THE CENTER FOR SEMIARID AGROFORESTRY

Inside Agroforestry

USDA Forest Service, Lincoln, Nebraska

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A new outlet:

CSA spreads agroforestry news

By Kristin Ticknor
Technology Transfer Asst.

Welcome to the latest source of agroforestry information.

Inside Agroforestry is just one of several publications produced by the Center for the specific purpose of keeping natural resource professionals informed and aware of the changing face of agroforestry. This quarterly update is designed to supplement and enhance some of the news that we think you need to know. But don't let all this seriousness fool you--*IA* is set to entertain with unique and unusual features that you might not find in other professional publications.

This publication is set to inform

This first issue will give you some important background on the Center for Semiarid Agroforestry. We'll tell you what we're all about and what we're up to in the world of agroforestry research, development and technology transfer.

We hope you enjoy your first issue of *Inside Agroforestry.* We encourage you to provide any and all comments in order to make upcoming issues even more informative and enjoyable. We also welcome any ideas you or someone you know might have for future articles that would be of interest to our readers. Perhaps you know of a landowner, and/or a cooperator who is doing some outstanding work in conservation forestry--if so, let us know and we will consider highlighting your idea in an upcoming issue.

Agroforestry practices protects soils, crops and wildlife, and provide a more comfortable human habitat. (photo courtesy USDA Soil Conservation Service)

"Sustainability is key"

Agroforestry 'opening doors' for agriculture

By Bill Rietveld
Program Manager

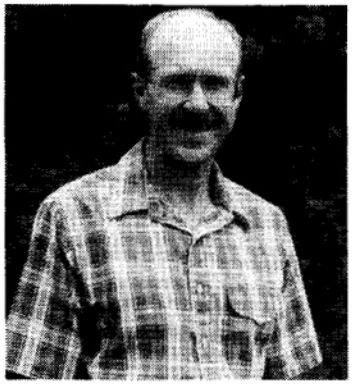
These are historical times for natural resource management issues. Yes, the challenges create dilemmas, the process of change is painful, and we may have to adjust to a new paradigm when the dust clears. But the silver lining lies in the opportunities that unfold to make things better.

Such is the case in ecosystems dominated by agriculture--agroecosystems. Where production enhancement was previously the dominant objective, now, due to the high environmental costs, the public is demanding "kinder and friendlier" land-use management practices. In response, the concept of "sustainable agriculture" was born, which emphasizes enhancing environmental quality and the resource base on which agriculture depends, providing for basic human food and fiber needs, economic viability, and enhancement of life for farmers.

We have come to realize the need for and value of sustainability, and the fact that we cannot have a sustainable system that emphasizes one component at the expense of others. We have also come to realize that no single discipline or agency working alone will be successful in charting the future. Discovering the means and ways of joining

See the Special Feature Section "Forestry Find" on Page 4

Inside This Issue



Message from the Manager

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

CSA gearing up for busy future

The science and practice of agroforestry may be new for many of the readers of this connection, and for many of our traditional customers. The Center for Semiarid Agroforestry was developed around a broadened definition of agroforestry that emphasizes the sustainability, conservation, and social values of trees in agroecosystems, in addition to the economic opportunities for converting marginal farmlands to high-value tree crops.

This first issue of *Inside Agroforestry* is focused on communicating the need for agroforestry, and the Center's identity and purpose. Future issues will support our role as an advocate, resource, and driving force for agroforestry, and will provide useful information and ideas, articles discussing issues, information on new programs, and showcase your successes.

"We are entering a new era of partnerships to attain our goals..."

CSA is still in its formative period. I am impressed with the dedication of our small cadre of Center employees; their innovation and support are vital to the success of CSA. Our emphasis during this period has been focused on communication with our partners, cooperators and customers, as well as planning appropriate programs to meet the goals of the Center. In the next year we will be conducting user surveys of agroforestry research and technology transfer needs, convening a steering committee, developing a charter, and continuing to develop programs and partnerships.

We envision component programs of the Center to include in-house research, cooperative research, technology adaptation and demonstration, tree

Continued Page 3

Research specialist: 'All trees are NOT created equal'

The following paper was written by Gerald A. Tuskan, Research Specialist and Geneticist, Oak Ridge National Laboratory, Oak Ridge, TN. The research was supported by Biofuels Systems Division, U.S. Department of Energy, under contract with Martin Marietta Energy Systems, Inc. The opinions and findings expressed in this article are not necessarily the opinion *Inside Agroforestry*. This paper has been reprinted by the authority of the U.S. Government.

Broad geographic adaptability is rare in the plant world, even among non-selected, natural populations. Differences among geographic locations in early and late frosts, extreme high and low temperatures, frequency and severity of drought, day length across latitudes, and soil characteristics restrict the movement of plant materials from one loacation to another.

