The
Temperate Agroforester

Volume 4, Number 1 January 1996

Agroforestry Promotes Sustainable Agriculture in California

Miles Merwin

Ten years of R & D efforts are proving the feasibility of using trees to manage saline agricultural drainage water in the central valley of California. Agroforestry appears to be a viable option for farmers to maintain the productivity of irrigated agriculture in the western San Joaquin Valley.

Salinity and Drainage Problems

The San Joaquin Valley is one of the richest agricultural regions of the world and contributes about 20% of total US crop production. Nevertheless, the western portions of the valley are affected by salinity and drainage problems that plague irrigated agriculture in arid and semi-arid regions around the world. About one third of the 2.25 million acres of irrigated land in the Westside of the San Joaquin Valley is affected by salinity and high water tables. For economic and environmental reasons, the canal (San Luis Drain) needed to export saline agricultural drainage water out of the valley will probably never be completed.

In addition to salinity and poor drainage, elevated levels of naturally-occurring selenium in Westside soils create an additional challenge for growers. Discovery of selenium-induced deformities in aquatic birds at Kesterson Reservoir along the San Luis Drain lead to federal closure of the canal in 1985. Since then, farmers have been forced to manage drainage water either on their own lands or collectively through local irrigation districts.

Agroforestry System

Starting in 1985, a consortium of governmental and private agencies have conducted an extensive on-farm investigation of the feasibility of using trees as

➤ ***California Agroforestry, p.4***

Southeastern Agroforestry Workshop Meets in Georgia

James Kettler, Luanne Lohr, Miguel Cabrera, and Paul Hendrix; University of Georgia

The Southeastern Agroforestry Workshop was held September 6-8, 1995 in Athens, Georgia. Objectives of the workshop were to examine traditional and contemporary agroforestry practices, consider the obstacles that constrain these practices, and develop recommendations on ways to overcome these obstacles. The workshop was intended to bring together researchers, policy makers, and extension personnel to advance agroforestry knowledge as it applies to the southeastern United States. The ultimate goal is to provide a win/win situation to landowners where environmental goals are met and desires for reasonable profit are satisfied.

The workshop consisted of two days of oral presentations by agroforestry experts from various universities, from the Natural Resources Conservation Service, from the Forest Service, and from the Agricultural Research Service. Individuals, their professional affiliations, and the topics they presented were as follows:

- P.K.R. Nair, University of Florida; *Agroforestry: Two Decades of Development*
- Bill Reitveld, USDA Forest Service/National Agroforestry Center; *Agroforestry in the United States: Enormous Opportunities and Challenges*
- Bruce Wight, USDA Natural Resources Conservation Service; *Ecosystem Management & Agroforestry*

➤ ***Southeastern Workshop, p.3***

The Temperate Agroforester

ISSN 1084-5925

Mission Statement

The mission of AFTA is to advance the knowlege and application of agroforestry as an integrated land use approach to simultaneously meet economic, social and environmental needs. AFTA focuses on agroforestry in temperate zones, with an emphasis on North America. AFTA pursues its mission through networking, information exchange, public education, and policy development.

AFTA Membership Dues

Regular $15; Student $10; Sustaining $50; Institutions $20; Lifetime $300
Send annual membership dues by check payable to AFTA in US dollars to: AFTA, Dept. of Forestry, Michigan State University, East Lansing, MI 48824, USA.

The Temperate Agroforester

Editor: Miles Merwin
Contributions related to agroforestry are welcome. Please submit items either on diskette (PC-compatible word processing program), as a text file attached to an e-mail message, or typewritten. Deadlines for submissions are the 15th of March, June, September and December. Address all items to: Miles Merwin, The Temperate Agroforester, P.O. Box 266, Lake Oswego, OR 97034, Tel/fax (503) 697-1767, e-mail mlmerwin@teleport.com

President's Corner

Gene Garrett, AFTA President

As your newly elected president, I look forward to serving you and to the challenges that lie ahead. Our first four years, under the capable leadership of Dr. Michael Gold, have been good ones. We have grown from an "idea" to a full fledged Professional Organization. We now have by-laws, elected officers, a newsletter and, most importantly, an organizational purpose and a highly-valued, growing membership. However, in spite of all our accomplishments there is much that remains to be achieved.

The success of our newsletter is critical to the future of our organization. Miles Merwin, our new editor, needs input from the membership to make the *Temperate Agroforester* a success. Those of you with accomplishments worthy of sharing with the general membership are encouraged to prepare "descriptive write-ups" and send them directly to Miles at the address shown on this newsletter. The purpose of our newsletter is to serve as a meaningful source of new information on agroforestry. Only through your help can it serve this purpose.

Currently, we are a national organization whose membership comes together only once every two years at our AFTA-sponsored, North American Agroforestry Conference. To grow and be able to meet the needs of our membership and the challenges that lie ahead for our organization, it is important that we develop active Regional Associations. Temperate agroforestry varies by regions, reflecting diverse landscapes, values and socio-economic conditions. Because of this, regional associations become critical in helping establish research, technology transfer, policy and technical assistance needs. Without strong regional associations, AFTA will be unable to meet the needs of its membership. If we are to grow and prosper as an organization, we must place a high priority on meeting membership needs. As your new president, I plan to work closely with Editor Merwin to make the *Temperate Agroforester* the type of newsletter that will best serve your needs. Furthermore, I, in concert with other elected officers, will draft and implement a plan for establishing "regional" AFTA chapters in the very near future. I will call upon many of you as we undertake this endeavor.

