybeans and corn to a perennial crop ecosystem. This bio-diverse system is made up of multi-use crops designed to enhance and work with each other while working on good land as well as marginal land. Rather than turning to intensive agriculture systems, Mark designed his system to use common and easily grown perennial plants that



would grow in his area. He notes, "When everything is in place, this will look more like an African savannah from National Geographic, rather than a corn field." Here is a breakdown of what you can find on his poly-culture, agroforestry, developed farm:

**Chestnuts:** These rows of trees provide nuts for eating (sales) as well as for feed for his livestock. The wood can be used for crafts and the discarded wood can be used for wood heating or growing mushrooms—all of which he does.

**Hazelnuts:** This shrub is also grown in rows but primarily on a unique contour layout system that carefully, and deliberately, moves water around (and through) the hillside, stopping periodically to provide spring-time pools of water for frogs and salamanders which are his primary pest control contractors. Hazelnuts are a big producer on the farm that provide nuts and oil for sale, husks as a mulch product, and shells for burning (burns as hot as anthracite coal), a possible biomass feedstock for burning or gasification. Mark likes to say that "chestnuts are our corn and hazelnuts are our soybeans."

**Apples:** These trees are another main-stay of his poly-culture system. His plantings include many obscure apple varieties that add to the diversity of his system. The fruit is produced and sold but recently he has taken this plant one more step and has begun to produce cider and wine for value added sales and profits.

**Organic produce:** Mark has been a certified organic producer since 1995. Strategically grown between his woody plantings as alley cropping systems are



asparagus for spring harvesting, peppers for summer harvesting, and squash for fall harvesting—confirming, that he is truly a "man for all seasons."

**Other poly-culture plants:** Adding to the already diverse mix of plants on his farm are comfrey, daffodils, iris, wormwood, pears, grapes, currants, roses, elderberries, hybrid poplar.

**Livestock/fauna:** Not content to just raise plants, Mark rounds out his self-developed agroforestry based savannah setting, with cattle, hogs, squirrels, deer, and badgers. Each of these animals is carefully (well most are) integrated into his unique system. Since not all the fruit can be harvested from his trees, Mark uses his livestock as vacuum cleaners to remove and utilize every last morsel that comes off the chestnut, hazelnut, apple and pear trees. And while not totally under his control (at least not yet), the squirrels, deer, and badgers are some of the best fed animals in the neighborhood.

With all this going on you might think that Mark creates more problems than he solves, but according to Mark "anytime you see the word 'problem', that's the word 'profit', spelled incorrectly."

"Maybe I don't have enough problems," he jokes! 🌲

*Adapted from "Making profits from problems" by Dean Young, Wisconsin Energy Cooperative News, February 2010. Read more about Mark's operation at: [www.forestag.com](http://www.forestag.com)*

Right: Aerial view of Shepard's farm showing new processing and visitors building. Above right: Examples of alley grown crops on the farm. Photos by Mark Shepard.



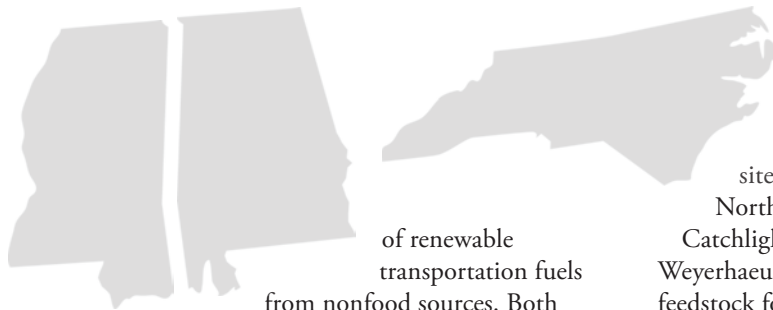
# “Catching” the energy wave

**Doug Wallace**  
NRCS Lead Agroforester  
Lincoln, NE

A “CATCHY” new word on the street (at least on the street of bioenergy) is Catchlight. Catchlight Energy™ is a joint venture between Chevron and Weyerhaeuser. In February 2008, these two companies came together, leveraging the strengths of both—Weyerhaeuser’s expertise in innovative forest stewardship, resource management and capacity to deliver sustainable cellulose-based feedstocks and Chevron’s technology capabilities in molecular conversion, product engineering, advanced fuel manufacturing, and fuels distribution.