Given that there are environmental restrictions on the movement of plant materials, this article will address selecting plant materials relative to three categories of trees:

1) native non-selected and native selected species
2) exotic species
3) species hybrids

Natural selection, the result of local environmental stresses placed upon local genotypes, typically results in genotypes which are conservatively adapted to the average growing conditions within a particular location. Improved growth rates can therefore be obtained, with minimal risk of environmentally caused damage or loss, by replacing local populations with trees from slightly southern origins. This rule-of-thumb, "northward movement" of plant materials, is also true of selected or improved native plant materials.

There are additional concerns, however, when dealing with selected populations. Usually, but not always, selection for improved growth or form results in a reduction in genetic variation. As a result, some geographic adaptability may be lost. *Thus, care should be taken in moving selected and non-selected native plant materials to locations drasticallly different from the environment in which these materials were developed.*

Exotic plant materials, particularly those from outside the U.S., generally perform in a predictable manner--they fail. There are, however, many notable exceptions. On the negative side, some exotics have become pests. For example, the tree of heaven in the northeastern U.S., the paulownia in south-

Continued Page 3

Exotic tree plantings take different care, consideration

Continued from Page 2

eastern U.S., and the tamarisk in the western U.S.

Alternatively, other exotics have been used successfully. For example the radiata pine in New Zealand and Australia, and the eucalyptus in South America and South Africa.

When exotic species have been successful they typically have exploited some aspect of the local environment that has not been exploited by the native plant materials. When exotics have been unsuccessful, it is usually the extremes in environment that eliminate these species. *Thus, care should be taken when selecting exotic plant materials.* Materials should be selected that are adapted to the local environment but will not escape and become a pest.

Species hybrids are generally the result of a breeding program operating under specific objectives related to a specific production system. Species hybrids can perform very well when grown under conditions for which they were developed. These conditions, sometimes referred to as "hybrid habitats," are typically characterized by high fertility and high moisture availability.

Hybrid corn, for example, only expresses its superior capabilities when grown under intensive agriculture. The same is generally true for hybrid tree species. The hybrid will outperform either parent under optimum growing conditions, but under average growing conditions hybrid vigor is lost. *Thus, care should be taken when selecting hybrid plant materials, the use of hybrids has to be accompanied with the selection and use of high quality sites and the possible use of fertilizers and irrigation.*

In conclusion, there are no miracle trees, each individual with each species has a set of environmental conditions under which it performs best. This is true of native, exotic, and hybrid plant materials. Individual landowners need to be aware of the unique environmental features of the areas they wish to plant, and then select plant materials which are adapted to these features.

Partners team up on new conservation forestry program

There's another option available to farmers who want to conserve their valuable land. A new partnership between the National Arbor Day Foundation and several federal, state and private agencies will place emphasis on planting and managing conservation trees on America's farms and ranches.

The program is called **"CONSERVATION TREES For Your Farm, Family and Future."** It's aim is to motivate America's rural landowners to plant conservation trees that will protect resources, save energy, and provide new income opportunities.

The program emphasizes 12 separate conservation practices: field windbreaks, farmstead windbreaks, living snowfences, riparina zone/filter strips, livestock windbreaks, wildlife habitat, fuelwood plantations, alley cropping, specialty forest crops, trees for recreation areas, woodland management and multiple use plantations.

The conservation trees program will feature a landowner recognition project and provide public service education announcements on television, radio, and in various publications.

Watch for a new "how-to" publication that will describe and encourage conservation practices. It will also provide information on how and where to receive financial and technical assistance.

Congratulations to the National Arbor Day Foundation on this timely program!

Source: Arbor Day, July/August, 1992

Natural tree chemical makes safe bug killer

Once again, the unlocked secrets of tree chemistry are coming to our rescue. According to a report in *Organic Gardening*, the seeds of an Asian evergreen, the neem tree, yield a compound called azadirachtin.

The complex molecular structure of the extract is proving deadly to some of our most obnoxious insect pests, including the Gypsy moth.

When ingested by leaf-eating larvae, this natural chemical prevents the insect from shedding its skin during molting, thereby causing death within days.

Since there is no toxic effect on the nervous system as with most insecticides, there is no danger to birds, bees, earthworms or mammals. In fact, neem oil is used in toothpastes in parts of the world and Sanskrit writings from 4,000 years ago describe it as an herbal remedy.

While EPA continues the approval process for broader use, neem is already approved in the U.S. for control of 18 kinds of insects on ornamental trees and shrubs. Extensive testing continues.

For more information, contact Ringer Corp., 9959 Valley View Road, Eden Prairie, MN 55344.

Source: Arbor Day, July/August 1992. Reprinted by permission.

More notes from CSA's manager

Continued from Page 2

health management, international exchange, and training. The target group for our programs is natural resource professionals, who in turn provide technical assistance to landowners.