Our future as an organization is bright, and as we begin a new year, I pledge my energies towards helping us reach our goals. ❐

➤ *Southeastern Workshop*

- Ron Carroll, University of Georgia; *Agricultural Sustainability & Agroforestry*
- Gene Garrett, University of Missouri-Columbia; *Natural Resource Management & Agroforestry: Opportunities and Constraints*
- Luanne Lohr, University of Georgia; *Economics of Agroforestry*
- Rhonda Janke, Kansas State University; *Broad Review of Temperate Agroforestry Research*
- Richard Lawrance, USDA Agriculture Research Services; *Agroforestry and Riparian Management: Process and Mechanism*
- Jim Robinson, USDA Natural Resources Conservation Service; *Agroforestry and Riparian Management: Policy, Issues and Opportunities*
- Larry Morris, University of Georgia; *Agroforestry Potential in "Industrial" Ecosystems*
- Lonnie Varnedoe, University of Georgia; *Recreation Possibilities in Agroforestry*
- Carl Jordan, University of Georgia; *Mixed Species Planting and Alley Cropping*

Participants were taken on a trip to two local agroforestry field sites consisting of an alley cropping experiment and a mixed tree species plantation.

On the final morning, interactive work group sessions were conducted. The work group sessions were broken down into four major themes: management, ecology, economics, and policy. These four themes were chosen because they represent the entire range of issues surrounding the development and implementation of agroforestry technologies.

Recommendations

Participants were divided into these four groups with the task of producing recommendations to overcome constraints identified in each topic area. The constraints were compiled from pre-workshop surveys and from the presentations and discussions during the first two days of the workshop. At the end of the breakout sessions, reporters from each session reported the key findings and recommendations. These findings were synthesized to provide a list of overall recommendations, as follows:

◆ Agroforestry systems are more complex from a management standpoint, and require a longer time horizon for planning than common agricultural systems. Some aspects increase risk, such as dealing with more production systems through time, but some decrease risk, such as multiple outputs for income generation. Ecologically speaking, agroforestry has the potential for greater diversity, so the overall production system might be more stable and sustainable. Economic planning requires attention to both intensity and timing of inputs and outputs to determine efficient resource allocation and to plan for a stable cash flow. Institutional considerations are important as well, such as how to use government cost-sharing or tax regulations to cover costs.

◆ Agroforestry encompasses many practices, and each can be considered part of the "tool kit" that conservation specialists use to achieve the goals of soil and water conservation. In economic considerations, it is important to evaluate the revenue and non-revenue benefits of a proposed agroforestry practice and compare these to alternative practices or structures that meet the same goals. Ecological and management planning require careful attention to crop-woody species selections that are at least compatible with, if not advantageous to, each other, and will succeed within the features of the land and climate.

◆ Beyond the farm gate, there are many possibilities for incorporating agroforestry systems into regional environmental and economic planning. Examples discussed include residuals management for both the forest products industry and agriculture, new recreational uses and enhancement of existing recreational areas, urban forestry benefits, and habitat creation for enhancement of biodiversity. Multi-institutional involvement and interdisciplinary research are needed to propose and evaluate regional plans.

◆ A final recommendation is that a practical and user-friendly "agroforestry packet" should be developed for extension agents that work with farmers in the Piedmont and Coastal Plain of the southeast. The packet should include: 1) basic descriptions of various agroforestry systems and their components; 2) good training and technical support; 3) an emphasis on greater opportunities and economic diversity; and 4) case histories of existing practitioners and known risk-takers.

There are a limited number of the proceedings from the workshop available. There is also a set of videos of the workshop presentations available at cost. For either of these resources, contact Luanne Lohr, Dept. of Agricultural and Applied Economics, University of Georgia, Athens, GA 30602, Tel. (706) 542-0847, e-mail llohr@agecon.conner.uga.edu. ❐

part of a drainage water management system. The principal public agencies involved are the Calif. Dept. of Food and Agriculture, USDA Natural Resources Conservation Service, US Bureau of Reclamation, Calif. Dept. of Water Resources, Westside Resource Conservation District and the University of California. Numerous private organizations and over 50 individual landowners have cooperated in the program.

Multistage System

The objectives of the Agroforestry for Sustainable Agriculture program are to develop and demonstrate a practical alternative for on-farm drainage water management which achieves the following goals: (1) reduction of the volume of saline drainage water, (2) concentration of the salts into a form which can be mined from the soil, (3) production of supplemental economic fiber and forage crops, and (4) protection of wildlife and groundwater quality. It is based on the premise that drainage water is a resource rather than a waste and that its proper management should result in the removal of salt from irrigated farmland.