Catchlight Energy reflects the parent companies’ shared view that cellulosic biofuels can fill an important role in diversifying the nation’s energy sources and addressing global climate change by providing a source of low-carbon transportation fuel. In addition, Catchlight Energy recognizes that agroforestry, and alley cropping/intercropping in particular, has the potential to produce biomass while still maintaining supply for traditional forest products. Biomass plants for this project include herbaceous perennials, short rotation trees, understory crops and residuals that can be used for emerging biofuels markets to supplement traditional markets of high-value timber.

The 50/50 joint venture company is focused on developing the next generation



of renewable transportation fuels from nonfood sources. Both Chevron and Weyerhaeuser will contribute resources including funding, background technology and employees to Catchlight Energy. Catchlight’s initial focus will be on developing, researching and demonstrating novel technologies, such as alley cropping, for growing and converting

cellulose and lignin from a variety of sources into biofuels. Future work will evaluate the impacts of biomass feedstock cultivation at watershed research sites in Mississippi, Alabama, and North Carolina.

Catchlight Energy intends to use Weyerhaeuser’s land to grow renewable feedstock for biofuels to supply Chevron’s distribution and marketing system. Their concept involves using intercropping/alley cropping to grow alternating strips of trees and energy crops (*Figure 1*). The alleyway energy crops can be harvested annually while the trees are managed for wood products and fiber. 🌲

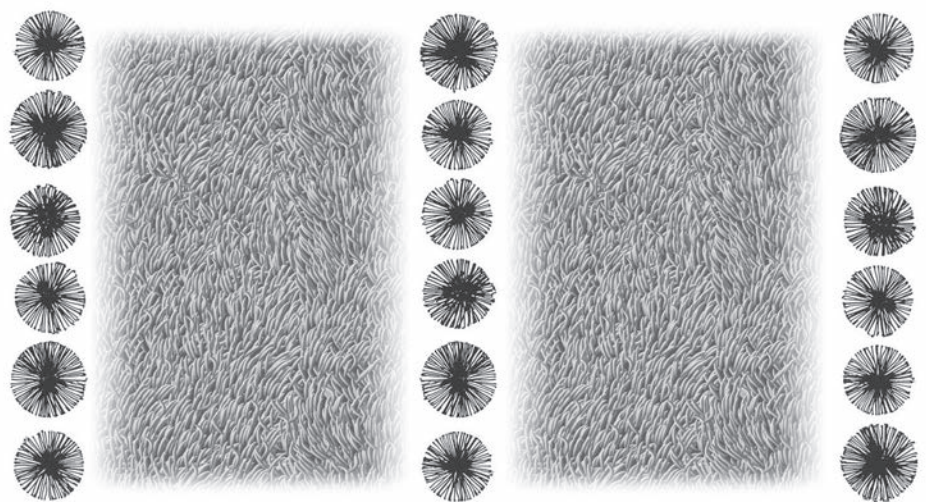


Figure 1: The Catchlight multi-functional alley cropping system combines perennial switchgrass with traditional loblolly pine for solid wood products and biofuels production.



Chevron, based in San Ramon, California, explores for, produces and transports crude oil and natural gas; refines, markets, and distributes transportation fuels and other energy products and services; manufactures and sells petrochemical products; generates power and produces geothermal energy; and develops and commercializes the energy resources of the future, including biofuels and other renewables.



