Fall 1996

BioOptions

Newsletter of the Center for Alternative Plant and Animal Products
UNIVERSITY OF MINNESOTA

BioOptions Library

This issue of the BioOptions Library features flax. Early colonists grew small fields of flax to produce linen for clothing and bedding. Next time, the BioOptions Library will feature broccoli, a hardy, cool-season vegetable which is a good source of Vitamin A and C.

TIME TO RENEW

It is time to renew your 1997 BioOptions subscription. We appreciate your continuing interest and encourage you to consider becoming a supporter with a contribution of $20 per year. If you believe that this newsletter is valuable, please share it with your friends and colleagues and suggest they subscribe.

The Center is here to help make the University more responsive to the needs of the agricultural community. We all need to work together to make this happen. Thanks to those who have already renewed their subscription.

Dried Flower Production and Marketing

Cindy Jo Hayward

Growing cut flowers specifically for drying is nothing new in agriculture. Some of us have been producing and ditching (harvesting native plant materials) for more than 25 years. Commercial dried flower production and marketing is, however, gaining in popularity and dollar value year by year. A 1995 study of the Permanent Floral Products Industry showed a 45 percent increase in the U.S. wholesale dollar value for dried flowers from 1992-1994. The actual dollar values were $204 million to $295.7 million respectively. This does not include many of the special items, foliages, silks, and accessories that are often sold along with the dried flowers. (cont. on page 6)

Aquaculture in Minnesota

Brian Erickson

Aquaculture is defined as the controlled cultivation of aquatic plants and animals. That broad definition includes a wide diversity of aquatic flora and fauna such as algae, alligators, cultivated wild rice, and hydroponically grown produce. A more common and limiting definition of aquaculture includes primarily fish farming; raising fish commercially for human consumption (food-fish), stocking to enhance recreational fisheries, and for bait.

Globally, food-fish aquaculture is getting a lot of attention these days because the world's population is projected to increase from 5.5 billion to 8.5 billion persons by the year 2025 and experts mostly agree that wild stocks of fish and (cont. on page 3)

Alfalfa Management

Dan Undersander, Neal Martin, et al.

This article is excerpted from the Alfalfa Management Guide, a cooperative publication of the University of Wisconsin Cooperative Extension, the Minnesota Extension Service - University of Minnesota, and Iowa State University Cooperative Extension Service. The Alfalfa Management Guide is a quality publication featuring up-to-date information and outstanding full-color pictures. If you are considering alfalfa production, this guide can help make it a successful and profitable operation.

Profitable forage production depends on high yields. Land, machinery, and most other operating costs stay the same whether harvesting three tons per acre or six tons per acre. Top yields in the northern United States have approached ten tons per acre while average yields are around three tons per acre. This booklet describes what it takes to move from a 3-ton yield to 6 or 9 tons per acre. (cont. on page 9)

Director's Column

by Erv Oelke

Provisions in the 1996 Farm Bill established the Fund for Rural America (FRA) which will provide initially at least $100 million over three years. This fund was established to provide funds for research, extension and other programs for the seven-year transition period during which time the traditional farm payments will be eliminated. The funds will be administered by USDA-CSREES and granted on a competitive basis.

The common themes of the FRA will be a broad interpretation of the Fund to respond to the many transitional factors affecting agriculture and rural America. It will be focusing on specific issues/ needs and encouraging a wide range of approaches and solutions, overcoming "stovepipe" approaches to meeting client needs, solving problems and capacity building through leadership training and local empowerment.

Other themes are economic stability and security for producers and rural communities; strengthening and developing partnerships; applying, developing, and utilizing existing knowledge to address problems/needs; demonstrating impact of FRA expeditiously; and learning from the successes of others in addressing issues.

The general purpose of FRA is to increase international competitiveness, efficiency, and farm profitability; reduce economic and health risks; conserve and enhance natural resources; develop new crops, new crops uses, and new agricultural applications of biotechnology; enhance animal agricultural resources; preserve plant and animal germplasm; increase economic opportunities in farming and rural communities; and expand locally owned value-added processing.

The timetable for requests for proposal development is expected to be as follows:

December 1996: Publication in the Federal Register of first RFP.

December 1996 - February 1997: Solicitations are open.

March - May 1997: Proposal review.

June 1997: Announcements of awards.

The FRA program themes and purposes align well with the mission of our Center especially in the areas of new crops and value-added. The FRA program offers an excellent opportunity for expanded activity in new crops and value-added activities, not only for our Center but also for other groups or individuals with similar interests.

"Do what you can, with what you have, where you are."

Theodore Roosevelt

Women in Sustainable Agriculture

Mary Doerr
Dancing Winds Farm

According to a recent study written by Kimberly Zeuli, a doctoral student at the University of Minnesota in Applied Economics, there are "at least 3,000 women farmers in Minnesota and about 145,000 in the nation." Of course, many more women work on farms but do not show up in the census of agriculture because the forms only provide one slot for the name of the operator and in the case where a couple owns the farm, it's often the husband's name even though the wife may be an equal partner. Patty Hennessy of the Minnesota Women's Press notes that "as the number of women farmers has grown, they have begun facing problems their mothers didn't face, challenges that most people do not understand. They need a place to talk about issues that affect them as female farmers."

A network of women farmers does exist, precisely for this growing need. Enter (W.I.S.A.) Women in Sustainable Agriculture. Three-year old W.I.S.A. is an organization that welcomes all women farmers and women who plan to farm. Our focus is on sharing practical information, support, and networking. Our community represents a diverse set of approaches and we celebrate that diversity. Our goal is to see our members establish economically viable and environmentally sound farms and a good quality of life in the country.

June Redig was an early leader. Sadly, June was killed in a car accident in the Fall of 1994. By creating W.I.S.A., a resource network for women in farming and/ or wanna-bes, June's dream lives on.

We meet every other month with topics of common interest. We are building a telephone directory of women farmers who may call on each other for help with those "bigger" projects and then reciprocate, thereby building community. The goal for many of us in W.I.S.A. is to be able to provide ourselves with enough money to live on and obtain the quality of life we want. Meanwhile, we operate our farms out of a concern for improving and sustaining our environment.

W.I.S.A. recently received funding to begin a pilot project called "Voices and Images of Women Farmers". We are initially focusing on women farmers, past and present, who live or have lived in the Cannon Valley and Zumbro Valley watersheds.

For more information, contact Mary Doerr of Dancing Winds Farm at (507) 789-6606, Fax (507) 789-5616 or Diane Milan of Hawk's View Farm at (507) 789-5616.

Aquaculture in Minnesota

(cont. from page 1)

shellfish are presently being harvested at or beyond maximum sustainable yield (about 100 million metric tons per year).

Even if global per capita consumption of these products remains stable at about 30 pounds (it has actually been increasing), world aquaculture production would need to increase almost five-fold, from 17 to 75 million metric tons, to supply that growing market. On a percentage basis, aquaculture production must increase from 17% to 48% of the total fish and seafood harvest by 2025 to fill this potential market void.

Since 1968 total consumption of fish increased 73% due to population growth.

In the U.S. per capita fish and seafood consumption has increased about 40% from 1968. Total consumption of fish increased 73% during that same period due to population growth. Although U.S. per capita consumption growth has slowed in the 1990's, it now stands at about 16 pounds.

The national trade imbalance in fish and seafood products has exceeded $3 billion in recent years. In Minnesota alone, we currently must import roughly 66 million pounds of fish and seafood into the state, resulting in an estimated annual state fish and seafood trade imbalance of about $130 million (assuming the U.S. per capita figure is an accurate reflection of Minnesota fish consumption, and estimating an average wholesale price paid for those products of $2.00).

The U.S. ranks around ninth in the world in aquaculture production with a farm-gate value of about $800 - $900 million.

The U.S. ranks around ninth in the world in aquaculture production with a farm-gate value of about $800 - $900 million (about half of that is catfish). Production has grown from about 78,000 tons in 1975 to more than 400,000 tons today.

The Minnesota aquaculture industry is small, but growing. The last Minnesota Department of Agriculture (MDA) state aquaculture survey revealed 1992 industry sales of $4.6 million. Experts estimate that overall industry production has not increased much from 1992 due in part to the failure of the state's largest farm, Minnesota Aquafarms, Inc. However, investment in fish production systems has been growing in recent years - the MDA plans to survey industry production again at the end of 1996.

With all that market potential, what is holding this industry back? The most basic answer is water. Significant freshwater aquaculture industries have developed in areas that have an exceptional natural resource (i.e. catfish in Mississippi and rainbow trout in Idaho). In Mississippi, water is available, the soil is right to dig shallow outdoor ponds, and processing labor is cheap, so they can grow the warm-water catfish economically. In Idaho, there is abundant and pure cold water spilling out of the mountains in an area known as the "Magic Valley".