The system utilizes several stages of drainage water collection, via underground tile lines, and reuse (Fig. 1). Irrigation water applied to salt-sensitive crops, e.g. vegetables, produces drainage water which is then applied (or blended with fresh water) to more salt-tolerant crops, e.g. cotton. The drainage effluent collected from cotton and similar crops is used to irrigated salt-tolerant trees, e.g. eucalyptus, and the resulting drainage water from the trees is then applied to more tolerant halophytic shrubs, e.g. saltbush (*Atriplex*).

Transpirational use at each stage reduces the volume of drainage water to only 6-11% of the original total. Because the trees and, to a lesser extent, halophytes exclude salts at the root zone, the concentration of dissolved salt increases from about EC 4 dS/m (irrigation water applied to salt-sensitive crops) to EC 50 dS/m (drainage collected from the halophytes).

After final collection from the halophytic shrubs, the concentrated drainage water is pumped into shallow solar evaporators for final crystallization. Water levels are controlled so that the evaporator surface is unattractive to aquatic birds which could be harmed by the high levels of Se therein. Salt harvested from the solar evaporators could potentially be sold for livestock feed supplements, food processing and industrial uses.

Large open evaporation basins are currently the principal method for disposal of agricultural drainage water on the Westside San Joaquin Valley. An area equivalent to about 10% of the total acreage of irrigated cropland must be set aside for evaporation basins. Besides the lost crop production, basins are costly to construct and maintain, and they attract wildlife which may be harmed by elevated Se levels.

In contrast, the agroforestry system requires that only about 3% of the total area of irrigated salt-sensitive crops be devoted to trees (2.0%), halophytes (0.7%) and solar evaporators (0.3%) in order to manage the same amount of drainage water.

As part of an integrated approach to drainage water management, Westside farmers are looking for ways to increase irrigation efficiency and thereby reduce the drainage problem at the source. Improved irrigation practices, application methods and scheduling all help reduce the amount of drainage water produced. Cropland with the most severe salinity and drainage problems is going out of production.

Ten Years of Research

Starting in 1985, a salt and water balance study was conducted at a farm site near Mendota to test the agroforestry system. Drainwater from adjacent fields was used to irrigate eucalyptus trees and the resulting effluent was applied to halophyte shrubs, mainly saltbush, with a small solar evaporator used for final drainwater discharge.

The results of this study showed that if soil and water salinity are allowed to reach levels harmful to even relatively salt-tolerant species, the growth and ET rate of the trees will be reduced significantly. It clearly demonstrated the need for regular leaching of the soil profile underneath the trees in order to control salinity levels and thereby maintain the tree's capacity for rapid growth and transpiration of applied drainage water. Better survival and growth also resulted when highly sodic soils were treated (with gypsum) prior to planting, and when trees were established using fresh water for the first year prior to application of saline drainwater.

Over the last ten years, over 600,000 trees have been planted on 50 private farms on the Westside in an effort to select those species, seed sources and individual clones which have the best growth and tolerance to salinity and frost. River red gum (*Eucalyptus camaldulensis*) has been the principal species planted, since it is well adapted to valley conditions and has a high degree of genetic variability for making selections. Seed sources from western Victoria, Australia,

(e.g. Lake Albacutya) and central Australia (e.g. Alice Springs) have performed best. In cooperation with the nonprofit Eucalyptus Improvement Association, more than 20 individual clones have been selected, tested, micropropagated and deployed in seed orchards and evaluation plots. Other promising species include casuarina (*C. cunninghamiana*) which is particularly valuable for field windbreaks.

A variety of halophytic shrubs have also been tested through the Agroforestry for Sustainable Agriculture program. Saltbush (*Atriplex* spp.) was one of the first halophytes which appeared promising because of its high salt tolerance and palatability as a livestock forage crop. Feeding trials showed that high levels of Se in the saltbush harvested on the Westside agroforestry trials benefited cattle on the east side of the valley where forages are generally deficient in selenium. Many different halophytes have been evaluated; one of the latest candidates is pickleweed (*Salicornia* spp.) which can be harvested as a fresh vegetable for food.