Weyerhaeuser Company, based near Tacoma, Washington is one of the world’s largest integrated forest products companies. Weyerhaeuser, incorporated in 1900, is principally engaged in the growing and harvesting of timber; the manufacture, distribution, and sale of forest products; and real estate construction, development, and related activities.



Round bales of harvested willow biomass. Photo by Naresh Tevathan, University of Guelph.

## Crossing over the border

**Richard Straight**  
USFS Lead Agroforester  
Lincoln, NE

THE evolution of agriculture in eastern Canada over the past half-century has been characterized by a spectacular gain in productivity with, in many cases, a concurrent but gradual exclusion of trees from croplands, particularly because of large farm mechanization. Combined with the intensification of agriculture, this decrease in forest area has resulted in a variety of environmental problems, including decreases in soil fertility, soil erosion, an increase in non-point source pollution and a reduction in biodiversity, all of which has resulted in an overall loss in terms of the quality of the rural landscape. Experiments conducted in eastern Canada and other temperate regions of the world have shown that intercropping systems (ICS), also called alley cropping, constitute a promising avenue for strategically reintroducing the ecological functions of the tree into an agricultural environment.

In Canada, the first experimental trials were established almost 25 years ago at Guelph, Ontario, northeast of Detroit. A variety of hardwood trees (red oak, silver maple, sugar maple, American ash, black walnut, hybrid poplar) continue to be grown with a variety of row crops.

### The effect of intercropping on tree growth

Can trees take advantage of their proximity

to intercrops and benefit indirectly from the care that these crops receive? Recent work in Quebec seems to indicate that this is the case. After 3–4 years of growth, above-ground biomass of various hybrid poplar clones associated with various annual intercrops was, on average, 40 percent greater than that observed when repeated harrowing was undertaken between tree rows, a practice commonly used in intensive poplar monoculture. According to this study, improved tree growth comes notably: 1) from stimulating the soil microbial biomass and mineralizing nitrogen through intercropping; and 2) from recovery by the tree roots of a significant proportion of fertilizer residues used in intercropping, which improves their mineral nutrition.

### The effect of intercropping on intercrop yield

However, to date, the development of Inter Crop Systems, ICS, whereby rows of trees are ‘inserted’ into crop production areas remains a rare practice in the agriculture sector. Recent studies in Canada have shown that the yield losses in soybeans and corn are generally a result of tree shade. Several options can help control competition for light. These include: 1) use wide within and between row tree spacing, 2) selecting tree species and clones that minimize shade (high crown porosity and low canopy width), 3) utilizing tree thinning and pruning, and 4) orienting tree rows north and south. However, some crops, such

as forage plants can produce greater total biomass and protein under partial shade. In Ontario, willow crops under moderate shade improved over the same crop in open grown.

Recently, there has been interest in using agroforestry systems for short rotation willow. The same impacts on microclimate found with windbreaks and alley cropping systems with annual crops are at work with shrub and tree willow species as well. Research at the University of Guelph in Ontario looked at the impact of a hardwood intercropping system on willow biomass production as compared to the typical monoculture short-rotation-woody-crop.

Data was collected on changes in root biomass production, litterfall, and willow biomass yield (above ground) for the three clones in each system. Not too surprising, the different willow clones not only produced at different rates in the SRWC scenario, but also responded differently to the intercropping system. But for all three measurements, there was a positive effect in the intercropping system grown willows.

The results indicate that a hardwood intercropping system is a viable alternative to typical monoculture short-rotation-woody-crop systems for people interested in agroforestry and biomass production. 🌱

*Adapted from “Hardwood Intercropping Systems—Combining wood and agricultural production while delivering environmental services,” Agriculture and Agri-Food Canada and Clinch, R. et. al. “Biophysical interactions in a short rotation willow intercropping system in southern Ontario, Canada.” Agriculture, Ecosystems and Environment 131 (2009) 61–69.*



Alley cropping research plots at Guelph. Photo by Naresh Tevathan, University of Guelph.