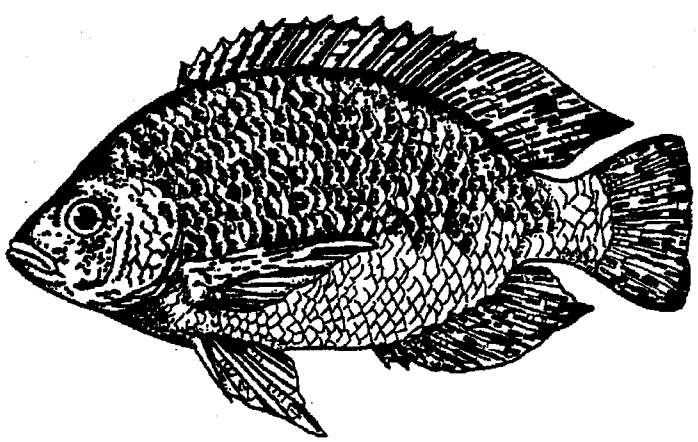
It has been said that it takes about 400 gallons of pond water to produce a pound of Mississippi catfish and that it takes a spring with more than 500 gallons per minute to start a small flow-through trout production facility. There may be a few undeveloped locations in Minnesota with those types of resources, but none large enough to support a significant industry based upon the Idaho and Mississippi models. The one exception may be the abandoned mine pits on the Iron Range, where state environmental rules may preempt industry development.

In Minnesota, we do have abundant natural surface waters in certain areas. However, most of those ponds and lakes do not have temperature regimes that would support sufficient annual fish growth. They do provide for effective seasonal bait fish and sport fish fingerling (stocker) production and have been used extensively for that purpose.

The Minnesota aquaculture industry has looked increasingly to indoor tank set-ups that provide a highly controlled environment.

There have also been limited successes in what may be considered aquatic "ranching" where a grower releases juvenile fish into ponds, then harvests them after two years or more at "food-size" with minimal management. Problems with that strategy include a lack of production consistency due to an inability to efficiently harvest and a lack of control over outside elements (pollution, drought, flood, parasites).

(cont. on page 7)



Minnesota Extension Service - Cluster 1

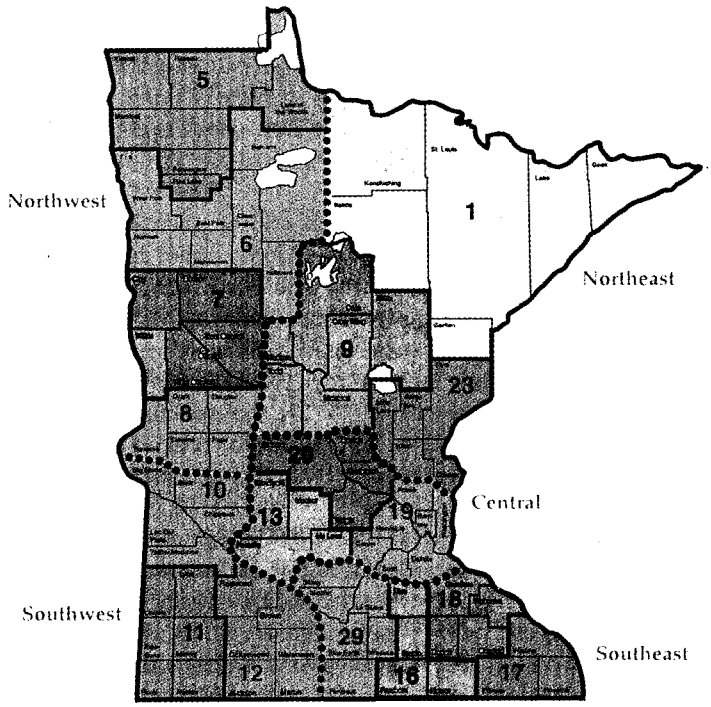


Figure #1

CLUSTER 1 - St. Louis County

One of the research projects involving Kendall Dykhuis, Extension Educator, Minnesota Extension Service (Cluster One) and Dr. Neil Martin, Forage Extension Specialist, University of Minnesota, is the introduction of Kura clover to forage and livestock producers in Northeast, Minnesota. Kura clover originally came out of Russia, near the Kura River, hencewame.

Kura clover research in Minnesota began with Dr. Craig Sheaffer at the University of Minnesota. He successfully bred a Kura clover plant which has increased seed production capabilities. The developed variety then went to the Grand Rapids Experiment Station for establishment, grazing and hay nutrient evaluation. From these research trials, results looked very promising for a superior legume adapted for Northeast Minnesota. A Sustainable Agricultural grant was sought and received for a three-year establishment study. Kura clover was planted on a number of local farms for on-farm evaluation in 1996.

The ultimate goal is to understand establishment techniques and bring a superior legume variety to the region in northeast Minnesota which is high in protein, winter hardy, longer lasting under low soil pH conditions and self spreading or propagating. A legume species was desired where plant populations and plant density increases over many years instead of decreasing. Decreasing populations of red clover and alfalfa demanded expensive field plowing, renovation and reseeding within two or three years.

Kura clover meets the criteria as a long-term sustainable alternative. It acts a lot like quack grass in the way it spreads in the soil profile by a rhizomatous root system. Because of this root system, it is very hardy when grazed or taken for a forage crop under multiple cutting schedules year after year. Therefore, the critical evaluation for on-farm use, application, growth characteristics, and establishment trials are being undertaken.

Four, ten acre sites will be seeded. Five acres will be direct seeded, 2.5 acres will be over seeded with oats and 2.5 acres will be over seeded with Royal barley (a forage barley). Dr. Neil Martin, Forage Extension Specialist, will be doing a statistical analysis for different establishment technique in a four block design. He will be looking at direct seeding, frost seeding, tilled and lightly tilled plots. Field days will be hosted to look at the growth characteristics and stand establishment under an oats and barley cover crop, no cover crop or direct seeding.

The final conclusion is "stay tuned". We will be able to tell you more in 1997-1998.

Kendall Dykhuis, Extension Educator, Crops and Soils

CLUSTER 1 - St. Louis County

Compost has long been valued by gardeners as a soil amendment. It has even been called "Gardener's Gold" by many, as it improves soil structure, water holding capacity and nutrient availability. The recent restrictions on depositing organic yard wastes into sanitary landfills sparked a surge of interest and research activity into efficient composting techniques. The Minnesota Extension Service of St. Louis County and the Arrowhead region of Northeast Minnesota became actively involved in composting yard and fish waste. Thomas Halbach, University of Minnesota, Department of Soil, Water and Climate, worked with Robert Olen, Minnesota Extension Service and Dale Baker, Minnesota Sea Grant College Program on developing more efficient methods of composting organic wastes.

The research effort on yard wastes focused on developing structures and methods for improving cold climate composting. The research on fish waste composting was designed to provide resorts and other fish waste generators with a method of on site waste reduction. The yard waste composting experiments investigated several structure designs including insulated compost bins of different sizes. The work was done in Duluth, Minnesota which has one of the coldest winter climates in the continuous 48 states. (cont. on page 5)

St. Louis County (cont. from page 4)

Several conclusions were drawn from the data collected. First, it is essential to optimize the organic waste for moisture content and carbon/nitrogen ratio (C:N). In most instances, fall "yard waste" is primarily leaves which have a C:N ratio of 40-80:1. For efficient composting, this must be reduced to a ratio of 30:1. The most practical way to do this is by adding nitrogen from either an inorganic or organic source. Moisture content should be optimized to approximately 50% by weight. The research indicated that oxygen was not a limiting factor for the systems as they were constructed.

It is essential to construct compost piles which maintain a porous structure by minimizing shredding or chipping of the organic material. Care must also be taken not to add a soil layer which compresses the pile and depletes available oxygen. Mineral soil which is added as an "inoculum" should be minimized and thoroughly mixed with the other organic components.

Efficient composting through the winter months is dependent upon several factors in addition to optimizing the moisture and nitrogen requirements. Under extremely cold temperatures, the composting process will stop as the available water freezes. This can be prevented if adequately insulated structures are used or if the compost pile is of sufficient size (at least 6 ft x 6 ft x 6 ft) to be self insulating. By properly constructing the system, the pile only needs to be "turned" once to incorporate the organic material which was on the outside of the pile.

The current objective of this work is to create a system where fall yard "waste" will be sufficiently decomposed during the winter so that it can be incorporated into the soil prior to spring planting.

The research effort on fish waste composting was designed to develop a practical method for resorts to efficiently dispose of fish waste on site and avoid depositing this material in sanitary landfills. Minnesota sport anglers catch an estimated 30-35 million pounds of fish annually resulting in at least 15 million pounds of fish waste (Minnesota Department of Natural Resources, R. Payer, 1991). Disposal of this waste has become a significant issue for resort owners.

The Minnesota Sea Grant College Program and the Minnesota Extension Service conducted five demonstration projects to determine the feasibility of composting fish waste at resorts and marinas. Once the feasibility of this concept was demonstrated, Extension Educators in the Minnesota Arrowhead region provided numerous educational workshops on these techniques which resulted in the adoption of on site composting at many northern Minnesota resorts.

There are several critical issues involved in on site fish waste composting. A permanent structure must be constructed in a suitable location which is far enough away from water resources and yet close enough to the area where fish are being cleaned. Composting a high protein product such as fish waste presents concerns which are not present when composting yard wastes. Care must be taken to properly prepare and maintain the compost system so that the process does not attract animals or flies. Needless to say, the process must be properly managed so that odors are not a concern.