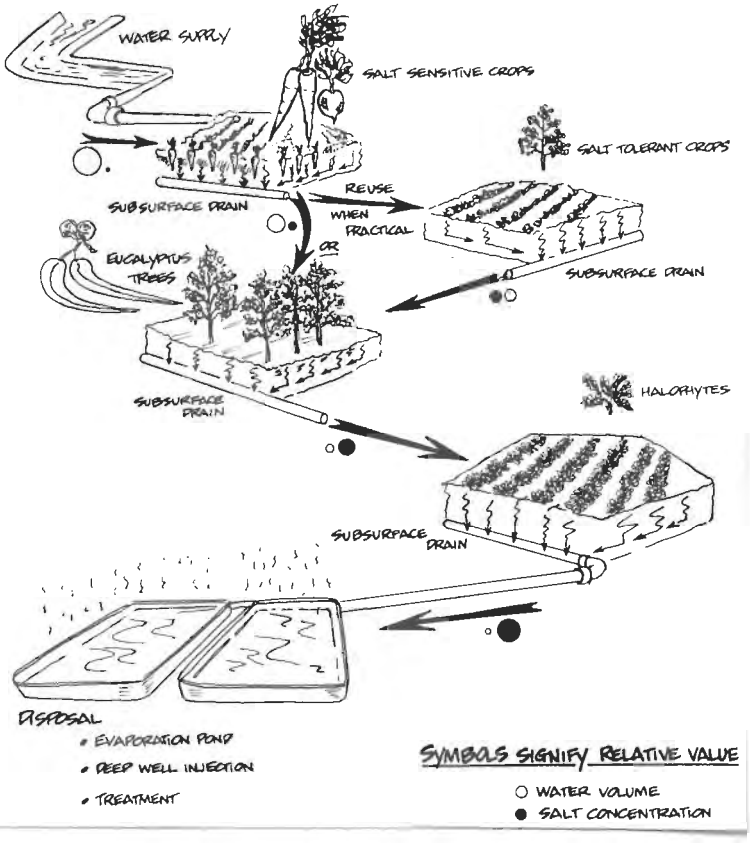
Research in several other aspects of the agroforestry program is being conducted by public agencies and private cooperators. A long term project to evaluate the potential entrance of Se into the wildlife food chain for species which feed or nest in the agroforestry plantings is being conducted by the Calif. Dept. of Fish and Game. Several different methods for the removal of Se from drainage water by chemical or microbial methods are under investigation. The feasibility of using trees to reduce seepage from unlined canal banks, to intercept subsurface lateral flows of shallow groundwater, and to lower high water tables is being tested in several new demonstration plots.

1995 Annual Meeting

Every year, the participants of the agroforestry program meet to share current research results and visit demonstration plantings on the Westside. At the 8th annual meeting held last October, plans were discussed to expand the program to a pilot scale system to manage drainage water on 640 acres of a commercial farm near Five Points. Funding for the next phase of development is being provided in part by grants from the US Bureau of Reclamation. A complete agroforestry system was installed, including about 13 acres of trees, 4.5 acres of halophytes and 2 acres of solar evaporators, to manage drainage water from irrigated land planted to salt-sensitive and salt-tolerant crops. Tile drains and tree rows were also installed along two sides of the area to intercept regional groundwater flow from upslope. Flow rates and salt concentrations will be monitored at all points in order to quantify the salt and water balance.

For more information about the Agroforestry for Sustainable Agriculture program, contact Vashek Cervinka, Calif. Dept. of Food and Agriculture, 1220 N St., Rm. A250, Sacramento, CA 95814, tel. (916) 653-9140, fax 653-9260, e-mail cervinka@ wheel.dcn.davis.ca.us.

Agroforestry for Sustainable Agriculture System



Source: Final Report, San Joaquin Valley Drainage Program, 1990.

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San Joaquin Valley Drainage Program, 1990, A management plan for agricultural subsurface drainage and related problems on the westside San Joaquin Valley (Final Report), US Dept. of Interior and Calif. Resources Agency, Sacramento. ❐

Intercropping Black Walnut in Oregon's Willamette Valley

Miles Merwin

Agroforestry is playing a role in the early days of a new black walnut industry developing in western Oregon. Among the first private landowners who have planted black walnut on their farms for timber are several innovators experimenting with intercropping as a means of improving the growth and economics of the tree crop.

Those involved in the new industry are optimistic that the Northwest can develop a market niche based on the unique properties of their home-grown black walnut. The oldest business in Oregon specializing in walnut wood is Goby Walnut Products. The business was started in 1975 by Gary Goby, who is also President of the Oregon Chapter of the national Walnut Council.

Agroforestry Trials

A member of the Oregon Chapter, Peter Kenagy, is experimenting with a variety of trees, forages and crops for interplanting in black walnut plantations on his 420 acre Willamette Valley farm.

In one of his first plantings of black walnut four years ago, Kenagy interplanted a wildlife forage mix between rows of trees planted at 10 X 20 ft. spacing. The 10 ft. wide forage strips, which include sorghum, sudan grass, buckwheat and sunflower, are intended to attract birds and other wildlife. Plastic tree guards (political signs creatively recycled) protect the walnut trees both from herbicides sprayed along the tree row to reduce moisture competition, and also against rodent damage. Kenagy plans to maintain the wildlife forage for 6 to 7 years until the trees achieve canopy closure.

In a recently cleared area, Peter Kenagy has tried intercropping black walnut with sweet corn. He planted pre-germinated nuts in rows 20 ft apart, sprayed once for weed control, and then drilled corn seed between the tree rows. The same traveling boom spray gun was used to irrigate the walnut/corn trial as for crops in the adjacent fields. Kenagy said that the corn produced about the same yield as in his other fields and provided the economic justification for irrigating the new black walnut plantation.

Kenagy is also testing several fast-growing, short-rotation tree crops for interplanting with black walnut. Hybrid poplar and paulownia act as a nurse crop to force straighter growth of the black walnut and also provide a source of income early in the walnut rotation. Poplar has proved to be too competitive when planted at the same time as walnut in Kenagy's trials, so he now plans to plant black walnut at double the final density two or three years prior to planting poplar or paulownia.