# Entrepreneurship: Begin it with research, end it with profit

**Doug Wallace**  
NRCS Lead Agroforester  
Lincoln, NE

MENTION the word research and many people have an image of someone confined in a dark, dreary, damp room with test tubes scattered on tables and bare wires running everywhere. Fortunately for Steve Shifley, a researcher with US Forest Service Northern Research Station in Columbia, Missouri this is not the case even though “applied research” (the trial and error method) is what he and his wife Mary are concerned with right now. They consider their work a labor of love, not research—but with a distinct profit motive as a long term goal.

Steve and Mary own 25 acres of land in Boone County, Missouri. Except for about 3 acres of trees along the property borders, the land had been used for traditional row crops. They bought the property in 1997 and continued to rent the open ground to a local farmer.

In 2000, the University of Missouri (MU) Agroforestry class designed an agroforestry plan for the property as a class project. That process got Steve and Mary thinking about some long term goals for the property. They wanted soil and water protection, increased plant and wildlife diversity, enough pasture and hay to support a few horses, some warm season grass, and some crops with the



Alley cropping tree row of Chinese chestnuts. Photo by Steve Shifley.

potential to generate a little income. The plan that the class developed included all those elements. The suggested woody cash crop in the class plan was hazelnuts grown in an alley cropping system with hay produced in the alleys.

They pondered those plans over the next five years (researchers by nature, rarely rush into anything) as Steve and Mary established some pastures and fences for the horses, built a house and barn, and got settled. During that period they continued to the rent 12 acres on the south half of property to a neighboring farmer who used no-till farming and rotated crops of corn, soybeans, wheat and occasionally clover or sorghum.

During that time the MU Center for Agroforestry expanded research on Chinese chestnuts for nut production. As a forester, growing trees appealed to Steve. Around 2005 he obtained about 20 surplus Chinese chestnut seedlings from the MU Center for Agroforestry and planted them on a 25-foot rectangular spacing in their pastureland. They continued to cut hay in the alleys between the trees. The next year he got 36 more Chinese chestnut trees, but this time they were commercially grown container

trees from Forrest Keeling Nursery. Steve established those in two rows on a 28-foot rectangular spacing among the wheat crop that his farmer tenant had in the ground that year. The spacing was designed to accommodate the farmer’s combine width in the alleyways. To assist Steve, he followed the wheat crop with red clover and the next year Steve added another 55 Chinese chestnut container grown trees.

During those first few years of chestnut establishment Steve had periodic discussions with Kim Reitz, Resource Conservationist, at the Natural Resources Conservation Service (NRCS) Columbia office. Kim helped guide him through development of a long term plan for the 12 acres of cropped land. Steve got additional guidance from Mark McCulloch, Missouri Department of Conservation private lands biologist, others from NRCS and the Farm Service Agency (FSA) on programs, plant selection, planting, and maintenance. The plan they designed included 5.1 acres of warm season grasses and forbs as field borders (Conservation Reserve Program [CRP] – CP33 field border practice), quail habitat improvement in the wooded and shrubby areas on the property perimeter, and 7.3 acres of Chinese chestnuts in an alley cropping system with mixed grasses and





legumes established for permanent ground cover and hay production in the alleys. Financial support for the additional tree planting and hayed alleys came through the Environmental Quality Incentives program (EQIP) program.

With the help of a neighboring farmer they established the warm and cool season grasses and planted more than 300 Chinese chestnut trees in the autumn of 2007. It was a lot of work. Cost share on the tree purchase, tree planting, seed purchase (warm and cool season grasses, legumes, and forbs), chemicals, and planting greatly defrayed out of pocket costs and made it financially possible for Steve and Mary to establish the trees and herbaceous plantings in one year. According to Steve, “Without the support of the EQIP program I would have continued to add only 20 or 30 trees each year.” And without the support of the CRP program they also doubted that they would have established warm season grasses and forbs, due to the cost.

