



# Inside Agroforestry

Rocky Mountain Forest & Range Experiment Station  
National Agroforestry Center

Summer, 1995

## The Role of Agroforestry in Sustainable Agriculture: An Interview

*Dr. Don Wyse is Director of the Minnesota Institute for Sustainable Agriculture, St. Paul, Minnesota.*

**NAC:** As a leader in the sustainable agriculture "movement," could you define it for us and comment on where it is going?

**WYSE:** There is a lot of debate about the definition of sustainable agriculture. Many definitions have been put forward and the one that's caught the attention of our legislators and universities is the one used in the 1990 Farm Bill. Most of what came out of it focuses on a systems approach to agriculture, which takes into consideration the environment, the profitability of agriculture, and the human component. This is somewhat different than conventional agriculture, which focuses mainly on the production of products. Only in recent years have we given more emphasis to the environment and to the human component.

**NAC:** How does agroforestry fit into your vision of sustainable agriculture?

**WYSE:** When you look at conventional agriculture today you're basically talking about commodities. The Federal program operates on a commodity basis. Therefore, we focus our agriculture on a limited number of commodities like corn, beef, and poultry. We don't focus on a system. In the sustainable agriculture movement, we

*(See Sustainable Agriculture on page 5)*

## Would Leopold Embrace Agroforestry?

*by Jerry Bratton  
Technology Transfer Program Leader  
National Agroforestry Center*



**Aldo Leopold**

How is it possible, that in 1948, a man of vision could have portrayed so clearly the opportunities and problems associated with today's natural resources? Aldo Leopold was a "clear" thinker. He was capable of seeing the trees for the forest, the grass for the range, the soil for the farm, and the raindrop for the river. He had the unique ability to understand the actions and interactions created by unstable ecosystems and the

prescriptions needed to make them stable. Is it possible that he is helping us shape the decisions we're faced with today? The answer would have to be a resounding "yes." In his book, *A Sand County Almanac*, Leopold makes reference to many of the problems and opportunities that confront us today. His words of wisdom are still viable and give us guidance toward making reasonable decisions for managing today's complicated environment.

Aldo Leopold didn't simply preach why and how to manage, improve, and care for natural resources — he practiced what he preached. He bought a "run-down" farm and it was there that he put his theories into practice. When he spoke or wrote he did so from experience which lent credibility to his words. Leopold is probably quoted in the conservation arena more often than any other conservationist I can think of. As far as I can tell, nearly every major point he made, relative to natural resource management, is still relevant today.

So, how do you suppose Leopold would react to combining forestry technologies with those of agriculture to create agroforestry? And then combine agroforestry practices with those of conservation agriculture to create sustainable agricultural systems? I

*(See Leopold on page 7)*

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## Message From the Manager

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

### Putting the "Agro" Into Agroforestry

Until recently, most of the interest in agroforestry has come from the forestry community. But, that's changing. Last August, in an effort to facilitate more cross-disciplinary interest in agroforestry, we sponsored the *Agroforestry and Sustainable Systems Symposium*. It was a good beginning. The Symposium received many favorable reviews, including one in the American Society of Agronomy's (ASA) Newsletter. However, they felt it focused more on "forestry" than "agro." ASA subsequently has invited us to jointly sponsor an agroforestry symposium in conjunction with their annual meetings, which we are doing in 1996. This time we will get it right.

We are pleased with the interest in agroforestry that is emerging from the agriculture community, especially from sustainable agriculture centers at several universities and private organizations that promote sustainable agriculture. Our *IA* interview with Dr. Don Wyse, Director of the Minnesota Institute for Sustainable Agriculture, reflects this interest. The common ground is recognition that agroforestry can help create agricultural systems that are productive and profitable, environmentally-sound, and provide for people's needs.

For years we have intentionally separated agriculture and forestry and thought about them as being mutually exclusive. After all, people cleared the forest to grow crops, so why would we want to plant the trees back?