Another Northwest innovator is J.T. Lowe who intercrops black walnut with Douglas fir that are managed for Christmas trees on his farm near Portland. The firs are planted at 5X5 ft. spacing, within walnuts planted at 15X15 ft. spacing, and harvested for Christmas trees at after 7 years. However, in older stands of healthy walnuts, Gary Goby has seen evidence of juglone-induced growth inhibition of young interplanted fir trees when their roots intertwine with the black walnut.

Rather than utilizing eastern black walnut (*Juglans nigra*), strains recommended by the Oregon Chapter of the Walnut Council for farm planting in the Northwest are hybrid crosses of eastern black walnut and California black walnut (*J. hindsii*). Originally developed as rootstocks for English walnut, these interspecific hybrids are well adapted to the Willamette Valley of Oregon. There the hybrids grow almost twice as fast as eastern black walnut, according to Gary Goby, and produce better quality timber than the California black walnut. Some of the larger trees planted by early settlers exceeded 5 ft. in diameter at harvest, he said, and yielded high grade lumber in large dimensions.

Wood Qualities

Favorable growing conditions in western Oregon, mineral content of the soil, and the absence of damaging storms as in the Midwest, contribute to special colors and grain patterns in the wood. Gary Goby frequently finds orange tones in the wood he processes, along with black highlights. His wood inventory contains examples of a wide variety of decorative figures, particularly desirable for furniture, gunstocks and musical instrument making. Local trees are capable of producing much larger timbers than are commonly available from Eastern sources; Goby has produced top quality "clears" exceeding 8/4 (2 inch thick) X 10 ft. long X 28 inches wide. He has observed the beginning of heartwood formation after 18-20 years in the Oregon crosses, compared to only

9-10 years in eastern black walnut. Furthermore, Goby does not steam sapwood to sell as heartwood, a common practice among eastern sawmills.

Custom Milling

Goby travels throughout western Oregon and Washington, buying trees offered to him by private landowners. After the logs are first processed on contract by a sawmill near Lacomb west of the Cascade Mountains, he drys and resaws the rough lumber at his own custom drying and milling operation near Albany. Goby Walnut Products offers a variety of products, including kiln-dried lumber in 4/4 to 8/4 (1-2 inch) thicknesses, air-dried 10/4 to 16/4 (2½-4 inch) lumber, gunstock blanks, musical instrument stock, resawn veneers and turning stock. Milling about 30,000 BF (board feet) of timber per year, the company sells to both national and international markets.

Peter Kenagy inspects wildlife forage strips interplanted between rows of black walnuts.

Although the black walnut trees harvested today come from rural homesteads and suburban homes, Goby sees increasing interest among rural landowners in planting black walnut woodlots specifically for timber. This is a difficult, long-term decision for many, he said, since 50-80 years are typically required to grow trees of sufficient size (at least 28 inch diameter) for maximum return on their investment. While commercial veneer manufacturers are not interested in black walnut at present because of concerns about saw-damaging metal objects hidden inside old farmstead trees, Goby foresees a valuable veneer market developing for plantation-grown trees in future.

Planting black walnut for timber is "not for selfish people," Goby believes. "This is stewardship in its most basic definition." Nevertheless, for landowners (and their families) able to initially invest about $1000 per acre to establish a black walnut plantation, and to wait 50-80 years for final harvest, the potential rewards are attractive. Goby pays a higher rate of sawlog stumpage to the landowner, at least $1 per BF, than in the eastern US, where the going rate for stumpage is closer to 35 cents per BF. In the future, he believes the price of carefully grown black walnut timber can only increase. "Young men plant radishes," he says, "old men plant trees."

A study comparing the costs and returns of black walnut to Douglas Fir, the Northwest's most common timber species, as farm tree crops was prepared in 1992 by a private forester. Based on a 100 acre plantation of each species, the estimated value for walnut harvested at age 80 years was projected to be $10 million compared to only $1.5 million for fir, even including a pre-commercial thinning for the fir.

Intercropping

Agroforestry could make the economics of black walnut culture more attractive in the Northwest as it has done in the Midwest. Many possibilities are being demonstrated locally through the efforts of Peter Kenagy, Joe Lowe and others in the Walnut Council. In addition to annual crops (e.g. corn) and short-rotation trees (e.g. poplar) already under trial, shade-tolerant, bareroot nursery stock or flower bulbs could be produced between the walnut trees. While cattle are likely to cause damage by rubbing the trees, it may be possible to graze sheep on grass-clover pasture sown in strips between the tree rows.

Nut production is an important source of early returns in many black walnut plantings. However, most of the hybrid walnuts now planted in Oregon are not good edible nut producers because of difficulties with meat extraction, according to Gary Goby. Some thin-shelled varieties, e.g. 'Cooksie,' are grown commer-

cially in the state. Goby believes that the threat of blackline disease, which ruins timber quality, precludes the possibility of high-grafting English walnut varieties to hybrid black walnut rootstock for a combination of nuts and timber.

Seed Source Important

As with any tree crop, careful selection of seed source is a prerequisite to success. A diverse genetic base exists in Oregon, including hybrid crosses and the pure parent species, *J. nigra* and *hindsii*. A high degree of variability in both growth and form has been observed among individual trees growing in the Willamette Valley. Goby stresses the need to maintain careful records on the characteristics of parent trees, the soil type and management regime of the plantation, the growth of progeny, and ultimately the quality of the wood they yield.