When properly managed, composting fish waste is a viable alternative to other disposal options. The process can be efficient and cost effective. With proper techniques and management, odors, flies and animals were not a problem. Several resort operators have even bagged the finished product and given it to appreciative customers to use in home gardens.

Procedures for efficiently composting fish waste are detailed in the publication "Composting Fish Waste, an Alternative for Minnesota Resorts" by Halbach and Baker. This 16-page publication is available for $2 by contacting the Minnesota Sea Grant College Program, 2305 E. 15th St., Duluth, Minnesota or by calling (218) 726-6191.

Robert Olen, St. Louis County Extension Educator, Horticulture

Agriculture and the Need for Biodiversity (cont. from page 11)

decline that year. Global welfare loss (i.e., loss to consumers and producers) of such a decline has been estimated to be more than $2 billion.

Along with the increased risk associated with genetically uniform crops and livestock, agricultural producers face pests and diseases that constantly evolve. New varieties are resistant for an average of five years. However, it generally takes 8-11 years to breed new varieties. Breeders continually search for resistance traits to keep high yielding varieties less vulnerable to pathogens. Maintaining (or improving) yields requires infusions of new biological material from outside the utilized stock. Breeders sometimes need wild relatives to find specific traits. Therefore, biodiversity is needed to ensure future improvements in breeding.

Conclusion

Biodiversity is a critical input to the agricultural production system. Biological diversity supports the environment in which agriculture operates. Genetic diversity must be maintained to sustain crops and livestock yields. Greater investment in preservation activities appears warranted. Involvement in biodiversity conservation allows agricultural producers to preserve the resources needed for the continued success of U.S. agriculture.

By Kelly Day, U.S. Department of Agriculture, Economic Research Service, (202) 219-0331.

Dried Flower Production (cont. from page 1)

Although it is true that the potential income on a very small acreage of dried flowers is great and the initial investment is small, there are also many challenges that play a big part in this venture. These challenges include a lack of good production information, no organized marketing channels like those that exist for other commodities, little if any mechanization for harvesting, location, climate, and the list goes on. Each one of these challenges as well as everything you do from the planning stage, through production, harvesting, packing, shipping, etc. impacts your business.

There are many challenges that play a big part in this venture.

Much of the production information for the various crops has been gathered over time by trial and error and the sharing of information among growers. As an example, very few chemicals are labeled for the crops grown for drying so pest control continues to be major concern. Too much rain and cool temperatures can ruin an entire crop of dried flowers. To minimize foliar and flower diseases, dried flowers are best grown with trickle rather than overhead irrigation. In general, we would prefer a hot, dry year where we have an option to irrigate rather than a wet, humid season where there is no control.

What to grow depends on several different issues. What crops are popular can vary from year to year and be quite different from the East to West Coasts, across the Midwest, and down South. What are the colors the florists are using this year? Do we grow one or two crops in large amounts or do we diversify and produce a little of everything to cover a wider market? Are plugs or seed readily available for these crops? Do we want to plant all annuals for a quicker return on our investment or do we grow perennials which will produce a crop for several years? These are questions every grower needs to ask in the planning stage with the answers depending mainly on what market he or she is working toward as well as climate, time, and finances.

Much of the production information has been gathered over time by trial and error and the sharing of information among growers.

There are at least 30 different dried flower varieties we can produce very well here in Minnesota and another 10+ items that can be harvested in the wild. Ditching, or harvesting native materials has few costs attached but you do have some legal issues to deal with regarding endangered, threatened and protected plant species. The prices of the ditched items are generally lower than field grown varieties and you usually have to get out of your area to do well marketing these items because the local consumer has ready access to them.Since there are no organized marketing channels for dried flowers, you will see markets as varied as the producers. There are the obvious distributor, wholesale and retail levels, but there are also those producers who sell on all levels. Within these levels, there are also producers that sells raw bunches to florists or manufacturers and others who sell value-added products through gift marts, garden and gift catalogs, custom design, wholesale florists, roadside markets, and farm markets. In all cases, there are very distinct marketing windows which strongly impact sales. For example, sales for dried flowers in December are minimal with the wide selection of silks and preserved items taking their place.

Since there are no organized marketing channels for dried flowers, you will see markets as varied as the producers.

There are really no grading standards in dried flowers like there are in the fresh flower industry. Bunch sizes, quality and price are basically whatever the seller decides to make them. Bunch sizes may vary from one ounce to one pound dry weight depending on the end use, and quality will range from top of the line florist quality bunches to field bunches, whatever fits their particular market. This makes the marketing very challenging, creating a customer need for much more information about bunch size, color, quality, etc. to making a purchasing decision. Buying based on price alone is rarely a good idea in the dried flower market.

Commercial producers can vary in acreage from a few thousand square feet to several acres. Size limitations are often due to the labor requirements rather than land issues. Since there is little mechanization when it comes to dried flower production, many have to rely on seasonal agricultural labor especially for harvesting.

Harvesting is specific to each flower variety, but will generally make up about 50 percent of the total labor. The stage of the flower at harvest is one of the most critical points in the entire production process. Sometimes a misconception exists among potential dried flower growers, that you can use seconds or slightly imperfect fresh flowers for drying thus utilizing every flower produced. This is not recommended due to the fact that drying second rate fresh flowers will give you second rate dried flowers. The drying process itself does not improve the appearance or quality of the flowers.

The shelf life for dried flowers can be months or even years giving a cut flower producer much broader market options.

Drying the flowers not only requires flowers harvested at the proper time, you must also have a dark, dry, well ventilated building with a heat source if it becomes necessary. All can be lost to mold in just a few days without the proper conditions including good air flow in the (cont. on page 7)

Dried Flowers (cont. from page 6)

drying shed. Also, time is money so the quicker you can get the products dried the sooner they can be sold. However, there can be the situation where the flowers are dried too fast resulting in a poor quality product, so a grower must be able to recognize the difference.

The shelf life for dried flowers can be months or even years giving a cut flower producer much broader market options. However, storage of the dried materials is not recommended for more than a couple of seasons since you can lose some quality in storage if conditions are not ideal. Humidity must be kept very low and constant so that flowers do not re-hydrate resulting in a color change or total destruction by mold. Products should be stored in a dark, dry facility, free of rodents and storage insects such as the Indian meal moth. These pests can usually be controlled with regular fumigation, sanitation and trapping.

Growing and marketing dried flowers as a business requires focusing on efficiency in every part of the business, especially the harvesting.

The size of the storage containers or boxes should be carefully considered for each type of flower. Some of the flowers will flatten in storage if packed in large numbers in each box. Wrapping them in a sleeve in storage is not recommended until the flowers are actually being shipped. Too tightly packed flowers and damp conditions can destroy a crop in storage.

Growing and marketing dried flowers as a business requires focusing on efficiency in every part of the business, especially the harvesting. There is no doubt that markets exist for these flowers both in the U.S. and abroad. Within these markets is fierce competition where buyers need constant attention from the sellers.

If you would like to learn more about the production and marketing of dried flowers, contact, Cindy Jo Hayward at Northland Community and Technical College, 900 Hwy 34 East, Detroit Lakes, MN 56501 or call (800) 492-4836 or (218) 847-1341. Our Commercial Production and Marketing of Dried Flowers Program gives you information on markets and production techniques, as well as hands-on dried design classes.

Aquaculture in Minnesota (cont. from page 3)

If Minnesota indeed does not have the cheap labor, ground water or suitable natural surface water bodies to grow food-fish economically outdoors, where is aquaculture development coming from? The Minnesota aquaculture industry has looked increasingly to commercial recirculating aquaculture systems (CRAS) - indoor tank set-ups that provide a highly controlled environment similar in concept to other livestock confinement operations. There are currently 12-14 CRAS built recently or under construction in this state. These systems represent anywhere from $50,000 - $4.2 million investments. Yellow perch, rainbow trout, bluegill sunfish, largemouth bass, and the exotic tilapia are among the fish being grown for food markets in these new systems.

Glacial Hills, Inc., a Minnesota company, has captured a significant portion of the initial market for design and construction of CRAS in this state. Glacial Hills, Inc. has been researching fish production in indoor systems for several years and has sold ten growout systems to farmers and ranchers throughout the state. They are presently building large (100,000 gallon) systems near Pequot Lakes and Paynesville and have plans to expand system sales to other areas of the Midwest. Part of their strategy involves the use of centralized processing stations and marketing contracts with growers.

They currently own growout and processing facilities between Benson and Starbuck, Minnesota. They are working with yellow perch and rainbow trout, adding value to the trout by marketing a smoked product and planning to sell the perch mostly to markets in other Great Lakes States.

Another significant investment in indoor aquaculture is the MinAqua Fisheries Cooperative of Renville, perhaps the first grower-owned fish production cooperative in the nation. MinAqua has begun construction of a $4.2 million CRAS to grow tilapia, a white, delicately flavored flaky meat similar to our native walleye. The cooperative is owned by area farmers who have committed soybeans to be included as an ingredient in the fish food.

Further development of Minnesota aquaculture may depend upon the success of indoor systems which may, in turn, depend upon the industry's ability to improve system efficiency and reliability, to develop compatible/genetically improved stock to grow in them, and to develop local feeds/feeding regimes for fish species of interest to increase performance and decrease waste.