The answer lies in one word — sustainability. Our modern, highly productive agricultural systems are not sustainable over time. It's now becoming widely recognized that we need integrated systems that optimize both economic production and environmental protection. And we need safety nets in the system that serve that vital function, and pay for themselves in products and services.

The draft Conservation Reserve Program for the 1995 Farm Bill reflects this recognition. There is more emphasis than ever on targeting of priority lands and practices. Tree planting practices — windbreaks, filter strips, living snowfences, and wildlife habitat — are repeatedly mentioned because they provide multiple, long-term benefits. This is, of course, good for business, but more importantly it draws us together. We share a common interest in optimizing the function and benefits of conservation practices, properly integrating them with agricultural practices, and developing an ecological watershed-level approach. Equally important, we need to learn how to practice "safe agroforestry," i.e. to minimize conflicts with crops or wildlife.

To accomplish this, interagency and interdisciplinary teamwork are essential. To that end, we hope the interest in integrated agricultural systems will continue, and that we will continue to build bridges between the forestry and agricultural communities.

## Agroforestry in Tropical Hawaii and Other Pacific Islands

Most of us don't think of a tropical climate, like Hawaii, when we think about traditional agroforestry. But, Hawaii, in addition to the other US-affiliated Pacific Islands (US Flag areas and Former Trust Territories), have a long history of indigenous subsistence agroforestry. Some of the most common agroforestry systems that Hawaii practices include: shifting cultivation, multilayer tree gardens, home gardens, alley cropping, live-stock-tree systems, and windbreaks.

Though Hawaiians have been incorporating agroforestry into their landscape, they face challenges that many mainlanders never even

think of. For example, opportunity costs are high for agroforestry in Hawaii and the other Pacific Islands, where land sale and lease prices often fare higher for tourism development. And, due to the small size of the islands and their isolation from major markets, they are generally classified as rural economies. This means that economies are usually small with people having modest levels of income. Therefore, income from agriculture is insufficient to support investment in conservation practices.

Despite these, and other challenges, resource professionals in Hawaii continue to address their

needs and opportunities. One such need is education. There is a critical need to create a new generation of college-educated island foresters. Most island forestry programs are now led by professionals from the mainland. The Forest Service is currently trying to provide scholarships to encourage interested islanders to return to their home islands. Ultimately, the most sound development in the future will come with islands depending primarily on their own people and sustainable management of their own resources.

*Source: adapted from "Agroforestry in the US-Affiliated Pacific Islands: Present Status and Future Potential" by Kathleen S. Friday and Robert W.*

*Wescom*

# Agroforestry...A Landowner's Perspective

by Ken Kudrna  
Farmer-Rancher  
Hay Springs, Nebraska

I've been called Mr. Appleseed a time-or-two...but, I don't mind. And, I certainly don't regret having the trees that I've planted. You see, lots of people would like to have some, or even just one, of my windbreaks.

Growing up, my dad planted trees and it was my job to hoe around each one and haul water to them. Even though this was a lot of work and I hated trees at the time, I believe it's where my love for trees originated. However, I must mention that even though I wouldn't trade my windbreaks for anything, they don't come easy.

My wife, Selma, and I now live on the home place, which we purchased in 1958. We take care of our place, and our parents places, the Frank Kudrna and Lester Lundy places.

We've planted trees every year since 1958, with the exception of the three years that I served in the military. Each year between 1958 and 1980, we hand-planted and maintained anywhere from 300-500 trees per year. It was a big job, but the part that I couldn't believe was that I was back to hoeing and watering trees — something I vowed to never do again!

The "big year" came in 1986, the spring after the Conservation Reserve Program (CRP) was initiated, when we planted 15,000 trees. Many thanks goes to the assistance of the Upper Niobrara-White Natural Resources District (NRD) and the Agricultural Stabilization and Conservation Service (ASCS), and of course, cost-share monies available through these agencies. If it weren't for these people and cost-share dollars, I wouldn't have accomplished this. Furthermore, in 1986 the NRD assisted me with the research and purchase of my own machine tree planter. They also helped tremendously with the arduous task of maintenance, as well as helped me set up my spray rig and calibrate the proper amount of chemicals to apply.