Their soils are heavy clay and 2007 was a dry year but, despite periodic watering, they lost about 25 percent of the trees that first year. They replaced those in the spring of 2009 and continued to replace about 40 more this spring. Most of the trees are well established, but the last two years have been exceptionally wet which is detrimental to chestnuts, especially in clayey soils that drain

slowly. Their oldest trees are now producing small crops of chestnuts and some of their youngest trees even had few nuts last fall. This spring they burned one-third of the warm season grass. They see much greater bird diversity now simply due to hundreds of perch sites associated with the trees.

The Center for Agroforestry (CFA) at MU continues to be a highly effective source of support. In 2009 they hosted an excellent series of four day-long workshops focused on different aspects of Chinese chestnut production. Steve periodically consults Ken Hunt, chestnut researcher at CFA, who patiently answers his questions. Steve recently was approved for a North Central Sustainable Agriculture Research and Education (SARE) Farmer Rancher grant. It will provide funding to graft his trees with scion wood selections from the Center for Agroforestry. That would be set up as an experiment (Steve claims it’s not real research) to measure differences in graft success and nut production. He also hopes to get accepted into the entrepreneurship training program for new and beginning Missouri farmers (<http://muagentrepreneur.wordpress.com/>). His intention—“unless I get smarter along the way,” he says—is to have a U-pick component to the chestnut business that provides a value added agri-tourism element. 🌱



Alley cropping with alley ways of cool season grass and legume hay. Photo by Steve Shifley.

## Small numbers, big opportunities

WHILE one of the least applied Natural Resources Conservation Service (NRCS) agroforestry practices (based on NRCS reporting), alley cropping is, never-the-less, at least seeing application across all regions of the US. As described throughout this newsletter, alley cropping is being enthusiastically adopted, promoted, and effectively used by a growing number of land owners. But one of road blocks for higher use across the US, is the fact that the alley cropping practice standard is currently adopted in about half the NRCS Field Office Technical Guides (FOTG). Without this practice available in FOTGs, NRCS programs cannot offer financial assistance or field office personnel do not have the technical guidance when land owners need or ask for alley cropping assistance. This lack of adoption is reflected in the program dollar amounts for alley cropping found in ProTracts (NRCS Program Contract System). Only \$43,219 (the lowest of all the agroforestry practices) has been spent on the establishment of alley cropping over the last 3 years through various federal conservation programs. 🌱

*Source: NRCS IDEA (Integrated Data for Enterprise Analysis. Report date 13 November, 2010)*

## Last, but not least

**Doug Wallace**  
NRCS Lead Agroforester  
Lincoln, NE

THERE'S a new agroforestry Conservation Stewardship Program (CSP) enhancement activity that is now available to land users: *Plant Enhancement Activity PLT14 – Alley cropping establishment for wildlife and beneficial insect habitat*. The addition of this activity to the suite of agroforestry enhancements offered through CSP adds to the list of existing agroforestry enhancements. All current agroforestry practices now have at least one enhancement associated with each of the practices.

This enhancement involves the planting of trees and/or shrubs in multiple-rows with agronomic, horticultural or forage crops grown in the alleyways that produce additional woody products and provide wildlife and insect benefits.

In addition, the enhancement requires the use one or more of the following methods to improve habitat for the targeted species:

- Manage cropping periods or add legumes or plant cover crops to enhance wildlife habitat during critical life cycle periods.
- Use native tree and shrub species that favor targeted species.
- Plant multiple tree and shrub species (3 or more; use native species whenever possible) with varying flowering times to favor beneficial insect species.
- Establish clusters of other tree and shrub species if needed as a food or pollinator source (e.g., oaks for mast or black locust for pollen).