The University of Minnesota has been researching CRAS unit processes, including solids removal, biological filtration, oxygenation, and more, at their Fisheries and Aquaculture Lab on the St. Paul Campus. Alexandria Technical College has also been working with systems and training technicians for this increasingly technical field.

Brian Erickson is an Ag Marketing Specialist with the Minnesota Department of Agriculture.

"It still holds true that man is most uniquely human when he turns obstacles into opportunities."
–Eric Hoffer

Department Highlight
Plant Pathology

Steering Committee Representative - Dr. Richard A. Meronuck

The Department of Plant Pathology has a long successful history in teaching, research and extension. Since its beginning as the Division of Vegetable Pathology and Botany in 1907, the faculty has had an important impact on plant production in the State of Minnesota, the nation and in foreign countries.

The Department has a successful long standing graduate education program. The first degree in "Plant Pathology" at Minnesota was awarded in 1910 and the first Ph.D. Degree in 1913. Since then a total of 389 Ph.D. and 380 MS students have been awarded through 1995.

The Department undergraduate degree, Plant Health Technology, has more recently been incorporated into the "Science and Agriculture" and "Animal and Plant Systems" majors in the College of Agriculture. A number of classes are offered in the evening and are open to students within the traditional, Continuing Education and Extension systems.

Since its inception, the faculty in the Department of Plant Pathology have made numerous and significant contributions to international teaching and research. Today, the majority of Departmental faculty have international experience through teaching, research and consultative activities. One of the most recent long range contributions was to the "Morocco Project" which officially ended in 1992. After 22 years of involvement, the College of Agriculture at Hassan II University in Rabat is staffed by highly qualified Moroccan nationals, many of whom were trained in the Department.

The Department of Plant Pathology presently has 26 state-supported and adjunct faculty along with a number of visiting and postdoctoral scientists. Three of these staff members are located at outstate branch experiment stations. Five of the 26 faculty hold joint appointments from the U. S. Department of Agriculture, or the U. S. Forest Service. The USDA Cereal Rust Laboratory, located near the Department of Plant Pathology on the St. Paul campus, houses the research facilities for four of the faculty members. Further, one adjunct faculty member is in the Department of Plant Biology, while another member is located at the University of Tel Aviv, Israel.

The Department of Plant Pathology has a significant research and teaching emphasis in genetically controlled resistance, molecular genetics, control of fungus diseases, wood deterioration, mycorrhizal interactions and mycotoxicology. In addition, major research areas include genetics of disease resistance at the molecular, cellular and whole plant levels; disease management; microbial ecology; biological control; population genetics, nematology, plant virology; and air pollution and global climate change. The Department is housed in 3 interconnecting buildings - Stakman Hall, Christensen Laboratory, and Borlaug Hall - which provide modern laboratories, offices, and state of the art teaching facilities.

For more information about the Department of Plant Pathology, call the Department office on the St. Paul Campus (612) 625-8200 or check the Department home page on the "net" at http://www.plpa.agri.umn.edu/.

FLAX (Oilseed)

Flax (Linum usitatissimum) was one of the first crops domesticated by man. The flax plant is the source of two valuable products — seed and fiber. There are two distinct types of flax. One, grown primarily for fiber, is tall, has few branches, and produces only limited amounts of seed. Flax grown primarily for seed is usually short, profusely branched, and produces good yields of seed. The fibers in this type are short and are used for production of fine quality paper.

Excavations of prehistoric dwellings in Switzerland, dated at 10,000 BC, show that the inhabitants used linen woven from flax. Linen cloth was also used extensively to wrap mummies in the early Egyptian tombs. As much as 1,000 yards of fine cloth were used in each burial preparation.

In the United States, early colonists grew small fields of flax to produce linen for clothing and bedding. Commercial production of fiber flax began in 1753; however, with the invention of the cotton gin in 1793, flax production began to decline. During the 1940's, fiber flax production dropped to nearly zero. Today, a few individuals still grow fiber flax for their own use, but flax is primarily produced in the United States for its oil rich seed. In Minnesota, flax acreage is concentrated in the northwestern part of the state; however, flax has been grown successfully in nearly all counties.

Seed flax is an annual plant that grows to a height of 12 to 36 inches. It has a distinct main stem with numerous branches at the top which produce flowers. Branches from the base of the plant may also occur depending on variety, stand and environment. The plant has a branched taproot system which may extend to a depth of 3 to 4 feet.

The flax flower has five petals and a five-celled boll or capsule, which may contain up to 10 seeds when filled. Depending on the variety, the petals are blue, pale blue, white, or pale pink. Individual flowers open in the first few hours after sunrise on clear, warm days, and the petals usually fall before noon. Flowering is indeterminate and continues until growth is stopped.

USES

Flax seeds contain from 32 to 44 percent oil by dry weight, and are processed into linseed oil and cake. Linseed oil is valued in industry as a high-quality drying agent. The oil is used in paints and varnishes, the manufacture of linoleum and oilcloth, soaps, patent leather, and other products. It is also used as an antispalling treatment for concrete where freezing and thawing effects have created problems on streets and sidewalks.

Recently there has been some interest in seed flax as a health food because of the high amount of poly-unsaturated fatty acids in the oil. Flax oil is also used in high-quality European suntan and skin oils.

Linseed oil meal contains about 35 percent crude protein and has good palatability making it a popular livestock feed. After the oil is extracted from the seed, the remaining linseed cake is prepared for livestock feed either by grinding into a meal or by making pellets of a suitable size for feeding on range or in feedlots. Linseed meal is often combined with grains and other feeds in the manufacture of mixed feeds. Green flax straw should not be grazed or fed as it is high in prussic acid.

ENVIRONMENTAL REQUIREMENTS

In Minnesota, land that will grow corn and soybeans is usually considered suitable for flax. Flax is best adapted to fertile, fine textured, clay soils with a pH in the 6.0 to 6.5 range. Flax grows well when it follows corn and a good rotation would include small grains, a legume, corn, and then flax.

Flax requires adequate moisture and relatively cool temperatures, particularly during the period from flowering to maturity. These conditions seem to favor both high oil content and high oil quality. There should be at least 5 inches of plant-available moisture in the soil before seeding flax.

Flax is an excellent companion crop to help establish small seeded grasses and legumes.

SEEDBED PREPARATION

The most important factors to consider in variety selection are maturity, disease resistance, standability, and oil content and quality. Clean, uninjured, disease-free seed is a major factor in assuring a good stand with few problems. Seed treatment has been shown very effective in improving stands and yield; it has reportedly even reduced some of the losses that might otherwise occur when planting damaged seed. More uniform stands of flax are frequently obtained when the seed is treated with a suitable fungicide.

The best seedbed for flax is similar to the ideal seedbed for small seeded grasses and legumes. A well-prepared, firm, seedbed will insure sowing at the proper depth and aids prompt and uniform germination of the flax, allowing the crop to start before the weeds. A heavy weed infestation in the field may reduce flax yields by as much as 40 to 70 percent.

Cool weather at the time of flowering and ample moisture and moderate temperatures until the flax is nearly ripe are conditions that contribute to high seed yields. Such conditions are more likely to prevail when flax is sown early.

In Minnesota, flax sown in late April or early May usually yields best. Minnesota tests indicated that delays of 10, 20, and 30 days after the first practical sowing date resulted in yield losses of 22, 23, and 47 percent respectively. This was attributed to the incidence of hot dry weather during the time from flowering to seed maturity.

Flax is also susceptible to cold damage during flowering and early boll stages. The immature seeds,containing as much as 75 percent moisture, will likely be killed by freezing temperatures that do not completely kill leaves and stems.

Flax should be sown shallow, at a depth of 1 inch or less, with a grain drill. Drilling provides uniform distribution of seed and depth of sowing and produces a more satisfactory stand. Flax seed is comparatively small and may fail to emerge from greater depths, especially if crusting occurs. Inexperienced growers often plant too deep, especially if the soil is loose. A seeding rate of 42-50 pounds of good seed per acre is recommended. Lower seeding rates often result in more severe weed problems.

Fertility programs should be based on soil tests and yield goals but, in general, flax requires about the same soil fertilization program as small grains. Flax seed is susceptible to damage from being placed too closely with fertilizer.

WEEDS and DISEASES

Weeds are generally more of a problem in flax than in small grains. Use post-harvest tillage and/or herbicides the previous season to suppress perennial weeds and to stimulate germination of annual weed seeds. Good weed control with a minimum of weed seed production in the preceding year's crop will facilitate a cleaner flax field. Delayed sowing of flax to permit additional spring tillage for weed control may be successful in some fields but the planting delay may be detrimental to the flax. Herbicides may also be available for weed control in flax depending upon your location.

Flax is sensitive to a number of diseases. Rust, wilt, and Pasmo are serious diseases of flax which can be controlled by growing resistant varieties. Rust is a fungus disease which first appears as yellow orange pustules on the leaves and stems. Good fall plowing that buries straw and stubble will aid in controlling the disease.