I'm from Hay Springs, Nebraska, (the northwest part of the state). Our ranch is 15 miles southwest of town. And, it's windy here! Furthermore, you can drive for miles without seeing any trees at all. In fact, I can almost guarantee you that any tree that you do see was planted for some reason or another.

I'm a farmer and rancher. We raise mostly dryland wheat and alfalfa. If I take my land out of CRP then I'll go back to raising oats and barley too. I also run about a 350-head cow/calf operation along with about 50-head of replacement heifers.

Right now, I've got approximately 14 five-row windbreaks that stretch for a total of about 12 miles and I've got about 16 two- and three-row windbreaks that stretch for about 14 1/2 miles. These field windbreaks are spaced 1/4 mile apart across my fields. I'm working on narrowing that distance to 1/8 mile, so that the entire area receives adequate protection. One of the windbreaks is "Z" shaped and doubles as an outdoor living barn and calving area. About four of the field windbreaks are "L" shaped and can also provide late spring protection for my cattle. The April and May storms are the ones that I really worry about because I've got a lot of young livestock around the place at that time of the year. I've also got wildlife habitat plantings filling in some of the corners of fields, one is a nine acre patch and another is four acres, with some other patches planted ran-

domly throughout my property.

Do the trees help? Yes! We've got some good farmers in the area and my trees help me keep up with them. Just one example of how effective my field windbreaks are is the extra 1/2 to 3/4 ton-per-acre yield of alfalfa that I'm getting because of the protection they provide. The alfalfa adjacent to the trees is twice as tall as compared to that in the middle of the field. And, when my cattle are calving near the "Z" windbreak, I don't worry about them because they're protected from almost every direction. They love it, and stay in better shape too! I also have a fall-calving herd, about 40 miles from home, that I calve out near a naturally wooded area where cedar and pine trees are in there so thick it's just like a wall. My father-in-law used to say that those trees are as good as a barn...and you don't have to clean it! This wooded area is located about 40 miles from our home, so you see, I don't worry about my cattle when they're protected by trees. In 1994 I didn't have enough hay to feed all winter, so I had to rent cornstalks to graze — I found out quickly that you pay considerably more for fields that have shelter — needless-to-say, you get more too! Then there's the

(See Landowner on page 6)



Ken bales hay inbetween rows of a cedar field windbreak, maximizing the use of his land. Here, his son Kevin checks the moisture content of a windrow.

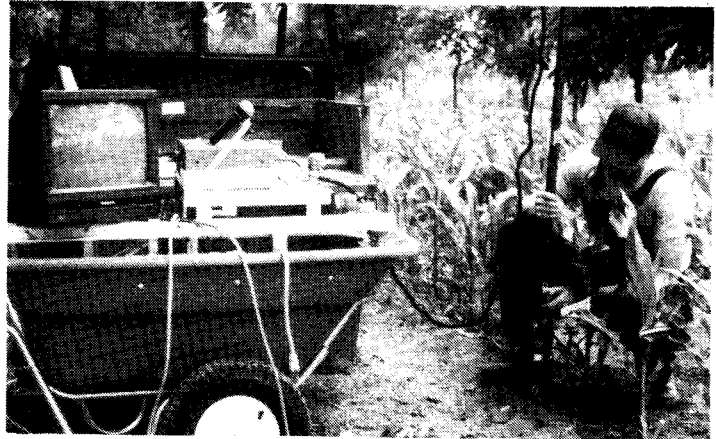
# What's New in Alley Cropping Research?

Alley cropping seems to fit the niche of combining a long-term, forestry-oriented, conservation practice that enhances the environment with a traditional cropping practice that provides annual income. Various economic analyses and field trials have been conducted on alley cropping systems and have shown it to be a technology that provides returns to both the land and the landowner.