I am really excited about the interest and opportunities for agroforestry that we have encountered throughout our contacts with various agencies and organizations. The opportunities are overwhelming at times!

Since the Center will work through cooperation and partnerships, and provide agroforestry support to the existing network of natural resource professionals, I truly believe we have a formula for success. We are entering a new era of partnerships to attain our goals of natural resources stewardship and sustainability.

If your agency or organization wants to be involved with CSA in developing agroforestry systems, or has suggestions on areas of mutual interest, please feel free to bring them to our attention. We would like to hear from you.

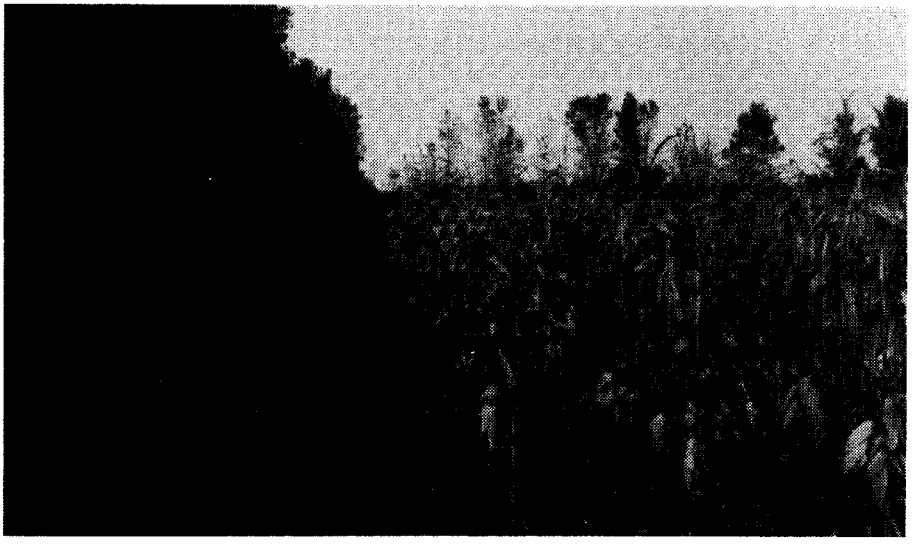
Why Agroforestry?

Continued from Page 1

hands and exploring the future together holds the most promise for the health of agriculture, the environment, and agricultural economies.

Where barriers existed before, the concept of sustainable agriculture is a door of opportunity for natural resource scientists and practitioners to contribute toward attaining solutions to major environmental issues in agroecosystems. However, the "ticket" required to enter that door of opportunity is to recognize the importance of partnerships and cooperation among all interested groups.

In this article I will present some of the roles that agroforestry might play in the development of sustainable land-use strategies, with the assumptions that:
1) we have something significant to offer to help attain sustainable agroecosystems AND,
2) that we will cooperate and work in partnership with all interested groups.



A field windbreak of Eastern redcedars can improve crop yields by as much as 50%. (Photo courtesy of USDA Soil Conservation Service)

Agroforestry is a specialized application of conservation forestry--situations where trees (and shrubs) are **added** to environments that are deficient in trees, and numerous values are created or enhanced because of their introduction.

How does domestic agroforestry differ from agroforestry in developing countries? In the latter case, traditional agroforestry is growing multiple crops on the same land simultaneously to increase the overall productive capacity of a limited and often degraded land base. We don't have a limited landbase (yet), and our needs go beyond basic supplies of food, fiber, and shelter. Thus, domestic agroforestry emphasizes the contributions of conservation trees toward sustainability, biodiversity, soil and water conservation, environmental quality, and social values. There are some basic differences between the two situations, yet there are some sobering similarities.

A more complete definition of domestic agroforestry is: "the use of conservation trees in agroecosystems to enhance agricultural productivity and sustainability, natural resource conservation, and environments for people."

Examples of agroforestry practices include field windbreaks, farmstead windbreaks, livestock windbreaks, streamside buffer strips (or riparian habitat and filter strips), roadway buffer strips, feedlot buffer strips, wildlife habitat, fuelwood plantations, high-value hardwood plantations, growing trees with crops or pasture, and municipal sludge disposal tracts. The list continues to grow as new and innovative ideas emerge for applying conservation trees.

Our concept of agroforestry is very pragmatic. We emphasize trees in support of agriculture; not conversion of productive agricultural land to tree culture.

A key concept in agroforestry is "working trees"--conservation trees must be planted in a particular place and configuration, and for a specific purpose in order to add value to the system. An example is field windbreaks; which may occupy 4-6% of the land area, yet increase crop yields 15-50% overall. At the same time, they protect crops from extreme weather.