Wilt is a soil-borne fungus disease that generally causes infected plants to wilt and die. It grows upon the live plant as well as upon the dead plant material in the soil and may remain in the soil for as long as 28 years. Wilt is most serious where flax is not rotated with other crops. The use of resistant varieties is the only satisfactory control on wilt-infested soil.

Pasmo is the most serious disease affecting flax in Minnesota. Pasmo is characterized by yellow-green to brownish spots on the leaves, stems and bolls. Infected stems appear as alternating green and brown areas giving a blotchy appearance. Prolonged humid weather during the flowering, boll forming, and maturing stages favors the spread and severity of Pasmo infection. Pasmo can cause serious damage by reducing yield and quality of seed.

Flax may be infested from time of emergence to maturity by cutworms, aphids, and other insect pests. To keep damage low, examine fields regularly for pests and use control measures promptly.

HARVEST and YIELD

Proper harvest time is important in flax production. Early harvest reduces yield while late harvest can change the chemical make-up of the oil and thus its quality and value.

Flax is more difficult to harvest than small grains; however, flax does not shatter or lodge as easily. Maturity in flax is judged by color of the bolls rather than by color of the straw. Flax is ready to harvest when 90 percent of the bolls have turned brown.

Flax may continue to bloom until frost if sown late or if the season is wet and cool. Seeds from these late flowers seldom mature and are lost during threshing and cleaning. In wet summers, the stems may remain green and the plants continue to flower long after the early bolls are ripe. It is important to harvest flax soon after it is mature because weeds usually become a greater problem. If left standing for a long period of time, the seed quality for oil purposes may be seriously reduced.

Flax seed over 11 percent moisture usually cannot be stored safely for extended periods. Top market prices are usually based on 9 percent moisture. Flax should be left in the windrow to dry until the seed reaches this moisture level. Seed containing large amounts of green weed seed and inert matter should be cleaned before storing.

The yield of oil varies with the variety of flax and with climatic conditions under which the crop is grown. If drought and high temperatures occur during the 25 days after flowering when the seed is developing, seed yield will be reduced and oil content will be low and of poor quality. Flax yield tests conducted in Minnesota showed that yields averaging 18 to 20 bu/a were possible from current varieties. In commercial crushing, about 20 pounds, or 2.6 gallons, of oil is obtained from a bushel (56 pounds) of seed.

ECONOMICS and MARKETING

Cash costs for flax production are typically less than for most small grains. As with any crop, markets should be established prior to beginning production.

by Bethany A. Davidson, The Center

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Note from the Editor

Thanks to all of you who subscribed to BioOptions for the first time or renewed your annual subscription. The Center distributes information from researchers, industry, producers, farmers and interested individuals providing the most up-to-date information on issues facing agriculture today. We continue to need the support of all of our readers. Send the name of someone you think would be interested in BioOptions and we will be happy to send them a complimentary copy.

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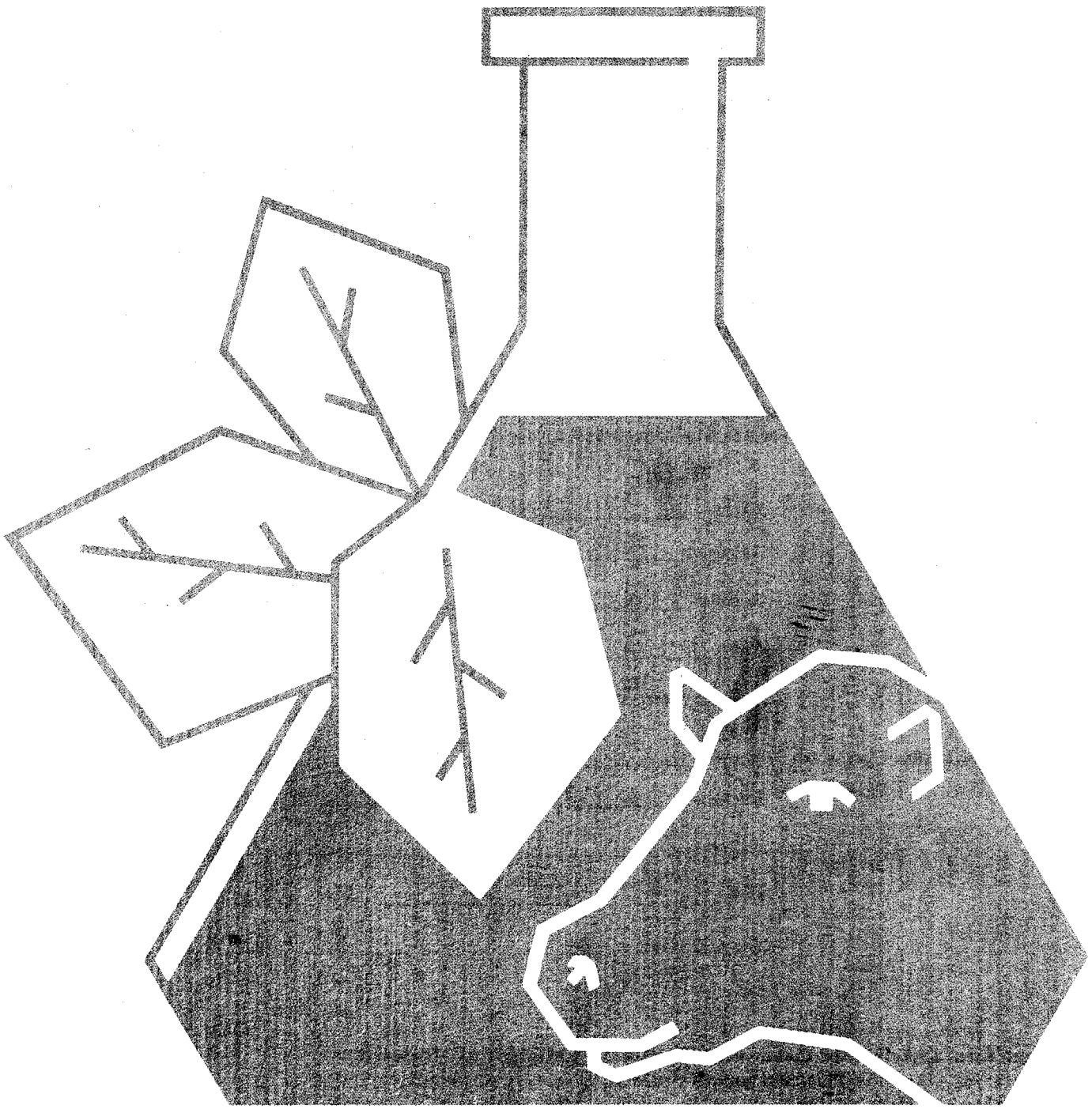

Alfalfa Management (cont. from page 1)

Establishment

A vigorously growing, dense stand of alfalfa forms the basis for profitable forage production. Profitable stands are the result of carefully selecting fields with well-drained soil, adding lime and nutrients if needed, selecting a good variety, and using appropriate planting practices to ensure germination and establishment.

Fertility

Proper fertility management is the key to optimum economic yields. Proper fertilization of alfalfa allows for good stand establishment and promotes early growth, increases yield and quality, and improves winterhardiness and stand persistance. Adequate fertility also improves alfalfa's ability to compete with weeds and strengthens disease and insect resistance.

Select a Good Variety

Plant breeders have developed alfalfa varieties with greater yield potential and disease resistance and improved forage quality. But with over 250 varieties available, how does one select an alfalfa variety? The major factors leading to profitability are:

* yield potential
* persistence (percent stand remaining or estimated from winterhardiness and disease resistance ratings),
* winterhardiness
* disease resistance, and
* forage quality.

Planting - Time of Seeding

Spring seeding of alfalfa can begin as soon as the potential for damage from spring frosts has passed. At emergence, alfalfa is extremely cold tolerant. At second trifoliate leaf stage, seedlings become more susceptible to cold injury and may be killed by four or more hours at 26° or lower temperatures. Alfalfa seeded with a companion crop survives lower temperatures and longer exposure times before showing frost damage. Frost damage is usually not a problem by the time farmers can get fields tilled in the spring and ready to seed. Early seedlings have less weed competition and less moisture stress during germination because of cooler temperatures.

Production

Once a good stand has been established, continued production and stand life depends on good management practices. Good management includes maintaining soil nutrients, applying manure judiciously, and controlling weeds and insects. Monitor diseases to estimate stand life and to determine resistance needed in future plantings. Finally, optimum production involves deciding when to rotate from stands that are no longer profitable.

Weed Management

Tillage is an important part of a weed management program when establishing alfalfa. Thorough tillage helps uproot existing annual weeds and sets back established perennial weeds. Final tillage should be done as near planting as possible to allow alfalfa a head start on weed growth.

For direct-seeded alfalfa planted in the spring, herbicides for weed control are usually necessary. Several herbicides are currently labeled for use in new alfalfa seedings.

Disease Management

Several diseases occur in alfalfa stands that can kill seedlings, limit yields, and shorten stand life. The occurrence and severity of diseases depends on environmental conditions, soil type, and crop management. Few economical control options are available for diseases once they're present in a field, but knowing diseases are present can help you select resistance varieties for future plantings.