In a joint effort with Oregon State University cooperative extension, the Oregon Chapter has identified promising individual trees as sources of seed for new plantations. For example, the 'BV' source originates from a 100 ft. tall, approximately 120 year old hybrid tree that is currently growing at a rate of about three-fourths inch in diameter per year and that yields large, heart-shaped nuts. Several test plots have been established since the local chapter was founded three years ago. In order to select the best seed sources for new plantations, there is an on-going need for more nut collections from good local trees, establishment of seedling seed orchards, and progeny trials.

Management Strategy

The strategy which Gary Goby recommends to landowners is to plant their walnuts at higher initial stocking and then remove the poorer trees at age five, leaving the best trees to grow at a final thinned spacing. The overall objective is to develop a straight, branchless trunk (bole) 16-20 ft. long with a small "defect core" through timely training and pruning. Once a satisfactory trunk is developed, then the only effort required is to maintain diameter growth so the tree will add high value, knot-free "clearwood" until it reaches optimal harvest size.

According to Gary Goby, hybrid black walnut in western Oregon grows best in deep, well-drained soils. Its soils requirements are similar to those of commercial fruit trees; the OSU extension service has prepared maps of suitable valley soils as a guide to landowners. Black walnut prefers moister north or east facing slopes, and creek banks. Shallow, dry or poorly-drained soils should be avoided for new plantations.

Landowners don't need to plant large acreages of black walnut to make a profitable investment, according to Goby. Farm woodlots as small as 1-2 acres can be sited in odd-shaped areas which are difficult to cultivate for annual crops. Clusters of black walnut trees can also be incorporated into riparian buffer strips.

Planting Black Walnut

Starting with a good seed source, the nuts are first stratified (moist chilling treatment) to increase the rate of germination. Following ground preparation, growers can plant either bareroot seedlings, or one or two pre-germinated (or ungerminated) nuts per planting spot. The initial spacing is usually 10-14 ft. between rows, depending on the size of the implements used for cultivation, and 10 ft. within the row. Although individual tree shelters are optional in the mild Oregon climate, some improvement in growth and protection from deer browse has been observed.

Most of the work required to grow black walnut between planting and harvest occurs during the first 10-12 years. Weed control is perhaps the most important task during this establishment phase, particularly to reduce grass competition prior to canopy closure. Where moisture is not limiting, cover crops could be planted and mown between the rows while maintaining an herbicide-cleared strip beneath the trees. Fertilization and irrigation during dry periods will promote faster growth. In Oregon, black walnut encounters no significant disease, insect or deer browse problems.

Early training and pruning are necessary for the production of high-value veneer and sawlogs. Training starts in the second year to eliminate branch crotches and other form defects. The aim of pruning is to remove shoots along the trunk in stages ("lifts") to 16-20 ft. high, yielding two branchless 8-10 ft. logs at harvest. Modified farm equipment such as a tractor-mounted cherry picker can be used for pruning. To minimize knot size, limbs should be removed before they reach an inch in diameter.

Thinning at about age five is also recommended for black walnuts. The best formed, apically-dominant trees are selected to grow on after removal of the poorer trees. The Oregon Chapter of the Walnut Council presents special workshops on pruning black walnut.

Thanks to Gary Goby for his help with the preparation of this article. ❐

New Black Walnut Book

Bob Chenoweth, 1995, Black Walnut: The History, Use and Unrealized Potential of a Unique American Renewable Natural Resource, Sagamore Publishing, Champaign, IL, 334 pp.

This is a highly personal treatise on eastern black walnut (*Juglans nigra*), containing many anecdotes of personal visits and correspondence by the author. While not a technical handbook on how to grow black walnut, it is a worthwhile summary of the history and current status of one of the most important native American hardwoods. Of particular interest are brief profiles of some of the private landowners and farmers who are growing trees for both wood and nuts. Included are growers such as Hammons Products Co. and Hugh and Judith Pence who are using intercropping with annual crops to produce income during the early years of the rotation.

Postpaid price $32.70. To order, call 800-327-5557 or write Sagamore Publishing, P.O. Box 647, Champaign, IL 61824.

Riparian Conference Proceedings

Proceedings of the Riparian Buffer Zones Conference, Sturbridge, Mass., November, 1994.

Contains papers related to the functions and values of riparian buffer zones, legal and regulatory status, and case studies of restoration and enhancement of buffers. The conference was co-sponsored by the Society of Soil Scientists of Southern New England, NRCS, Universities of Connecticut, Massachusetts and Rhode Island, and the Southern New England Soil and Water Conservation Society.

To order, send a check for $10.00 per copy to SSSSNE, P.O. Box 258, Storrs, CT 06268.

Agroforestry Education Directory

Directory of Agroforestry Education and Training Institutions in the United States, Dr. Badege Bishaw, Oregon State University, October 1995.

This new publication provides details on academic programs related to agroforestry education and research at 30 American universities. A one-page profile for each institution includes information on contact persons, educational programs in forestry and agriculture, institutional facts, facilities and teaching staff, courses and research related to agroforestry, and fees for foreign students.