However, Dr. Andrew Gillespie, Associate Professor of Silviculture, Purdue University, West Lafayette, Indiana, with the assistance of several Purdue agronomists and economists, is building on past research results and going one step further. Previous research mainly focused on crop yields and economic analysis of the tree/crop system. Gillespie is attempting to better understand plant competition at the tree/crop interface. He is taking a close look at both above-ground and below-ground processes, including nutrient cycles, photosynthesis, and water-use relations.

Gillespie's research plot includes a 12-block replication of alternating rows of soybeans and trees, and corn and trees. Sets of four, six, and 12 rows of crops are within each alley to assess the differences between resource competition for light, water, and nutrients. Two species of trees are used, red oak and black walnut, and two spacings within tree rows have been tested, four foot and eight foot. However, the best trees have now been selected and all tree rows have been thinned to eight foot spacings and pruned to allow adequate space for farm machinery to maneuver. The experimental system is 10-years-old and tree heights are 20 to 25 feet.

Additionally, a unique research opportunity surfaced for Gillespie when he met Hugh Pence, a Lafayette, Indiana landowner and farm manager. Mr. Pence, already a pioneer in the agroforestry arena and an active member of the American Walnut Council, believes so much in what current agroforestry research results are showing that, in 1988, he established a well-thought-out



*By inserting a small camera down a glass tube (a minirhizotron), a research assistant analyzes the rooting pattern of trees and corn.*

alley cropping system on his own farm. On his own initiative, he planted 44,000 walnut trees spaced 22.5 feet apart on 124 acres and plants corn each year in the alleys. In the future he plans to plant soybeans and hay.

Pence's contribution to Gillespie's research is important because he is able to provide actual, on-farm information for use in economic analysis. With Pence's cooperation, cost assumptions can be analyzed and real figures from his farm are used for alternative projections. Pence's "working farm" provides important data like: the time it takes to prune trees, yields and return on investment, cost for inputs such as fertilizer and herbicides, and cost of application. Furthermore, Pence is "thoroughly convinced that this system of agriculture has a lot of unrealized potential for "the heart of the cornbelt" and is more than willing to assist Purdue University in this research pursuit. Infact, according to Gillespie, Purdue is probably realizing greater returns from this cooperative effort than Pence is. The union of the two is no-doubt a win-win situation.

Gillespie believes that "in a year-or-two, we'll definitely know the potential of alley cropping systems in the Midwest and how to modify and optimize them for a variety of different objectives." Results from this research project will be used to understand interactions between traditional cropping practices and alley cropping as a system, under normal crop management. Also, this project will provide a comparison of low-input techniques and the impact of soil and water conservation on yields. Hopefully data on system performance, yields, economics, management, and ease of adoption will be achieved as well.

Gillespie's plans for the future are to extend this intensive biology-economics type of research to other systems used in the Midwest.

*It is because of the dedication of scientists like Andy and the initiative and cooperation of landowners like Hugh that needed agroforestry research continues and that this knowledge can be acquired to make practices like alley cropping more profitable and successful for landowners. Thank you Andy and Hugh!*



*A research assistant takes gas exchange measurements (photosynthesis, transpiration, etc.) for black walnut trees using an infrared gas analyzer.*

# Santee Sioux Tribe Establish “Outdoor Living Barn”

An “Outdoor Living Barn” is the solution to the Santee Sioux Tribes’ economic and conservation needs.

Two years ago the Tribe, located in Knox County, Nebraska, decided to find a way to get their calves to market sooner than the competition, which would allow them to obtain a higher price. In order to accomplish this, the Tribe needs to get their calves to market in September, rather than December, which means calving in late January or early February. The problem is that during these months the winter weather still persists and often times the temperature plummets below zero. And that, in addition to the windchill, can kill a newborn calf.

*(Sustainable Agriculture from page 1)*

as a group, are trying to look at the system, and the components of that system, in an effort to bring about new inputs and opportunities that help supply the end result, which is a focus on profitability, environmental protection, and people. So, I believe that agroforestry provides us with the opportunity to bring new opportunities to rural America. For example agroforestry has the potential to bring about new products, which in turn create new job opportunities and enhance the local economy.