Harvest Management

The final step to profitable alfalfa production is to set goals for forage quality and use the appropriate harvest techniques to minimize field losses and maximize tonnage of high quality forage. This recognizes that high quality forage is profitable to animals that can use the quality but that tradeoffs exist between forage quality, yield, and stand life.

The Alfalfa Management Guide, publication #5798, is available from the Minnesota Extension Service Distribution Center, 20 Coffey Hall, 1420 Eckles Ave., St. Paul, MN 55108; phone: (612) 625-8173.

Agriculture and the Need for Biodiversity

Kelly Day

Agricultural producers should be concerned about the conservation of biodiversity because biologically diverse resources are needed to support and maintain current agriculture production. Such resources are needed to sustain the environment in which living things grow, and as genetic inputs to create new varieties, maintain resistance, and sustain yields.

The agricultural sector needs a certain amount of biodiversity to maintain (or increase) current production. However, we don't know how much or what kind of biodiversity will be needed because potential threats to and demands of agriculture are never certain. Our knowledge about the present and future states of biodiversity and their impacts on agricultural production is limited.

Biodiversity: Definitions and Values

There are three definitions for biodiversity. Genetic diversity is the combination of different genes and the pattern of variation found within the same species. The different genes (and therefore traits) found within wheat are an example. Species diversity is the variety and abundance of different types of species in a region. Examples are the different species of mammals found within areas, the populations of these mammals, or the number and variety of trees. Ecosystem diversity is the variety of habitats that occur within a region, e.g., grasslands, wetlands, and salt water habitats.

Although measurement of biodiversity is difficult, most scientists believe that it still has economic value to society on many levels. Some of these values arise from the use of resources, and some resources are believed to be valuable, even though they are not used.

Some biodiversity resources or functions are consumed directly by society, or contribute directly to the production process. Crops, livestock and related genetic resources are used directly, being consumed as food, or an input in agricultural production. Pharmaceuticals often use biological resources. Twenty-five percent of pharmaceuticals currently used in the U.S. contain an active ingredient derived from plants.

Even though some biological resources are not used directly, these resources provide indirect benefits that are necessary for direct uses of other resources. Examples of these are the wide range of ecological functions that ecosystems provide allowing the continuation of life. For example, ecosystems protect watersheds, prevent soil erosion and flooding, store and recycle organic nutrients and industrial wastes, and regulate the climate. Ecosystems provide oxygen, soil, and soil nutrients needed to produce agricultural and timber products. Ecosystems also provide habitats for species (including humans) and a suitable venue for agricultural, fishery, and industrial production.

Another example of indirect resource use is pollinators, such as bees, which are critical for crops requiring insect-pollination. While different pollinators are best suited for different crops, the U.S. has come to rely heavily on honeybees. Pesticide use and habitat loss, along with the reliance on honeybees, has reduced the level and diversity of pollinators used by agriculture.

Non-bee pollinators, such as butterflies, hummingbirds, and moths have declined. Therefore, a significant portion of the pollinator population, lacking diversity, was vulnerable to a set of pests. (Honeybee populations have fallen significantly due, in part, to two parasitic mites). Other pollinator populations have declined too significantly to compensate for the honeybee loss. As a result of biodiversity loss, inadequate pollination has reduced yields for certain crops.

Some biodiversity has value, even if the resources are not presently being used either directly or indirectly. If resources are conserved, they can be consumed in the future. For example, we may not need to use a particular species of potato occurring naturally in the Andes. However, this species (because it can be grown at high altitudes) may be of value to agricultural producers in the future. The options to use many biological resources are valuable because we do not know which resources we will need in the future.

Biological resources also have value to some, even if they do not need or ever want to consume those resources. For example, a person may have never seen, nor expect to see, a Siberian tiger. Nevertheless, the continued existence of these tigers has value to this person.

Insufficient Conservation of Biodiversity

If biodiversity is valuable, why is not more conserved? The values listed above suggest that there would be sufficient incentive to conserve biodiversity to levels wanted by society. However, insufficient conservation of biodiversity is a serious problem. The primary reason that biodiversity is not conserved more is because the private value of biodiversity is often different from the social value.

For example, wetlands serve an important role in maintaining biodiversity. They serve as habitat to many species, recycle nutrients, provide a sink for waste, help regulate the climate, and serve as a recreational and aesthetic resource. If a landowner chooses to sell a particular wetland to be developed, the benefits of the wetland will be lost after development. However, the transaction will be based solely on how the buyer and seller value the property, not the values provided to society as a whole. Many aspects of biodiversity operate outside the market and situations where private values and societal values diverge are common.

There are other ways in which the marketplace fails to account for the full value of biodiversity. Hypothetically, a company could produce a product, and in (cont. on page 11)

the process, release industrial pollutants that enter the air and water. This causes vulnerable species to die or vacate the area, and damages a nearby lake. The loss of bird species allows certain insects to flourish, affecting agricultural production. The pollution of the lake affects recreation use and property values. Yet, the prices charged by the company do not include any of the costs borne by society as a whole.

Such costs, called externalities, are an important reason that biodiversity may not be conserved to the level wanted by society as a whole. Other factors that limit the conservation of biodiversity are public policies that distort the value of harvested or cleared biological resources. Agricultural, forestry, transportation, and development policies have the potential to affect the conservation of biodiversity adversely.

Agriculture's Impact on Biodiversity

Agricultural production can adversely affect biodiversity in two ways. First, land may be converted from a more natural state to one managed for agricultural production. Second, the agricultural production process itself can reduce biodiversity.

The pressures on biodiversity from land conversion vary considerably between different regions and countries. Unlike much of the developing world, U.S. agricultural land has remained relatively stable since 1945. Therefore, growth of agricultural land will probably not be a significant pressure on U.S. biodiversity.

Agricultural production is generally focused on promoting one or more selected species rather than the more diverse set of species that would occur in an undisturbed state. Agricultural production varies widely in its intensity. Higher intensity agricultural production may have more impacts on biodiversity than lower uses, on a per acre basis.

Agricultural production can affect ecosystems in five ways. First, soil composition can be altered so that natural occurring organisms and nutrients are lost. Second, water distribution and quality can be affected by farming methods, particularly the use of irrigation and agrochemicals. A decline in water quality or availability may not support certain plants and animals. Third, atmospheric properties may change if carbon dioxide and methane levels are higher than they would be in unmanaged systems. Fourth, farming may change the landscape structure to increase erosion and/or reduce wildlife habitat area. Finally, species interactions may be altered because crop and livestock systems reduce the diversity of flora and fauna. Linkages between species may be reduced, as illustrated by the pollinator example.

It is often assumed that agricultural production will have an adverse effect on biodiversity. However, this is not always true. Possible negative impacts of agriculture can be reduced. Agro-ecosystems can be managed to enhance biodiversity. Crop rotations, particularly those involving nitrogen-fixing plants, can enhance biodiversity and restore soil nutrients. Intensive management techniques, such as site-specific farming, can use water and agrochemicals more efficiently. This can improve water quality, which fosters greater diversity at several levels. The use of buffer/filter strips on fields can also improve water quality, as well as create wildlife habitat. Integrated pest management techniques allow farmers to use pesticide more selectively, and can include the use of beneficial insects.

Moreover, agriculture can have a positive affect on biodiversity. Agricultural uses are often more beneficial to biodiversity than other forms of land development, such as urban uses. In the Central valley of California, livestock grazing has improved the biodiversity found in the oak range savannah. In this region, both overgrazing and under grazing led to biodiversity loss. However, judicious grazing has aided wildlife production and plant growth by enhancing habitat and preventing excessive shading.

Genetic Diversity is Needed by Agriculture

Agricultural productivity increased over the last century as a result of the direct contributions of biodiversity. Farmers now produce more food and fiber with fewer inputs due, in part, to increases in crop yields and livestock feed conversion rates. Half the productivity increase of the last 60 years can be attributed to genetic improvements. As modern breeding came into being, crop and livestock yields rose more rapidly because breeders could select specific desirable traits. The ongoing selection process has resulted in a narrowing base of genetic variety and crops and livestock becoming more genetically uniform. For example, 50 percent of U.S. apple production is drawn from only two cultivars.

Unfortunately, increased genetic uniformity can also increase vulnerability to pests and disease. A particular crop can be relatively uniform across an entire country. While uniformity does not cause vulnerability by itself, uniform species are more likely to share a vulnerable trait. This allows pests and diseases to spread throughout a host population. The Southern corn leaf blight of 1970 is an example of such a pathogen moving through a genetically uniform crop. This epidemic resulted in a 15 percent yield (cont. on page 5)

CENTER PROJECTS

Promoting the Benefits of Economic Diversity in Rural America

Minnesota Agri-Power

The Center is coordinating research at the University of Minnesota for the Minnesota Agri-Power Project.

Task I. Feeding Trials

Dairy, beef, and turkey alfalfa leaf meal feeding trials are currently underway. These trials will provide an estimate of the economic value of alfalfa leaf meal to dairy, beef, and turkey producers.