To order a free copy, contact the National Agroforestry Center, USDA Forest Service, Rocky Mountain Station, East Campus-UNL, Lincoln, NE 68583, tel. (402) 437-5178. The Directory is also available online via AFTA's web site (see p. 11).

IUFRO Congress Agroforestry Papers

Agroforestry: Science, Policy and Practice, F.L. Sinclair, ed., *Agroforestry Systems* 30(1-2), 1995.

This special issue of *Agroforestry Systems* reprints papers selected from the agroforestry sessions of the IUFRO 20th World Congress held in Tampere, Finland, in August, 1995. Topics related to agroforestry that are covered in the papers include policy issues, financial and non-financial costs and benefits, development assistance policy, nutrition of intercropped plants, tree root characteristics, soil amelioration by *Parkia biglobosa*, root structure and shoot pruning, growth modelling, combined forest and crops models, modular modelling, incorporation of indigenous knowledge in agroforestry development, and methods for capturing diversity of endogenous agroforestry knowledge.

Agroforestry in Industrialized Nations

Agroforestry in Industrialized Nations, P.K.R. Nair, R.G. Muschler, C.R. Latt, R.F. Hüttl, eds., *Agroforestry Systems* 31(2), 1995.

Papers selected from the International Symposium on Agroforestry and Land-Use Changes in Industrialized Nations, held in Berlin in 1994, are included in this special issue. Three general papers review the current status of agroforestry in Europe, USA and Australia/New Zealand. Also included are specific papers from northeastern Germany and central Italy.

Working Trees for Communities

This new full-color brochure describes the use of trees in urban areas as buffers along the farmland/suburban interface, windbreaks, dust and noise barriers, wildlife habitat, living snowfences, riparian filter strips and for energy conservation. Copies of both this publication and "Agroforestry: Working Trees for Agriculture" are available at no cost from the USDA National Agroforestry Center, East Campus-UNL, Lincoln, NE 68583. ❐

National Agroforestry Center Partnership

Earlier this year the scope of the Agroforestry Center was expanded to support the expanding national interest in agroforestry, and renamed the "National Agroforestry Center" (NAC). This was followed by an agreement signed by the Chiefs of the USDA Forest Service and USDA Natural Resources Conservation Service to establish the NAC as an interagency joint-venture, effective October 1, 1995. The partnership combines the resources of the two agencies to enhance the ability of the Center to pursue its mission to "accelerate the development and application of agroforestry technologies to attain more economically, environmentally, and socially sustainable ecosystems".

Recent statements by NRCS Chief Paul Johnson indicate that NRCS intends to make agroforestry a priority area for technology development and application. NRCS has made a major commitment to the partnership in NAC with the assignment of six full-time positions to the Center, and providing partial support for a seventh position.

The NRCS positions include three agroforesters: Bruce Wight located at NAC in Lincoln, NE; Jim Robinson located at NRCS's Grazing Lands Institute in Ft. Worth, TX; and Gary Kuhn located at NRCS's Watershed Sciences Institute in Seattle, WA. The NRCS agroforesters and Forest Service technology transfer staff (Jerry Bratton, Kris Irwin, Kim Isaacson, and Joyce Jacob-Mua) will form one team to work with the network of cooperators to apply agroforestry technologies nationwide.

In agroforestry R&D, NRCS is co-locating three scientists with NAC. Two scientists (Stephanie Aschmann and Dave Anderson) are affiliated with NRCS's Watershed Sciences Institute in Seattle, and one scientist (Mike Whited) is affiliated with NRCS's Wetlands Sciences Institute in Laurel, MD. These scientists will work with Forest Service, university, and other scientists and specialists to develop appropriate watershed and wetlands technologies for the Great Plains and Midwest regions.

The FS/NRCS partnership, and additional support from USAID, also establishes the Center's International Technology Exchange program. The three agencies have agreed to provide initial funding to establish an International Coordinator position at NAC. The Coordinator will facilitate the development of agroforestry projects with USAID Missions and other agroforestry institutions with the participation of scientists and specialists from FS, NRCS, and land-grant universities throughout the United States.

All of these developments help to establish a national institutional framework for agroforestry. It is by no means exclusive. NAC will continue to solicit the participation of other federal agencies in the partnership, and to increase the number of organizations and institutions becoming involved in agroforestry R&D and technology transfer. Agroforestry development is a national effort involving all stakeholders. The role of NAC is to act as a clearinghouse and catalyst to accelerate the process.

Bill Rietveld, Director, NAC

Hardwood Research Award

The National Hardwood Lumber Association (NHLA) will recognize excellence in hardwood research with the 1996 Hardwood Research Award. It will be awarded to the best hardwood forestry/silviculture research, which includes any research aimed at improving the growth, quality, protection or management (including harvesting) of North American hardwood forests.

The Hardwood Research Award is open to any researcher - private, governmental, academic or student. It carries a $2,000 cash prize, plus travel expenses to the 24th Annual Hardwood Symposium, May 8-11, 1996, in Cashiers, North Carolina, at which the winner will present his/her research and accept the award.