**NAC:** What is the Minnesota Institute for Sustainable Agriculture (MISA) doing on agroforestry?

**WYSE:** The Institute spent the last two years trying to bring a group of people together, from both the forestry and agricultural fields, to look at how agroforestry fits into sustainable agriculture. I’ve found, in my discussions with individuals dealing in agroforestry, that the focus is still somewhat narrow. Folks currently look at agroforestry in much the same way we look at monoculture corn. The original idea of agroforestry was to put trees on the landscape, and not a lot of thought was put into how that would fit into the overall development of a sustainable system. Through our discussions, I believe we’re beginning to talk now about

In an effort to find a solution, the idea to establish an “outdoor living barn” evolved. This past spring, the Tribe, along with the Nebraska Forest Service; Bureau of Indian Affairs; and USDA Forest Service, National Agroforestry Center, established a six-row, 7,000 foot (1.3 mile), windbreak comprised of red cedar, ponderosa pine, and mixed shrubs. The objective of the planting is to stop blowing snow within the windbreak to provide late winter/early spring protection for the Santee Sioux’s 500-head cow/calf operation.

According to Darrell Ausborn, Forest Manager, Bureau of Indian Affairs, “the project was driven by a benefit-cost analysis. The importance

of agroforestry and agriculture can be combined to provide a landscape approach to our production system. And, MISA has played the role of facilitator in this effort.

**NAC:** What roles for agroforestry, within sustainable agricultural land-use systems, do you see as the most important?

**WYSE:** Well, the primary problem that I see in moving agroforestry into mainstream agriculture is that most of the concepts that have been put forward in the past have not been profitable — at least farmers have not received them as being profitable. In most cases, agroforestry has been presented as a way of protecting the environment. And, most farmers don’t want to take on that whole responsibility single-handedly. They would like to see agroforestry provide them with new opportunities to solve social and profitability problems, as they deal with environmental issues across the landscape. So, if we’re going to move agroforestry into mainstream agriculture we need to look at how we can do this in a profitable way. If it’s profitable, I think we’ll have more farmers stepping forward to provide support and moving that technology into the agricultural system, resulting in environmental protection as well as an added compo-

ment of profitability to agriculture in general. In this case, the ability to get first-year calves to market in September versus December means an expected market advantage of \$.15-per-pound. The Tribe currently has the potential to market 460 head of 500-pound calves a year. This totals an economic advantage of \$34,500-per-year!”

The Tribe provided the land and initiative for the project. They were responsible for planting the trees and shrubs and will continue to provide maintenance. The land adjacent to the planting is in row-crops now, but will be converted to pasture this fall.

ment of profitability to agriculture in general.

**NAC:** You mentioned landscape-level management, what are the benefits of this approach?

**WYSE:** As we look at social, environmental, and profitability issues, I think that the new thought process coming about is that we approach these from a landscape perspective. The landscape provides the focus for our efforts. As we set goals and objectives for a landscape, we move individual farmers through individual farm plans in an effort to meet the overall landscape objective. In other words, we need to get farmers within a region to focus on the broader issues, which is really what we’re doing when we talk about water quality within a river basin. Farmers need to begin thinking about their farm as part of a larger landscape, in the fact that what they do on their farm either contributes to, or minimizes, the whole problem. Furthermore, the idea is that by moving perennial plants onto their cropping system, they are doing the appropriate thing for overall landscape management. I think that we also need to mention that as we approach agroforestry and the development of new cropping systems, we need to think about wildlife.

*(See Sustainable Agriculture on page 7)*

(Landowner from page 3)

wildlife, as with everything, there are positives and negatives. But, I really enjoy seeing them around and I can't see that they're hurting my bottom line in terms of dollars. Infact, my son Kevin is interested in trees too. He has bought land and is already getting set up to plant about six field windbreaks next spring. He likes to hunt so the wild-life factor is one of his alternate goals.