Task II. Alfalfa Supply System

An NIRS system was set up at the MnVAP alfalfa processing plant to evaluate hay quality. Work continues to refine the process and measurements taken. Alfalfa was harvested using two, three, and four cut treatments at Rosemount, Lamberton, and Morris Experiment Stations. Samples were taken at all harvests to determine dry matter, leaf stem ratios, and Kalu & Fick, a maturity rating protocol. Five experimental alfalfa lines being developed for biomass were evaluated for resistance to three major alfalfa diseases common in the upper Midwestern U.S. Hay storage studies are being conducted at the West Central Experiment Station and on farmer cooperator sites to compare four different storage treatments (under permanent cover, covered by tarpaulin on gravel, exposed on gravel, and exposed on pasture).

Task III. Environment

Paired watersheds have been set up at the Morris Experiment Station and instruments installed to measure alfalfa and corn yields , and estimating the soluble and total P associated with the plant residues. Neutron probe access tubes have also been installed to measure soil water on plots that have an alfalfa cutting treatment. Preparations are being made to continue environmental studies on a farmer cooperator site.

Task IV. Economic Analysis

A grower location and volume survey was designed and distributed. Information collected will be used to compute road distances between plant location and on-farm storage and to compute ton-miles and transportation costs to Priam, Granite Falls and other area location.

Task V. Community Education

The education program is scheduled to begin in January 1997.

Alternative Livestock Manual

The Center for Alternative Plant and Animal Products, the University of Minnesota Extension and the University of Wisconsin Extension are collaborating on an Alternative Livestock Manual. The manual will feature chapters on alternative livestock such as red deer, bison, dairy sheep as well as general chapters on topics including marketing and economics. All chapters are being reviewed by Minnesota and Wisconsin Extension personnel as well as alterative livestock producers to insure accurate and timely information.

Several chapters have been completed and more are under editorial review. The manual will be published with an initial seven to ten chapters. As additional chapters are completed, they will be sent to people who have already purchased manuals.

Canola

The Minnesota canola crop yield was good even though most fields were planted late due to cold, wet weather. The Minnesota Canola Research and Canola Council supported by a check-off is busy developing educational and research programs for canola producers. The Center is cooperating with them in their activities. The 1996 research results on varieties, planting date, plant population, weed management, nitrogen and sulfur fertilization, and swathing date will be reported at the annual canola meeting in Roseau on March 10 and 11, 1997.

Woody Agriculture

The Center for Alternative Plant and Animal Products (CAPAP) is working with the Center for Integrated Natural Resources and Agricultural Management (CINRAM) to promote the development of hazelnuts.

In December, CAPAP's Steering Committee members Dr. Dave Davis and Dr. Bill Breene met with Dr. Jim Luby from the Department of Horticulture and Scott Josiah and Jan Joannides of CINRAM to discuss the future of hazelnuts and the possibility of obtaining funding to continue woody ag research.

Phil Rutter, a hazelnut breeder from Badgersett Research Farm, will be meeting with the group in January to discuss cooperative research.

NEWS BRIEFS

Minnesota's first code-approved, straw bale house is being built in North Branch, MN. The house is being constructed under a special experimental building code permit. Because straw is merely wheat chaff, there's no food value to attract rodents and insects. The bales are so tightly compressed as to be anaerobic, or oxygen-free, making them inhospitable to creatures, as well as fire.

New weed-fighting strategy. Weizmann Institute researchers showed that a combined application of a herbicide and an agent enhancing its toxicity in plants is expected to significantly reduce the amount of herbicides required to protect crops.

Sale of some poppy seeds may be halted. If you grow poppies as part of a flower business, you may no longer be able to find seeds for Papaver somniferum, the species most widely grown for its pods. The U.S. Drug Enforcement Administration has recently warned seed companies that selling the seed could be considered a felony.

Tillage practices that control soil erosion and lower production costs are becoming increasingly popular among U.S. farmers (Agricultural Outlook, August 1996). Conservation tillage practices such as no-till, ridge-till, and mulch-till involve relatively little or no disturbance of the soil, providing sufficient residue cover to help protect the soil surface from water and wind erosion. Conservation tillage is expected to be used on a record-high 103 million acres this year (more than one-third of the U.S. planted cropland).

A satellite-based remote sensing system is slated to be launched into orbit in 1999. The RESOURCE21 space system will be able to provide farmers with twice-weekly data detailing nutrient deficiencies, weed, insect and pest outbreaks, moisture status and more. For more information, contact Jim Everitt at (210) 969-4848.

The U.S. FDA will now allow apples to be labeled "fat free and high in fiber." The label change is expected to give health-conscious consumers more reasons to eat apples. (Illinois Fruit & Vegetable News, Vol 2, No 17).

Consumer food prices continue to rise. A Farm Bureau "marketbasket" survey showed an 84-cent average jump in selected grocery items during the third quarter, the third straight increase of the year. Pork products were the biggest contributor to the higher prices. A pound of bacon, which averaged $1.94 last year, averaged $2.58 this year. The Farm Bureau said the main reason for the jump was increased demand for bacon caused by increased use of bacon in fast-food sandwiches.

New flavorings on the tips of Americans' taste buds include preserves, spreads and poultry sauces made from rain forest and other offbeat fruits, such as cloudberries, gooseberries, rainberries and guanabana. We'll look to Asia for new marinades and noodle and pasta sauces, with cumin, cardamom and lemongrass flavorings playing a bigger role in recipes.

Ducks Unlimited has grown from 6,270 supporters in 1937 to more than 900,000 contributors today. The world's largest private non-profit wetlands, waterfowl, and wildlife conservation organization has raised more than $1 billion to conserve more than 7.5 million acres of habitat throughout the U.S., Canada and Mexico. Ducks Unlimited waterfowl habitat projects benefit more than 600 species of wildlife, including dozens that are threatened or endangered.

A new pink onion has been bred by Dr. Thomas Walters (The Great Lakes Vegetable Growers News, May 1996). While trying to breed for male sterile onions for future breeding work, Dr. Walters produced a mild, pink onion that will be called "New York Sweet Blush". Its potential use is for the fresh market.

Leasing on the rise. Harold Breimyer, a retired University of Missouri agricultural economist, notes that 40% of all U.S. farmland is now farmed under lease. He says that's up from a low of 35 percent in 1953, and close to the depression-era level of the 30's.

Oil Spill Recovery Assessed. More than seven years after the biggest oil spill in U.S. history, the bald eagle has been the only species among 20 to recover from the damage in the waters off Alaska. Pink and sockeye salmon populations appear to be on the mend, but it's too early to say that the species has recovered. The oil spill occurred in 1989 when the Exxon Valdez ran aground in Alaska's Prince William Sound, pouring millions of gallons of crude into the waterway.

A Second Chance for Elms. After two decades, scientists at the Agricultural Research Service have found two varieties of American elm trees that could replace those ravaged by Dutch Elm Disease. The varieties, Valley Forge and New Harmony, are expected to be available commercially by 1999.

Minnesota tops the list of healthiest states in the U.S. for the fourth time in seven years in the annual ReliaStar State Health Rankings, widely recognized as the most comprehensive analysis of the relative health of the populations in all 50 states. Louisiana has the least healthy population. The rankings combine 17 components that measure disease, lifestyle, access to health care, occupational safety and disability, and mortality.

Farm Safety. From 1985 to 1994, fatality rate estimates published by the National Safety Council ranked agriculture as the nation's most hazardous industry. But, the Safety Council's 1996 figures show that agriculture dropped to second place, with a death rate less than half of what it was ten years ago.

INFORMATION DESK

One of the Center's most important functions is to provide information. We receive requests daily on a wide variety of subjects. We encourage you to write or call us with questions of your own. We maintain a library on alternative crops and animals and will be happy to send you copies of articles (10 cents/page).

Just how well earthworms can enrich soil quality depends on what they eat. ARS tests confirmed that the type of crop makes a difference; earthworms feeding in soybean fields deposit a higher concentration of nitrogen and protein than those eating in corn fields. Earthworms (Lumbricus terrestris) take in the nutrients from munching on crop residues plus microbes feeding on plant parts. The worms then excrete a substance loaded with carbon, nitrogen and other nutrients that are more readily used by crops for growth.

Another finding from the soil tests: reduced tillage means more worms. That's because less tillage leaves more organic matter.

For more information, contact Dennis Linden, at Soil and Water Management Research, St. Paul, MN (612) 625-6798.

Did you know:

* Some 1,900 of the 16,863 new food products introduced in 1995 were low-fat.
* Of the 4,000 species of mammals in the world, more than 900 are bats.
* Strawberries stack up third, right behind papaya and cantaloupe, on a a list of the most nutritious fruits compiled by the Center for Science in the Public Interest.
* California produces more than half of the nation's fruits, vegetables, and nuts on just 3 percent of U.S. farmland.

We want wheat: The average American consumes 138 pounds of wheat flour a year in foods such as bread, pasta and cereals, and that's rising about 2 percent a year.

Myth: Milk loses nutrients when fat is removed. **Fact:** All milk varieties have the same amount of calcium and other essential nutrients including vitamins A, B12 and D, riboflavin, niacin, phosphorus, protein and potassium.

Top 4 Concerns of label readers: Fat, 54%; Cholesterol, 44%; Salt, 30%; and Sugar, 15%.