Any hardwood silviculture/forestry research conducted or published between May 1994 and May 1996 is eligible. Nominations will be accepted in the form of published papers or unpublished drafts of research conducted during that period. If a technical paper is not yet completed, a detailed summary may be submitted in its place, provided a technical paper will be ready for presentation at the Symposium.

Nominations for the 1996 Hardwood Research Award can be made by submitting six copies of the technical paper or research summary to Dan Meyer, Director of Technical Services, NHLA, P.O. Box 34518, Memphis, TN 38184-0518. Only submissions mailed by February 1, 1996 will be considered. ❐

Internet Resources

AFTA Home Page in Progress

A World Wide Web home page for AFTA and temperate agroforestry information has been created, thanks to the efforts of Jan Joannides and Hobie Perry, within the Center for Integrated Natural Resources and Agricultural Management (CINRAM) at the University of Minnesota. On-line AFTA members are encouraged to submit ideas for their new home page; contact Jan at jjoannid@forestry.umn.edu. To visit the AFTA page, type http://rock-bass.gis.umn.edu/~hperry/ agroforestry_home.html.

Soil and Water Conservation Society

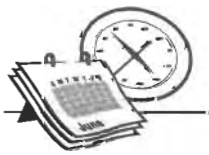
The Soil and Water Conservation Society maintains a Web site for members and others interested in resource conservation issues. It includes a calendar of events, what's new section, table of contents of the latest *Journal of Soil and Water Conservation*, publications list and useful links to other sites related to conservation. The address is http://www.netins.net/ showcase/swcs/.

Agricultural Information Search System

Within the @griculture Online site, edited by *Successful Farming* magazine, browsers will find a useful tool for accessing information about agriculture. Using the Agricultural Information Search System, maintained by Information Services for Agriculture (ISA), it is possible to search 10,000 agriculture-related web pages by up to four keywords at one time. Also included in @griculture Online is a list of *Successful Farming* publications, and information from the publication, *ag/Innovator*, which focuses on the application of computers and geographic information systems (GIS) in agriculture. The home page for @griculture Online, located at http://www.agriculture.com, contains a link to the Agricultural Information Search System, or you may access it directly at http://www.aginfo.com/search/ search.html.

Alternative Farming Systems

The Alternative Farming Systems Information Center is one of ten online information centers operated by the USDA National Agriculture Library, in cooperation with the University of Maryland Inform System. It contains useful links to a wide variety of other sites related to sustainable agriculture, lists of government documents, full text patents related to biological control and other alternative farming practices, keyword searching capability, and NAL publications (e.g. the Quick Bibliography series). The main address for NAL is nalusda.gov which contains links to a wealth of agricultural information. The Alternative Farming Systems Information Center can be visited directly via http://www.inform.umd.edu:8080/EdRes/Topic/ AgrEnv/AltFarm. ❐



Mark Your Calendar

Soil and Water Conservation Society, July 7-10, 1996, Keystone, CO. The annual meeting of SWCS will focus "on individuals who manage or affect the management of natural resources, and their needs as people who are responsible for conservation of the earth's land and water resources." Contact SWCS Meeting Coordinator Nancy Herselius for conference information and guidelines for preparation of papers and posters at: SWCS, 7515 NE Ankeny Rd., Ankeny, IA 50021, tel. (800) 843-7645 ext. 18, fax (515) 289-1227, e-mail swcs@netins.net.

Fifth Black Walnut Symposium, July 28-31, 1996, Springfield, MO. As part of the Walnut Council annual meeting, there will be two full days of technical presentations on all aspects of managing walnut, especially the use of agroforestry. A field tour is planned to the Hammons Products Co. to see their agroforestry program. For details contact: James Jones, Hammons Products Co., 217 Hammons Dr., Stockton, MO, 65785, tel 417-276-5181, fax 276-5187. ❐

The Temperate Agroforester
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AFTA PUBLICATIONS ORDER FORM

Agroforestry: Blending Agriculture and Forestry Production and Conservation Practices, Opportunities for the 1995 Farm Bill, includes policy statement, executive summary and seven issue papers on specific agroforestry practices. MEMBERS' Price $2.00, NONMEMBERS' Price $3.00. (Foreign postage, add 2 ounces.)

Agroforestry for Sustainable Development: A National Strategy to Develop and Implement Agroforestry, Report of a Workshop to Develop a Framework for a Coordinated National Agroforestry Program, June, 1994. MEMBERS' Price $2.50, NONMEMBERS' Price $3.75. (Foreign postage, add 3 ounces.)

Agroforestry: An Integrated Land-Use Management System for Production and Farmland Conservation, The Agroforestry Component of the Resource Conservation Act Appraisal for the SCS (USDA Soil Conservation Service), Feb. 1994. MEMBERS' Price $13.00, NONMEMBERS' Price $20.00. (Foreign postage, add 8 ounces.)

The Temperate Agroforester, back issues, Vol. 1 (1993): Nos. 1,2; Vol. 2 (1994): Nos. 1, 2; Vol. 3 (1995): Nos. 1,2. MEMBERS' Price $3.00 each, NONMEMBERS' Price $4.50 each. (Foreign postage, add 2 ounces **each**.)

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