Through trial and error, I've learned a lot over the years. For instance, in the mid-60's, lombardy poplar trees were the only species I had planted around our house. They were 40 foot high and doing well when in the early 80's they froze and I lost them all. I quickly learned to use a variety of species. Since then, I have replaced them with black walnut, American elm, hackberry, and green ash. Now, I use a variety of species in most of my plantings. All of my windbreaks consist of one, or a combination, of these species: juniper, red cedar, ponderosa pine, elm, green ash, russian olive, honeylocust, hackberry, and a shrub row of either sandcherry, lilac, sumac, buffaloberry, chokecherry, or plum (good for the wildlife).

I've visited with many neighbors and even offered them the use of my tree planting machine, but haven't had a lot of takers. In talking with them, I believe that part of the problem with getting them to plant trees is that most either don't understand the whole concept or simply aren't committed to it. They're often times "too busy," or say "trees...they take up too much room," or that they have "tried planting trees and most of them died anyway so I got discouraged."

Well, I've found out that not *every* tree will grow *every* year and then some years all of them will grow. It's a hit-and-miss situation. And then, of course, there's the long-term turn-around. Basically, I believe you're planting trees for the next generation. However, I'm already starting to see benefits of my own labors. And, I must say, I just enjoy trees!

As I mentioned before, the NRD really deserves a pat on the back. They help me with maintenance, which is so important because tree-

## Help Save the Butternut

Forest inventory data collected by the USDA Forest Service reveal that butternut trees have declined up to 84 percent in some parts of the Lake States over the past 10-15 years. Never very common, this close kin to walnuts is now in serious jeopardy. The culprit is a fungus discovered in 1967 that produces cankers that close off the tree's food and water supplies. But officials at the Forest Service's North Central Experiment Station say there is still time to fight back. They are conducting a campaign to locate healthy butternuts growing within 100 feet of infested trees of the same species. In this way, they hope to find disease-resistant trees they can propagate in the nursery, assuring healthy butternuts for the future. For information on how to identify and report a disease-resistant butternut, contact: Forest Disease Project, USDA Forest Service, 1992 Folwell Avenue, St. Paul, Minnesota 55108

Source: *Arbor Day*, January/February, 1994.

maintenance time is also a busy field time for farmers and ranchers. They also help me choose the correct location for windbreaks based on prevailing winds, landscape, and soil types, choose species, and prepare the ground. The cost-share programs are an incentive that help encourage landowners to plant trees. This is important because it's such a long time before you're able to see a payback, especially when compared to the quick turnaround and payback you get from practices like terraces and waterlines. Actually, I found out that a lot of landowners don't even realize that these cost-share programs exist. I don't believe though that the government should foot the entire bill or there would be less enthusiasm on the part of the landowner, and enthusiasm is the key ingredient!

Based on my experience, for a windbreak to function properly, I suggest putting some time and research into where the windbreak is going to be located. The landowner really needs to be involved in this because special attention needs to be paid to how the land is laid out. It's important to think about things like direction of prevailing winds, at all times of the year, and what the future plans are for the area. For instance, is there a field that may have a center pivot irrigation system installed on it someday? And, what will the windbreak be used for?

One of the biggest mistakes I think many farmers and ranchers make is planting around the house first, then planting field windbreaks. It should be the other way around or at least done simultaneously. You need to establish your "back-up" rows first, so that snow doesn't pile up right in the yard because you only have that one windbreak around the house.

All-in-all establishing a windbreak system takes work and commitment. The turn-around time to see the benefits may be slow, but if I can increase my yields, protect my cattle, and improve wildlife habitat, time is of the essence. People knew 100 years ago that trees were good and paid off, what's taking us so long to catch on today...everyone's got to start somewhere!



Ken and his wife Selma are pictured here with two of the awards that they have been presented for their conservation efforts.

Individual farmers need to understand that what they do on their farm contributes to an overall ecosystem management objective.

NAC: What do you see as the main barriers and challenges confronting agroforestry?