Check out the complete list of CSP enhancements, including all the agroforestry activities, at [www.nrcs.usda.gov/programs/new\\_csp/csp.html](http://www.nrcs.usda.gov/programs/new_csp/csp.html). This program is administered through the USDA Natural Resources Conservation Service. To sign up for this enhancement or to find out more about the CSP program, contact your local USDA Service Center. 🌱

# Alley cropping: making money with no complaints

**Doug Wallace**  
NRCS Lead Agroforester  
Lincoln, NE

JUST beyond the northern suburbs of Memphis near Millington, Tennessee, amid fields of cotton and soybeans, forested creeks and new housing developments, lies a small family farm owned by Alvin and Shirley Harris. Everything they do on their farm is organic-based, from their forages to their blueberries. Their current alley cropping system is also organic and consists of rows of eastern black walnut using organic farming principles in the alley ways that have produced water melons, black-eyed peas, cream peas, purple hull peas, sweet corn and other short rotational crops. There are no chemicals used anywhere on the farm. As Alvin points out, "I have been doing this for thirty something years and it's going to stay that way."

The alley cropping system that Alvin set up is fairly new on the farm. "I basically started from scratch and a lot of what I do I learned overseas traveling around the world seeing how they did things," explains Alvin about his farming operations.

Alvin used some suggestions from David Brauer from the USDA Agriculture Research Service in the planting and development of eastern black walnut in his alley cropping project. He wanted the rows of walnut far

enough from each other so he could grow annual crops in between while the trees were growing. He admits knew nothing about growing trees but went ahead anyway. He was instructed to grow the trees using 25 feet by 25 feet spacing but his thoughts were to space them 25 feet by 30 feet so that he could have more room in between the rows to grow his other crops.

What is the status of the new alley cropping system? According to Alvin, "I am making money in this field every year. Not from the trees yet, but from growing produce in between them. I still make money. Really I haven't lost anything, I don't think, in this field, and I think this is the fifth or sixth year."

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**"I am making money in this field every year. Not from trees yet, but from growing produce in between them." — Alvin Harris**

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Would he recommend this system to other farmers? He emphatically says, "Yes, I've made money so I'm not complaining." 🌱

*Based on an interview by Dr. Frank Mrema, Tennessee State University Cooperative Extension, with Alvin and Shirley Harris.*



Alvin Harris on his farm in Tennessee  
Photo by Dr. Frank Mrema.

## Bridge

Continued from page 1

The early history of alley cropping has its roots in Southeast Asia. During the early 19th century, the Taungya System of forest management was developed by the British in Burma. In exchange for tending their Teak plantations, the wealthy allowed the poor the opportunity to grow food crops between and alongside their trees. In the beginning, and during the many decades that followed, even into the mid-1900's, the Taungya System and other variations of alley cropping were viewed primarily as an inexpensive means of establishing forests. However, beginning in the 1960's and 1970's, a few visionaries began to speak out on the benefits of growing trees and food crops together to address hunger and ecological degradation in many parts of the world. It was at this time that the Food and Agriculture Organization (FAO) of the United Nations (1976) decided to focus its attention in forest management development on the beneficial interactions that were being reported by researchers when trees and food crops were integrated into a single land-management system. In combination with other highly significant events, such as the establishment of the International Council for Research in Agroforestry currently in Nairobi, Kenya, a movement began on the part of many, to advance the knowledge and the adoption of alley cropping-related practices. Its development and adoption were especially noticeable throughout the tropics where land was scarce and used to meet many needs.

It was also at this time that the Center for Agroforestry at the University of Missouri and Hammon's Products Company of Stockton, Missouri entered into a cooperative research/demonstration effort to evaluate the benefits (economic, environmental, biological and social) of alley cropping with black walnut. The initial plantings created 40-foot alleyways within which conventional agronomic crops such as corn, soybean and milo were double-cropped with wheat. While the alleyways proved too narrow to maximize the production opportunities, much was learned that has served as the basis for improving alley cropping designs to better meet the needs of temperate zone landowners.



Alley cropping system with cotton and pine trees. Photo credit: University of Missouri Center for Agroforestry.