Farmer Cooperatives Are an American Success Story

The National Council of Farmer Cooperatives (NCFC) has published the following lists of facts:

* One in every three people in the U.S. belong to one or more cooperatives. These cooperatives include farmer marketing, supply, and credit co-ops; rural utilities; credit unions; and housing, child care, and consumer co-ops.
* Farmer cooperatives market 86% of the nation's milk, 40% of all grains and oilseeds, 41% of cotton, 20% of fruits and vegetables, and 13% of the livestock produced in the U.S.
* With total sales of more than $90 billion, farmer cooperatives generate significant economic activity across many rural areas and communities.

If you're looking for advice or information on cooperatives, here are a few places to start:

* "Year in Cooperation," published by the Minnesota Association of Cooperatives, 30 East 7th St., Suite 1720, St. Paul, MN 55101; (612) 228-0213; Fax (612) 228-1184.
* Minnesota Department of Agriculture, 90 West Plato Blvd., St. Paul, MN 55107; (612) 297-4648.
* Cooperative Development Service, 30 West Mifflin St., Suite 401, Madison, WI 53703; (608) 258-4396.
* Cooperative Services Program (a division of USDA's Rural Business and Cooperative Development Services) USDA/RBCDS Cooperative Services, AG Box 3255, Washington DC 20250-3255; (202) 720-6483 (general information); (202) 720-7558 (requests for assistance); Fax (202) 720-4641.

Publications

Cooperation Works by E.G. Nadeau and David Thompson examines examples of cooperatives in 50 real-life situations demonstrating their potential to meet the perplexing and difficult challenges of the '90s. Cost is $16.95. Contact: Cooperative Development Services at (608) 258-4396.

Conservation Tillage: A Checklist for U.S. Farmers is a handy booklet providing basic information on main conservation tillage methods and management techniques, tips for success and regional concerns. Cost is $4. Contact: CTIC, 1220 Potter Dr., Room W. Lafayette, IN 47906; (317) 494-9555.

The 1995-97 edition of the Minnesota Forest Products Directory (Item BU-1390), a 316-page directory listing over 1,300 businesses and retails, is an ideal reference for anyone who buys or sells lumber, panel products, manufactured wood products, supplies or equipment. Cost is $20 plus tax and shipping. Call 624-4900 or (800) 876-8636 outside the Twin Cities for details.

Aquaculture and Water Pollution Control, a one-page fact sheet available from the Minnesota Pollution Control Agency (MPCA), outlines water quality planning considerations, a short description of the MPCA's permitting process, and other related information. Contact: MPCA at (612) 296-7238.

57 Ways to Protect Your Home Environment (and Yourself) explains the advantages of microbial insecticides over other pesticides for homeowners. Cost is $10. Contact: University of Illinois Cooperative Extension Service, 69 Mumford Hall, 1301 W. Gregory Dr., Urbana, IL 61801; (217) 333-2007.

Pondscapes, the magazine of the National Pond Society costs $24 for a one-year subscription (10) issues or $5 for a sample copy. Contact: Pond Publishing Co., Inc., P.O. Box 449, Acworth, GA 30101; (770) 975-0277.

101 Big Ideas for Promoting a Business on a Small Budget by Barbara Lambesis is a 100-page book full of ideas for promoting your company on a small budget. Cost is $11.50. Contact: Marketing Methods Press, 1413 E. Marshall Ave., Phoenix, AZ 85014 or call (602) 849-7308.

Beekeeping in Northern Climates, a package with a 40-minute video and 68-page manual (EP-6684-NR), is available from University of Minnesota Extension for $45 (or separately, manual (MI6683-NR) for $15, video (VH6553- NR) for $40) plus shipping. For content questions, call (612) 624-3636.

The Farmer's Guide to the Internet by Henry James, a 334-page softcover, explains what you need and how you go about accessing the Internet. Contains more than 1,000 listings of agriculture related Internet addresses, grouped by topics and states. Cost is $19.95. Contact the University of Kentucky at (888) 885-9800.

Growing Blueberries: A Guide For the Small Commercial Grower is an excellent resource for anyone who is considering growing blueberries for u-pick or off-farm sales. Cost is $18.50. Contact: Rush River Publications, W4098, 200th Ave., Maiden Rock, WI 54750; (715) 594-3648.

Tips on Growing and Marketing Garden Mums provides tips on all areas of successful garden mum production and is designed to help both novice and experienced growers. Cost is $25 plus $5 for S&H. Contact: O.F.A. Services, Inc., 2130 Stella Court, Suite 200, Columbus, Ohio 43215; (614) 487-1117.

Professional Guide to Herbaceous Perennials, a 28-page, full color booklet was developed by the Professional Plant Growers Association (PPGA). Cost is $2.60. Contact: Dana Taggert, PPGA, P.O. Box 27517, Lansing, MI 48909-0517; (800) 647-7742.

Field Grown Cut & Dried Flower Production/Marketing, a 96-page resource, provides information on marketing, climate, trade organizations, conferences, literature and includes a species list. Contact: ATTRA, P.O. Box 3657, Fayetteville, AR 72702; (800) 346-9140.

Cold-Climate Gardening, a 308-page paperback by Lewis Hill, explains how to extend your growing season by at least 30 days. Author is a professional nurseryman and writer from Vermont. Cost is $11.95 plus $2 S&H. Contact: Country Store Books, Box 6025, Suite 57, Columbia, MO 65205.

IPM Solutions is a free Integrated Pest Management newsletter. Contact: Gempler's Inc. IPM Solutions, P.O. Box 270, Mt. Horeb, WI 53572; (800) 382-8473.

The Alternative Field Crops Manual is an award winning publication. The 3 ring binder with over 50 crops provides information on the production of many minor or new field crops, some of which may be considered alternatives to traditional field crops. Cost is $45. Contact: CAPAP, 352 Alderman Hall, 1970 Folwell Ave., St. Paul, MN 55108 (612) 624-4217, FAX (612) 625-4237.

Water and Nutrient Management for Greenhouses (NRAES-56), a 110-page publication, provides managers with guidelines for fulfilling crop nutrient needs while minimizing environmental risk. Cost is $20. Contact: NRAES, Cooperative Extension, 152 Riley-Robb Hall, Ithaca, NY 14853-5701.

The Proceedings of the 1995 Symposium on "Agriculture and People - Building a Shared Environment include talks on cattle/pig nutrient management, managing manure and sustainability. Cost is $13. Contact: University of Nebraska Ag Research & Development Center, Rt. 1, Box 63A, Ithaca, NE 68033-9731.

CALENDAR OF EVENTS - Notify the Center of events of interest and we will publish that information for you.

January 28 - February 2, 1997 - The 1997 North American Direct Marketing Conference Albuquerque, New Mexico. Contact: Vance Corum, North American Direct Marketing Executive Director at (360) 693-5500.

January 22-25, 1997 - Ecological Farming Conference Pacific Grove, California. Contact: (408) 778-7366.

January 30 - February 1, 1997 - Minnesota Fruit & Vegetable Growers Association Conference and Trade Show St. Cloud, Minnesota. Contact: MFVGA, 1207 Constance Blvd. NE, Ham Lake, MN 55304; (612) 434-5929.

February 5-8, 1997 - Mid-Atlantic Direct Marketing Conference Dover, Delaware. Contact: Carl German, (302) 831-1317.

February 6-10, 1997 - 2nd Annual Herb Business Winter Getaway Conference Baton Rouge, Louisiana. Contact: The Herb Growing and Marketing Network, P.O. Box 245, Silver Spring, PA 17575; (717) 393-3295.

February 11-13, 1997 - New York State Vegetable Conference Liverpool, New York. Contact: NY Vegetable Growers Association, P.O. Box 4256, Ithaca, NY 14852; (607) 539-7648, Fax (607) 539-3150.

February 20-23, 1997 - World Aquaculture '97 Seattle, Washington. Contact: (206) 485-6682.

February 21, 1997 - Northern Piedmont, North Carolina Specialty Crops School Oxford, North Carolina. Contact: Carl Cantaluppi, Granville County Center, P.O. Box 926, Oxford, NC 27565; (919) 603-1350, Fax (919) 603-0268.

February 23-25, 1997 - 14th Annual California Farm Conference Riverside, California. Contact: David Visher, Small Farm Center, Davis, CA 95616; (916) 752-7779.

March 19-21, 1997 - International Conference on Agricultural Production and Nutrition Boston, Massachusetts. Contact: William Lockeretz, School of Nutrition Science and Policy, Tufts University, Medford, MA 02155.

April 28-May 1, 1997 - In Situ and On-Site Bioremediation New Orleans, Louisiana. Contact: Bioremediation Symposium Registrar, The Conference Group, 1989 West Fifth Ave., Suite 5, Columbus, OH 43212-1912; (800) 783-6338.

June 16-17, 1997 - An International Training Program in New Crops: Aromatic and Medicinal Plants West Lafayette, Indiana. Contact: James E. Simon, Center for New Crops and Plant Products, Department of Horticulture, Purdue University, 1165 Horticulture Building, West Lafayette, IN 47907-1165; (317) 494-1328; Fax (317) 494-0391.

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