WYSE: Well, again it goes back to some of the things I mentioned earlier. I think that for agroforestry to be mainstreamed into agriculture, the opportunities presented must be profitable and they must fit into this landscape management approach. We have to figure out how agroforestry fits into a landscape management scheme, based on the ecosystem that we're dealing with. Just stepping forward and saying we're going to put trees across the landscape is not the appropriate approach. We have to figure out what the impact of moving forest products into agriculture is going to have on the environment and the profitability of farmers willing to move this technology into cropping systems, and we must also think about the impact it would have on communities.

NAC: How do we put the "agro" in agroforestry, meaning get the agricultural community of interest more involved?

WYSE: When you look at landscape management, you automatically bring foresters and agriculturalists together. Having them start from the very beginning together and developing a plan of action, I think is the way to get agriculture into forestry, and forestry into agriculture. Historically we both did our own thing. I think that it's time to really put some teams together with equal input. Agroforestry, in the minds of a lot of people today, is still very narrow. It's nothing more than growing trees on the landscape. It doesn't take a very broad systems approach. Unless we have that joint discussion, we'll end up with a patch of corn and a patch of hybrid poplars and we'll call it agroforestry. I would argue from a landscape perspective that we can do better than that.

think he would relish the idea. After all, he planted many trees and shrubs on his Wisconsin farm in order to "heal" the mismanagement of previous owners. He didn't condemn the profession or importance of farming, he knew we must eat. In fact he wrote; "Scientific agriculture was actively developed before ecology was born." (Pg 260) However, he realized that growing food was no excuse for destroying our resources and condemned the way much of the land was managed. He disagreed with reasoning behind decisions that were based entirely on short-term production economics. He deduced, "As a land-user thinketh, so is he." (Pg 263) In other words if a landowner thinks short-term he will manage for the short-term, and that is not always good for natural resources. Trees placed in an agricultural ecosystem are by their very nature long-term and add stability to a vulnerable environment.

Leopold didn't use the term "sustainable agriculture" but he unknowingly defined it when he discussed land ethic: "Examine each question in terms of what is ethically and esthetically (sic) right, as well as what is economically expedient." He went on to say, "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise. It of course goes without saying that economic feasibility limits the tether of what can or cannot be done for land. It always has and it always will." (Pg 262)

So what might an agricultural landscape look like that incorporates Leopold's land ethic philosophy? It would need to be diverse, stable, environmentally sound and profitable. In my "mind's eye" I picture a landscape of multiple farm ownerships. Individual farm management decisions would be made relative to their effect at the watershed level. To

create economic stability each farm/ranch would integrate tree/crop/live-stock farming systems that optimize products and income. In order to protect natural resources and provide for aesthetics, the system would contain field and landscape buffer zones. These buffers consisting of trees, shrubs, and grasses would be incorporated to: provide protection from climatic extremes of temperature, wind, and water; trap, filter, break down, and consume sediments and agricultural excesses; enhance biodiversity; protect soil and water; increase and improve wildlife habitat; and provide a more pleasant human environment.

In 1949 Leopold stated; "By and large, our present problem is one of attitudes and implements." (Pg 263) This remains true today. The attitude that problems are negligible or that they're nonexistent abound. Since the concept of agroforestry (combining both conservation and production facets) is relatively new to the U.S. we lack the awareness, understanding, acceptance, and support needed to implement adoption. One of our first obligations is to convince traditional agricultural that there really is a need and that agroforestry can help meet that need. Only then can we expect that the public, state and federal government agencies, and land-users will accept and adopt the wide array of agroforestry practices needed to help agriculture become sustainable.

I think if Aldo Leopold were still alive today he would fully embrace the concept of agroforestry as a major tool available to help manage agricultural land. I reason he would agree that if all natural resource management decisions involving agriculture were made after it has been determined they were "ethically and esthetically (sic) right, as well as economically expedient" we would already have sustainable agroecosystems.

*"There is much confusion between land and country. Land is the place where corn, gul-lies, and mortgages grow. Country is the personality of the land, the collective harmony of its soil, life, and weather."*

—Aldo Leopold