Alley cropping is especially well adapted to meet the needs of small farms throughout the Midwestern United States. For senior landowners who are interested in reducing the acreage being row cropped and transitioning to forests for the purpose of preparing to pass their land to their non-farming children, it is the perfect tool. Likewise, for landowners who are not just interested in the production aspects of farming but also equally interested in environmental and conservation benefits, alley cropping can be designed to hold the soil and significantly reduce the loss of nutrients and pesticides. Moreover, for those interested in improving their wildlife habitat, establishing grasses, forbs and shrubs in direct association with the tree rows or in the alleyways can create enhanced wildlife opportunities.

While alley cropping can be designed with any tree species (oak, maple, etc.), it is at its best when the species of choice offers high income opportunities while providing a suitable microenvironment within which the companion crop can be grown. Specialty crop tree species such as those that produce edible crops (Chinese chestnut, walnut and pecan) or long-needles (loblolly, pitch and loblolly hybrid, etc.) for the production of pine straw mulch, are good examples. When tree species that produce an annual crop are matched with the appropriate companion crop, alley cropping can become a practice of great economic value.

Research has shown that Chinese chestnut

trees planted on a good site can yield as much as 3,500 lbs. of nuts per acre per year at maturity, with a market value ranging from \$1–3 per pound. These trees can reach productivity in less than five years, be producing 1,000 pounds of nuts per acre by age 10, and have an internal rate of return reaching as high as 10 percent over a 40-year period. Likewise, a loblolly pine planting can generate income from pine straw production (needles) as early as 6 years after planting. The trees can produce around 150–250, 30 lb. bales per acre every other year, with a market value ranging from \$4–7 per bale. In addition to pine straw markets, pines are marketable as posts, poles, pulpwood, chip-n-saw, and sawlogs as they get larger. This provides market diversity and flexibility to the landowner who could see rates of return as high as 11 percent over the life of the trees. By planting chestnut or pine in an alley cropping design, with 60- to 90-foot alleyways, one can create additional income from alley crops that are selected on the basis of their compatibility with the tree species and its crop (pine straw, nuts, etc.).

Currently, there is a shift in the thinking of many landowners and government agencies towards land practices that emphasize multiple conservation benefits. Not unlike its original application in the tropics, the strength of today's temperate zone alley cropping practice is found in its ability to meet multiple objectives while conserving our natural resources and creating a lasting bridge to the future. 🌱

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## Upcoming Events

### October 8, 2011

9<sup>th</sup> Annual Missouri Chestnut Roast.  
New Franklin, MO.  
[www.centerforagroforestry.org/events/chestnut/index.php](http://www.centerforagroforestry.org/events/chestnut/index.php)

### November 2–6, 2011

2011 Society of American Foresters  
National Convention: “Linking Global,  
Regional, and Local Solutions.”

Honolulu, HI. [www.safnet.org/natcon11/index.cfm](http://www.safnet.org/natcon11/index.cfm)

### November 7–8, 2011

Silvopasturing in the Northeast  
Watkins Glen Harbor Hotel. Watkins  
Glen, NY. Contact: Brett Chedzoy,  
[bjc226@cornell.edu](mailto:bjc226@cornell.edu)

### Woody biomass webinar series

The University of Minnesota Extension

will offer 7 webinars on woody biomass  
in fall 2011. There is no charge, but  
pre-registration is required. [www.myminnesotawoods.umn.edu/2011/05/extension-fall-2011-woody-biomass-webinar-series/](http://www.myminnesotawoods.umn.edu/2011/05/extension-fall-2011-woody-biomass-webinar-series/)

For more upcoming events, visit our  
website calendar: [www.unl.edu/nac/calendar.htm](http://www.unl.edu/nac/calendar.htm).



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### 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 are located at the University of Nebraska, Lincoln, NE and in Blacksburg, VA. 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.

### Policy

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