Another example is filter strips; which are bands of trees, shrubs, and grasses along waterways to intercept and immobilize sediments and chemicals in runoff from adjacent fields or livestock enclosures. Growing trees in pastures has the potential to grow a high-value tree crop, while at the same time increasing forage production and reducing animal stress.

Agroforestry also encompasses some more traditional forestry practices. Opportunities abound to convert environmentally sensitive or economically marginal farmland--such as CRP land, small fields, and fields that frequently flood--to high-value tree crops such as fuelwood plantations, woodlots, or fine hardwoods. With competing uses excluding more and more public forest land from intensive fiber production, the profit potential from forestry enterprises on private lands will continue to rise.

In environmentally-stressed areas, establishing a system of tree buffers enables the growing of sensitive or specialty crops, such as fruits, vegetables, and herbs. All of these practices will have a positive and diversifying effect on rural economies.

People and communities are also an important component of agroecosystems, and high quality environments and social benefits of conservation trees for people are yet another important contribution from agroforestry. Trees provide visual screening and noise abatement, reduce heating and cooling costs, and enhance wildlife in farmsteads and communities. In agroecosystems, woody vegetation may occupy only 5% of the land area, yet account for more than 50% of the biodiversity. Some people react to biodiversity by saying they can't eat it or take it to the bank. But wildlife is a part of biodiversity, and game species provide basis for profitable fee hunting enterprises.

In a recent survey of CRP enrollees by the Soil and Water Conservation Society, nearly half (49.7%) were willing to plant

Continued Page 5

Agroforestry viable option for today and tomorrow

Continued from Page 4

vegetative cover to improve wildlife habitat on their CRP acres. This is a clear indication that landowners are interested in biodiversity and wildlife. Research is needed to identify the true value of biodiversity in sustainable agroecosystems.

Clearly, conservation trees can have a larger role to play than just their traditional forestry role, or even their role in sustainable agriculture.

With few exceptions, trees are a requirement for a sustainable culture. L.R. Brown (1985, "Reforesting the Earth", American Forests '91 (4):38-44) wrote: "one telling measure of humanity's progress toward sustainability is the extent of efforts to plant trees." Trees are a vital component of sustainable agricultural land-use systems. Production and protection have become the basis for the concept of sustainability, and agroforestry is focused on addressing that need, as well as enhancing other resource and social values. We need to learn how to integrate agroforestry practices with various conservation farming practices and other elements of the agriculture infrastructure in ways that will most effectively attain the goals of sustainable agriculture.

The Center for Semiarid Agroforestry helps visitors from foreign countries get to know more about agroforestry research, development and practice in the U.S. Pictured from left are: Koffi Bassan, an intern from Togo, Africa; Mike Rodell, CSA information management assistant; Kande Matungulu, a scientist associate from ICRAF, Nairobi, Kenya; and Michele Schoeneberger, acting CSA research program leader.

International guests visit CSA

When it comes to agroforestry, different countries are often worlds apart in research, technologies and practices. Every region has its own ideas on how to approach agroforestry science and practice. International exchanges can help to bring these very different worlds a little bit closer in sharing important information.

The Center for Semiarid Agroforestry cooperates with the International Forestry branch of the Forest Service. Several visitors from around the world have checked in on CSA in recent weeks.

One of these visitors will be getting an "in depth" tour of CSA's research. Koffi Bassan, a native of Togo, Africa, will be working at CSA for the next four months. His stay was made possible through an internship funded by the African American Institute.

Bassan finished his masters in Forestry Research Management at SUNY College of Environmental Science and Forestry. His stay will allow him to get practical training in field service and agroforestry research.

Apart from adapting to all the differences in the United States, Bassan says there are a lot of advantages to studying here. "You gain more and it's more challenging here," he says. "You are in contact with the latest technologies and the best results from research."

Bassan hopes to take all the knowledge he has gained in American agroforestry back to Togo after he completes his education.

Also visiting the center was a member of the International Center for Research in Agroforestry (ICRAF). Kande Matungulu is a scientist associate with the Nairobi, Kenya based organization.

Matungulu, a native of Zaire, arrived for a tour of CSA August 11. He's busy developing the Soils Center for ICRAF through coordination with the National Soil Survey Lab, USDA Soil Conservation Service in Lincoln, Nebraska.

Prior to his work with SCS, Matungulu recently completed his doctorate degree at North Carolina State University under the direction of Dr. Buol.

Matungulu came to find out more about CSA and to look into possible international cooperation and coordination with U.S. based programs like this one.

The Center's program manager, Bill Rietveld, appreciates the opportunity to meet with international guests. He says that although CSA is still developing its role in international forestry, foreign visitors are always welcome.

"Ultimately our goal is to be a satellite part of the Forest Service International Forestry program," Rietveld said. "We want our activities to be an integral part of their program. We hope it will be of value to international agroforestry scientists and of value to the U.S. in terms of agroforestry science and practice."